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Contents

INCIDENCE OF MULTIDRUG RESISTANCE STRAINS OF BACTERIAL UROPATHOGENS IN PATIENTS VISITING VENUS INTERNATIONAL HOSPITAL

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Abstract: *Urinary Tract Infection (UTI) is one of the most common infectious diseases that affect people of every age-group in every geographical location. The impact of disease is worst in developing countries due to unawareness of the UTIs caused by multidrug-resistant (MDR) pathogens. The aim of this cross-sectional study was to determine the bacterial uropathogens associated with Uninary Tract Infection and their antibiotic resistance pattern at Venus International Hospital, Baneshwor, Kathmandu. A total of 543 urine specimens were collected for urine culture during April to September 2012 in the microbiology laboratory of Venus International Hospital from the patients suspected of Urinary Tract Infection. Of them 129 (23.8%) were found to be culture positive. Urinary Tract Infection was more common in female (57.37%) than in male (42.63%). Association of significant bacteriuria and gender of patients was found to be statistically insignificant (P>0.05). Status of bacteriuria was found highest in age group 31-40 (17.82%) followed by age group 21-30 (17.05%). Altogether six different bacterial isolates were isolated, among which Gram-negative organism constituted 75.20% and Gram-positive constituted 24.80%. Escherichia coli (62.01%) was the predominant uropathogen followed by Staphylococcus aureus (24.80%), Klebsiella pneumoniae (6.97%), Pseudomonas aeruginosa (4.65%), Morganella morganii (0.77%) and Proteus mirabilis (0.77%). Gram-negative bacteria showed best susceptibility towards Nitrofurantoin (75.25%) whereas Nalidixic acid (58.76%) was found to be least effective. Gram-positive bacteria showed best susceptibility towards Vancomycin (100%) whereas Cotrimoxazole (37.5%) was found to be least effective. Out of 129 bacterial isolates 54 (41.86%) were found to be Multidrug Resistant (MDR). It was found that out of 80 isolates 36 (45%) isolates of Escherichia coli were multidrug resistant. Similarly, 9 out of 32 isolates (38.12%) Staphylococcus aureus, 5 out of 9 isolates (55.55%) Klebsiella pneumoniae, 3 out of 6 isolates (50%) Pseudomonas aeruginosa and 1 (100%) Proteus mirabilis out of 1 isolate were multidrug resistant.*

Keywords: *Urinary tract infection, multidrug resistance, Uropathogens.*

Introduction

Urinary tract infection (UTI) is defined as the colonization of microbes in any part of the urinary tract (Syeda *et al.*, 2010). Despite the advances in and the wide–spread availability of antimicrobials, UTIs continue to be the most common causes of infections in hospitalized patients, accounting for approximately 40% of the hospital

acquired infections (Babypadmini & Appalaraju, 2004; Kamat *et al.*, 2009). Clinical experience has indicated the presence of numerous cases of antibiotic resistance to common antibiotics by uropathogens in both developed and developing countries (Gupta, 2002).

Resistance to newer and more potent antimicrobials is no exception, making the therapeutic options very limited to certain antimicrobial agents like carbapenem, colistin and fosfomycin. The updated knowledge and situation of the prevailing bacterial uropathogens that are multidrug resistant (MDR) is of prime importance for the proper use of antimicrobial drugs and for the policy making to combat multidrug resistance in UTIs (Giamarellou, 2010).

Wide spectrums of organisms are implicated in its aetiology, the most common being *Escherichia coli* (Babypadmini & Appalaraju, 2004; Kamat *et al.*, 2009; Pallavi *et al.*, 2010) and other Gram-negative bacteria, followed by Gram-positive organisms. The culture of the urine samples is essential for identifying the organisms and their antimicrobial susceptibilities.

The antibiotic therapy aims at relieving the existing symptoms and in preventing the development of complications like renal scarring. The increased emergence of antimicrobial resistance in the uropathogens, probably due to the empirical administration of anti bacterial therapy, even before the availability of the urine culture results, is a matter of growing concern worldwide (Oladeinde *et al.*, 2011). These data might be informative to health professionals to make a positive contribution to current understanding of the situation in UTI caused by MDR bacterial pathogens.

Materials and methods

A cross-sectional study was conducted prospectively at Venus International Hospital from April to September 2012. A total of 543 urine samples were collected from patients of all age groups and both sexes, suspected of UTI visiting Venus Hospital, and samples were processed according to the standard laboratory methods. The urine samples were cultured onto MacConkey agar and Blood agar plates and then were aerobically incubated at 37°C overnight. Colony count was performed to calculate the number of colony forming units (CFU) per ml of urine and the bacterial count was reported as: <104/ml organisms: not significant; 104 to 105/ml organisms: doubtful significance (suggest repeat specimen); >105/ml organisms: significant bacteriuria.

The identification of bacterial isolates was done using standard microbiological techniques as described in Bergey's Manual of Systemic Bacteriology which comprises of studying the colony characterstics, staining reactions and biochemical tests. Antibiotic susceptibility test of different isolates were performed by Kirby-Bauer disk

diffusion method on Mueller Hinton agar (MHA). Those organisms which showed resistance to at least three or more antibiotics of different structural classes were considered MDR as described elsewhere (Sahm *et al.*, 2001; Simner *et al.*, 2011).

Results

Of 543 urine samples subjected for culture, male patients constituted 269 (49.5%) and female patients constituted 274 (50.5%). The highest number of patients 131 (24.1%) belonged to the age group 21-30 followed by the age group of 31-40 (20.8%), 41-50 (12.2%) and least from >80 (1.8%). Higher number of female patients 81 (29.5%) were found in the age group 21-30 and higher number of male patients 61 (22.67) were found in the age group 31-40 (Table 1). The chi-square test revealed significant ($\chi2=26.628$, d.f.=8, P=0.001) difference between gender and age groups.

Table 1. Age and gender-wise distribution of patients

Age group	Male		Female		Total		P-value
	No	%	No	%	No	%	
0-10	12	2.20	30	5.52	42	7.73	
11-20	17	3.13	24	4.41	41	7.55	
21-30	50	9.20	81	14.91	131	24.12	
31-40	61	11.23	52	9.57	113	20.81	
41-50	37	6.81	29	5.34	66	12.15	
51-60	33	6.07	23	4.23	56	10.31	P<0.05
61-70	23	4.23	17	3.13	40	7.36	
71-80	29	5.34	15	2.76	44	8.10	
>80	7	1.28	3	0.55	10	1.84	
Total	269	49.5	274	50.5	543	100	

Table 2 illustrates gender wise growth profile of sample. Of the total 543 urine samples subjected for culture, 129 (23.8%) were culture positive and 414 (76.2%) were culture negative. Among them the numbers of growth in male and in female were 55 and 74, respectively. The chi-square test revealed insignificant ($\chi2=3.226$, d.f.=1, P=0.072) difference between gender and growth pattern.

Table 2. Gender-wise growth profile of sample

Growth	Gender		Total		P-value
	Male	Female	No	%	
Significant growth	55	74	129	23.8	
No growth	214	200	414	76.2	P>0.05
Total	269	274	543	100	

Among 476 samples from outpatient department, 118 (24.78%) showed significant growth and among 67 samples from inpatient department 11 (16.41%) showed significant growth (Table 3). The chi-square test ($\chi2=2.273$, d.f.=1, P=0.132) revealed insignificant difference between growth and types of patients.

Table 3. Distribution of the isolates in the inpatient and outpatient samples

Department	Growth		No growth		Total		P-value
	No	%	No	%	No	%	
Outpatients	118	24.78	358	75.21	476	87.66	
Inpatients	11	16.41	56	83.58	67	12.33	P>0.05
Total	129	23.75	414	76.24	543	100	

Among 129 positive cases of the samples which constituted 6 different species *E. coli* (62.01%) was found to be the most predominant organism followed by *S. aureus* (24.8%), *K. pneumoniae* (6.97%), *P. aeruginosa* (4.65%), *M. morganii* (0.77%), and *P. mirabilis* (0.77%). Of total 129 growth positive cases 55 (42.63%) were male patients and 74 (57.36%) were female patients (Table 4). *E. coli* was the most predominant in both genders.

Table 4. Distribution pattern of isolated uropathogens among male and female patients

Organisms	Isolates				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Escherichia coli	35	43.75	45	56.25	80	62.01
Staphylococcus aureus	13	40.62	19	59.37	32	24.80
Pseudomonas aeruginosa	3	50	3	50	6	4.65
Proteus mirabilis	0	0	1	100	1	0.77
Klebsiella pneumoniae	3	33.33	6	66.66	9	6.97
Morganella morganii	1	100	0	0	1	0.77
Total	55	42.63	74	57.36	129	100

Table 5 shows the correlation of pyuria with culture. Among the total 543 samples, 78.26% of samples showed insignificant pyuria; however among these, 14.35% of samples gave positive culture results. Similarly, 118 (21.73%) of total samples showed significant pyuria, and among them 57.62% samples gave positive culture results. The association of significant bacteriuria with pyuria was found to be statistically significant ($\chi2=1.099$, d.f.=4, P=0.00).

Table 5. Correlation of pyuria and culture result

Pyuria	Culture positive		Culture negative		Total		P-value
	No.	%	No.	%	No.	%	
Significant (≥5WBC/HPF)	68	57.62	50	42.3	118	21.73	
Insignificant (<5WBC/HPF)	61	14.35	364	85.64	425	78.26	P<0.05
Total	129	23.75	414	76.24	543	100	

Of nine different antibiotics used, Nitrofurantoin (75.25%) was found to be the most effective antibiotic towards Gram-negative isolates followed by Gentamycin (65.97%), Ceftriaxone (53.60%), Cefotaxime (50.51%), Cotrimoxazole (48.45). Amoxycillin (64.94%) was found to be the most resistant followed by Nalidixic acid (58.76%) (Table 6).

Table 6. Susceptibility pattern of Gram-negative bacteria

Antibiotics	Sensitive		Intermediate		Resistant		Total no.
	No.	%	No.	%	No.	%	
Amoxycillin	18	18.55	16	16.49	63	64.94	97
Ceftriaxone	52	53.60	7	7.21	38	39.17	97
Cefotaxime	49	50.51	10	10.30	38	39.17	97
Gentamycin	64	65.97	16	16.49	17	17.52	97
Nalidixic acid	33	34.02	7	7.21	57	58.76	97
Ciprofloxacin	42	43.29	10	10.30	45	46.39	97
Ofloxacin	42	43.29	11	11.34	44	45.36	97
Cotrimoxazole	47	48.45	7	7.21	43	44.32	97
Nitrofurantoin	73	75.25	6	6.18	17	17.52	97

Staphylococcus aureus was the only Gram-positive isolate. The susceptibility pattern showed that it was highly susceptible to Vancomycin (100%), followed by Gentamycin (78.12%) and Cephalexin (71.87%). Cotrimoxazole (37.5%) was found to be the least effective (Table 7).

In this study the organisms are considered as MDR when they are resistant to at least three or more antibiotics of different structural classes. Out of 129 isolates, 54 (41.86%) isolates were found to be multidrug resistant. It was found that 36 (45%) *E. coli* were multidrug resistant out of 80 (62.01%) isolates; 9 (28.12%) *S. aureus* were multidrug resistant out of 32 (24.80%) isolates; 5 (55.55%) *K. pneumoniae* out of 9 (6.97%) isolates; 3 (50%) *P. aeruginosa* out of 6 (4.65%) isolates; and 1 (100%) *P. mirabilis* out of 1 (0.77%) isolate (Table 8).

Table 7. Susceptibility pattern of Gram-positive bacteria

Antibiotics	Sensitive		Intermediate		Resistant		Total
	No.	%	No.	%	No.	%	
Amoxycillin	18	56.25	1	3.12	13	40.62	32
Gentamycin	25	78.12	2	6.25	5	15.62	32
Ciprofloxacin	20	62.5	2	6.25	10	31.25	32
Ofloxacin	20	62.5	5	15.62	7	21.87	32
Cotrimoxazole	12	37.5	7	21.87	13	40.62	32
Vancomycin	32	100	0	0	0	0	32
Cephalexin	23	71.87	0	0	9	28.12	32

Table 8. Microbial pattern of multidrug resistance isolates

Organism	Multidrug resistant		
	Total no of isolates	No.	%
Escherichia coli	80	36	45
Staphylococcus aureus	32	9	28.12
Pseudomonas aeruginosa	6	3	50
Proteus mirabilis	1	1	100
Klebsiella pneumoniae	9	5	55.55
Morganella morganii	1	0	-
Total	129	54	41.86

Table 9 shows the source-wise and gender-wise distribution of MDR isolates. Of the total 118 bacterial isolates in OPD, 49 (41.53%) were MDR among which the percent of distribution in male and female patients were 55.1% and 44.9%, respectively. Similarly, out of total 11 bacterial isolates in IPD, 5 (45.45%) were MDR among which the percentage of distribution in male and female were 60% and 40%, respectively.

Table 9. Source wise and gender wise distribution of MDR isolates

MDR	OPD				Total		IPD				Total	
	Male		Female				Male		Female			
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	27	54	22	32.35	49	41.53	3	60	2	33.33	5	45.45
No	23	46	46	67.64	69	58.47	2	40	4	66.67	6	54.55
Total	50	100	68	100	118	100	5	100	6	100	11	100

Discussion

The present study provides the information about the distribution and antibiotic resistance pattern of bacterial pathogens isolated from the UTI patients. Of the total 543 mid stream urine samples received, 129 (23.8%) samples showed significant growth where as 414 (76.2%) samples showed no growth. The low number of growth positivity among urine samples was similar to that observed in Kathmandu[10]. The referral of all the patients seeking intervention regarding problems of urinary tract to urine culture, the prior use of the antibiotics, or the possible presence of the fastidious bacteria are some of the reasons behind the poor growth positivity seen in urine culture.

Patients of all age groups were included in the study. In the present study higher number of female patients were infected in the age group 21-30, and higher number of male patients were infected in the age group 51-60, similar as observed in India (Prakasam *et al.*, 2012). This result suggests that sexually active women of child bearing age are more susceptible to UTI. Increasing frequency of prostrate disease and diabetes mellitus are responsible for incidence of UTI in elderly patients.

In our study, altogether six different bacterial isolates were isolated. Among the isolates, *E. coli* 80 (62.01%) remains the leading pathogen followed by *S. aureus* 32 (24.80%), *K. pneumonia* 9 (6.97%) responsible for UTI similar as observed in India (Sharma & Paul, 2012).

The presence of 5-10 pus cells per HPF can be a good marker of UTI. In this study significant pyuria was observed in 118 (21.73%) samples, and among them 57.62% samples gave positive culture results and 425 (78.3%) samples showed insignificant pyuria; however among these, 14.35% of samples gave positive culture results. The association of significant bacteriuria with pyuria was found to be statistically significant (P<0.05). In general, as the number of pus cells/HPF increases, the chance of getting culture positive result will also be higher.

The highest sensitivity of Gram-negative bacteria observed in this study was towards Nitrofurantoin (75.25%) and highest resistance towards Amoxycillin (64.94%) as observed in the study in Iran (Forouzan & Amir, 2013). *Staphylococcus aureus* was found susceptible to Vancomycin (100%) followed by Gentamycin (78.12%) where as Cotrimoxazole was found to be least effective (37.5%), finding is similar in Kathmandu (Subedi *et al.*, 2009). In contrast to this, all these antibiotics resistance against *S. aureus* was found in Nigeria (Onanuga & Awhowho, 2012).

In the present study, those organisms which showed resistance to at least three or more antibiotics of different structural classes were considered MDR. A large number of the bacterial isolates in this study showed multiple antibiotic resistances (≥3 drugs). Among 129 bacterial isolates, MDR isolates accounted for 41.86%, a finding

constituent in Kathmandu where 41.1% MDR isolates were detected (Baral *et al.*, 2012). In contrast to this lower prevalence of MDR, 13.92% was found in a study conducted in Spain (Oteo *et al.*, 2001). Out of 80 *E. coli* isolates, 45% were MDR, as observed in similar study in Kathmandu (Shrestha *et al.*, 2012). This finding is not consistent with the study done in NPHL, where the percent of MDR *E. coli* were higher (73.68%). In this study a high incidence of MDR UTIs was found in both hospitalized patients (45.45%) and out-patients (41.52%). It gives the impression of extensive dissemination of MDR uropathogens in both community and hospital environment.

Conclusion

We observed the high prevalence of multidrug resistance among bacterial uropathogens. Particularly, the rate of resistance to Amoxycillin, Nalidixic acid, and Flouroquinolones were higher, and these antibiotics should be avoided for empirical-based therapy of UTIs. In such cases, empirical treatment with Nitrofurantoin and Amikacin might provide much better antibiotic coverage.

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CYTOTOXIC AND ANTIOXIDANT ACTIVITIES OF EXTRACT OF THE LEAVES OF *Annona reticulata*

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Abstract: *The main objective of this study is to evaluate dichloromethane (DCM) and water soluble methanolic leaf extract of Annona reticulata against Brine shrimp lethality, anticancer activity on HeLa cell line, PC3 cell line and 3T3 cell line. The leaf extracts were evaluated for antioxidant activities by DPPH radical scavenging assay. DCM fraction and water soluble fraction of Annona reticulata leaves showed cytotoxic effect towards HeLa cell line with IC_{50} 20.537±0.663 µg/mL and 7.666±0.218 µg/mL respectively whereas the standard doxorubicin has IC_{50} 0.349±0.01 µg/mL. DCM and water soluble fraction showed cytotoxic effect towards PC3 cell line with IC_{50} 17.427±0.704 µg/mL and 4.123±0.290 µg/mL respectively where as the standard doxorubicine has 1.382±0.161 µg/mL. Water soluble fraction has cytotoxicity with IC_{50} 7.026±0.254 µg/mL while DCM fraction showed moderate cytotoxic effect with IC_{50} 20.73±0.80 µg/mL towards 3T3 cancer cell line. The DCM fraction of Annona reticulata showed positive Brine shrimp lethality with LD_{50} 16.1140 µg/ml but the standard drug etoposide has 7.4625 µg/mL and the water soluble fraction showed positive lethality with LD_{50} 25.70 µg/mL where as the standard drug etoposide has LD_{50} 7.4625 µg/mL. The IR spectrum of DCM fraction showed the strong absorption bands at 3359 cm^{-1}, 2923 cm^{-1}, 2856 cm^{-1}, 1737 cm^{-1}, 1622 cm^{-1}, 1456 cm^{-1} and 1064 cm^{-1}. Similarly the IR spectrum of water soluble fraction showed the strong absorption peak at 3411 cm^{-1}, 2925 cm^{-1}, 2854 cm^{-1}, 1743 cm^{-1}, 1458 cm^{-1} and 1074 cm^{-1}. DPPH-RSA antioxidant activity of water soluble fraction showed the IC_{50} 470.87±4.77 SEM [µM], and percentage radical scavenging activity was found to be 71.194.*

Keywords: Cytotoxicity, *Annona reticulata*, dichloromethane, lethality, antioxidant.

Introduction

Annona reticulata, commonly known as bullock's heart or *ramphal* plant in Nepal and all over the India, is tall with many branches, bearing nutritious fruits. Ayurveda and various ancient literatures have stated the plant as herbal remedies for a number of human ailments. The leaves are used as insecticides, anthelmintic, styptic and are also used externally as suppurate (Zaman & Pathak, 2012). Bark of the plant is powerful astringent used as antidysentric and vermifuge. Root, bark, stem and leaves possess isoquinoline alkaloids (Zaman and Pathak, 2012). Root and seed extracts of *Annona reticulata* cause the cell death in various cancer cell lines. An aqueous extract of *Annona reticulata* showed maximum protection of cell death (Shital *et al.*, 2014).

Compounds isolated from the plant have potent activity to antiplatelet, antitumor cytotoxic and antibacterial activities (Pyo *et al.*, 2003). Secondary metabolites isolated from the plant have been used against insect attacks, plant diseases, stimulation of the immune system, modulation of hormones metabolism and antibacterial and antiviral effect (James & Anderson, 1983; Nithya *et al.*, 2011). The most important of these bioconstituents of plants are alkaloids, tannins, flavonoids, cardiac glycosides, steroids and saponins (Nithya *et al.*, 2011). The plant extract exhibited significant activities in the central as well as peripheral analgesic and anti-inflammatory activities (Nithya *et al.*, 2011).

Kaur-16-en-19-oic acid was isolated from the bark of the plant and studied for its analgesic and anti-inflammatory activity by Moghadamtousi *et al.* (2014). Thirteen compounds were isolated from the seeds of this plant (Rawal *et al.*, 2009). The phytochemical and pharmacological activities of *Annona reticulata* components suggest a wide range of clinical application in lieu of cancer chemotherapy. The ethanol extract exhibited a prominent inhibitory effect against A-549, K-562, HeLa and MDA-MB human cancer cell lines at a concentration range between 10 and 40 µg/mL, whereas the aqueous extract showed a lower activity at the same concentration (Suresh *et al.*, 2011). Using cytotoxicity as a guide to fractionation, one novel acetogenin, annoreticuin-9-one [3] and four known cytotoxic acetogenins, squamone [4], solamin [5], annomonicin [6] and rolliniastatin-2 [7] were isolated from active extracts of leaves of *Annona reticulata* (Islam *et al.*, 2012).

Present study includes investigation of bioactive constituents of *Annona reticulata* leaves for cytotoxic properties against Brine shrimp larvae (Nauplii). Brine shrimp lethality test is also employed as a preliminary tool to evaluate other potential biological activities that have not been reported by the traditional healers. Dichloromethane and water soluble fraction of *Annona reticulata* leaves showed potent cytotoxicity against PC3, 3T3 and HeLa cancer cell lines. *Annona reticulata* leaf extract could be used as source for isolation and characterization of potent cytotoxic natural compounds.

Materials and methods

Plant collection and extraction

Leaves of *Annona reticulata* were collected from local areas of Chitwan district, Nepal, in the month of July. Air dried and coarsely pulverized leaves (900 g) extracted with 80% methanol in water by maceration for 72 h. Obtained extract was concentrated to dryness in a rotatory evaporator at room temperature to obtain methanol extract (68 g). After removal of solvent, percentage yield was calculated and plant extract was stored in refrigerator at 4°C until use.

Scheme: Processing and extraction of crude plant material
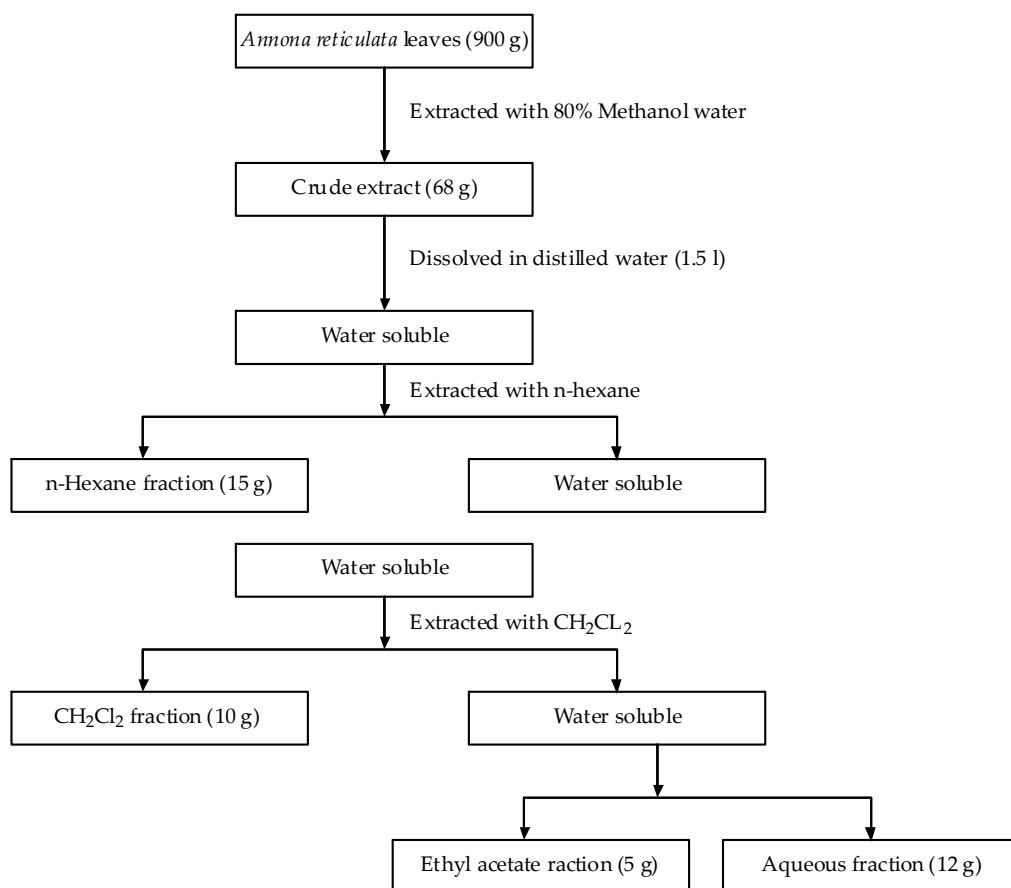
Phytochemical analysis

The n-hexane, dichloromethane, aqueous and ethyl acetate fraction of *Annona reticulata* leaf was subjected to the preliminary phytochemical tests to determine the group of secondary metabolites present in the plant material. The concentrated extracts were used for preliminary screening of phytochemicals such as polyphenols, steroids, flavonoids, alkaloids, glycosides, reducing sugars, tannin, cardiac glycosides, anthraquinone, carotenoids and saponins.

Brine shrimp lethality assay

Twenty mg of fractionated extract dissolved in 2 mL of methanol and transferred into 5, 50, 500 μL to each vials (3 vials/concentration). The concentration was 10, 100 and 1000 μg/mL, respectively. It was allowed to evaporate overnight. Brine shrimp eggs were hatched in artificial sea water and after 2 days of hatching nauplii were

placed 10 larvae/vials using a Pasteur pipette. The volume was made 5 mL with sea water. It was incubated at 25-27°C under illumination. Methanol and cytotoxic drug were used as negative and positive control (Mayer *et al.*, 1982; Alves *et al.*, 2000).

Antioxidant activity

DPPH solution (95 μL, 300 μM) in Ethanol was mixed with test solution (5 μL, 500 μM). The reaction was allowed to progress for 30 min at 37°C and absorbance was monitored by multiplate reader, SpectraMax340 at 517 nm. Upon reduction, the color of the solution fades (Violet to pale yellow). Percent Radical Scavenging Activity (% RSA) was determined by comparison with a DMSO containing control. The concentration that causes a decrease in the initial DPPH concentration by 50% is defined as IC_{50} value. The IC_{50} values of compounds were calculated by using the EZ-Fit Enzyme kinetics software program (Perrella Scientific Inc. Amherst, MA, USA). N-acetylcysteine, ascorbic acid and BHA are used as the reference compounds.

Cytotoxic activity

PC3 cell line (Mosmann, 1983)

Cytotoxic activity of compounds was evaluated in 96-well flat-bottomed micro plates by using the standard MTT (3-[4,5-dimethylthiazole-2-yl]-2,5-diphenyl-tetrazolium bromide) colorimetric assay. For this purpose, PC3 cells (Prostrate Cancer) were cultured in Dulbecco's Modified Eagle Medium, supplemented with 5% of fetal bovine serum (FBS), 100 IU/mL of penicillin and 100 μg/mL of streptomycin in 75 cm^2 flasks, and kept in 5% CO_2 incubator at 37°C. Exponentially growing cells were harvested, counted with haemocytometer and diluted with a particular medium. Cell culture with the concentration of 1×10^5 cells/mL was prepared and introduced (100 μL/well) into 96-well plates. After overnight incubation, medium was removed and 200 μL of fresh medium was added with different concentrations of compounds (1-30 μM). After 48 h, 200 μL MTT (0.5 mg/mL) was added to each well and incubated further for 4 h. Subsequently, 100 μL of DMSO was added to each well. The extent of MTT reduction to formazan within cells was calculated by measuring the absorbance at 570 nm, using a micro plate reader.

HeLa cell line (Mosmann, 1983)

Cytotoxic activity of compounds was evaluated in 96-well flat-bottomed micro plates by using the standard MTT (3-[4,5-dimethylthiazole-2-yl]-2,5-diphenyl-tetrazolium bromide) colorimetric assay. For this purpose, HeLa cells (Cervical Cancer) were cultured in Minimum Essential Medium Eagle, supplemented with 5%

of fetal bovine serum (FBS), 100 IU/mL of penicillin and 100 µg/mL of streptomycin in 75 cm^2 flasks, and kept in 5% CO_2 incubator at 37°C. Exponentially growing cells were harvested, counted with haemocytometer and diluted with a particular medium. Cell culture with the concentration of 6×10^4 cells/mL was prepared and introduced (100 µL/well) into 96-well plates. After overnight incubation, medium was removed and 200 µL of fresh medium was added with different concentrations of compounds (1-30 µM). After 48 hrs, 200 µL MTT (0.5 mg/mL) was added to each well and incubated further for 4 h. Subsequently, 100 µL of DMSO was added to each well. The extent of MTT reduction to formazan within cells was calculated by measuring the absorbance at 570 nm, using a micro plate reader.

3T3 cell line (Mosmann, 1983)

Cytotoxic activity of compounds was evaluated in 96-well flat-bottomed micro plates by using the standard MTT (3-[4,5-dimethylthiazole-2-yl]-2,5-diphenyl-tetrazolium bromide) colorimetric assay. For this purpose, 3T3 (mouse fibroblast) cells were cultured in Dulbecco's Modified Eagle Medium, supplemented with 5% of fetal bovine serum (FBS), 100 IU/ml of penicillin and 100 µg/ml of streptomycin in 75 cm^2 flasks, and kept in 5% CO_2 incubator at 37°C. Exponentially growing cells were harvested, counted with haemocytometer and diluted with a particular medium. Cell culture with the concentration of 5×10^4 cells/mL was prepared and introduced (100 µL/well) into 96-well plates. After overnight incubation, medium was removed and 200 µL of fresh medium was added with different concentrations of compounds (1-30 µM). After 48 h, 200 µL MTT (0.5 mg/mL) was added to each well and incubated further for 4 h. Subsequently, 100 µL of DMSO was added to each well. The extent of MTT reduction to formazan within cells was calculated by measuring the absorbance at 540 nm, using a micro plate reader.

The cytotoxicity was recorded as concentration causing 50% growth inhibition (IC_{50}) for all these three (PC3, HeLa and 3T3) cancer cell lines. The percent inhibition was calculated by using the following formula:

% inhibition = 100- ((mean of O.D of test compound – mean of O.D of negative control) / (mean of O.D of positive control – mean of O.D of negative control) *100

The results (% inhibition) were processed by using Soft- Max Pro software (Molecular Device, USA).

Results and discussion

Phytochemical analysis showed that the methanol extract of *Annona reticulata* is rich in secondary metabolites (Table 1) and it can be used as the source of phytoconstituents for isolation of active constituents.

Table 1. Preliminary phytochemical tests of *Annona reticulata* leaf extracts

Plant constituents	n-Hexane	Dichloromethane	Methanol	Aqueous
Polyphenols	-	+	+	+
Steroids	+	+	+	-
Flavonoids	-	+	+	+
Alkaloids	-	+	+	+
Glycosides	-	-	+	+
Reducing sugars	-	+	+	+
Tannin	-	-	+	+
Cardiac glycoside	-	+	+	+
Anthraquinone	-	+	+	+
Carotenoids	-	+	+	+
Saponins	-	-	+	+

Brine shrimp bioassay showed only the dichloromethane (DCM) and aqueous fraction of *Annona reticulata* leaf are cytotoxic. Aqueous fraction of plant showed more cytotoxic than dichloromethane soluble fraction (Tables 2 and 3). The result is comparable to the previous work by Hamid *et al.* (2011).

Table 2. Brine shrimp bioassay results of *Annona reticulata* dichloromethane (DCM) fraction

Dose (µg/mL)	No. of Shrimps	No. of survivors	LD (µg/mL)	STD. Drug	LD50 (µg/mL)
1000	30	6			
100	30	11	16.1140	Etoposide	7.4625
10	30	16			

Table 3. Brine shrimp bioassay results of *Annona reticulata* aqueous fraction

Dose (µg/mL)	No. of Shrimps	No. of survivors	LD (µg/mL)	STD. Drug	LD50 (µg/mL)
1000	30	1			
100	30	5	25.70	Etoposide	7.4625
10	30	22			

The dichloromethane soluble fraction of *Annona reticulata* leaf showed cytotoxicity against HeLa cell line with IC_{50} = 20.53±0.66 µg/mL and water soluble fraction has IC_{50} = 7.66±0.21 µg/mL whereas the standard Doxorubicin has IC_{50} = 0.349±0.01µg/mL. The water soluble fraction is more cytotoxic than the dichloromethane soluble fraction (Table 4).

Table 4. Cytotoxic effect towards HeLa cell line

Sample Code	IC50±SD (µg/mL)
AR-DCM, Dichloromethane fraction of *Annona reticulata* leaf	20.537±0.663
AR-WSF, Water soluble fraction of *Annona reticulata* leaf	7.666±0.218
Doxorubicin (As standard)	0.349±0.01

Water soluble fraction of *Annona reticulata* leaf showed more cytotoxicity against PC3 cancer cell line with IC_{50} = 4.12±0.29 µg/mL and the dichloromethane soluble fraction showed cytotoxicity with IC_{50} = 17.42±0.70 µg/mL. The standard Doxorubicin has IC_{50} = 1.38±0.01 µg/mL (Table 5).

Table 5. Cytotoxic effect towards PC3 cell line

Sample Code	IC50±SD (µg/mL)
AR-DCM, Dichloromethane fraction of *Annona reticulata* leaf	17.427±0.704
AR-WSF, Water soluble fraction of *Annona reticulata* leaf	4.123±0.290
Doxorubicin (As standard)	1.382±0.01

Water soluble fraction of *Annona reticulata* leaf showed cytotoxicity against 3T3 cancer cell line with IC_{50} = 7.02±0.25 µg/mL and the dichloromethane soluble fraction showed cytotoxicity with IC_{50} = 20.73±0.80 µg/mL. Water soluble fraction is more potent than the dichloromethane soluble fraction against 3T3 (mouse fibroblast) cell line (Table 6).

Table 6. Cytotoxic effect towards 3T3 cell line

Sample Code	IC50±SD (µg/mL)
AR-DCM, Dichloromethane fraction of *Annona reticulata* leaf	20.738±0.806
AR-WSF, Water soluble fraction of *Annona reticulata* leaf	7.026±0.254
Cycloheximide (As standard)	0.073±0.12

Water soluble fraction of the plant showed antiradical activity with IC_{50} = 470.87±4.77 µM but the standard gallic acid has IC_{50} = 4.3±0.43 µM. The result showed that water soluble fraction has 71.19% and dichloromethane soluble fraction has 36.18% radical scavenging activity. Water soluble fraction of the plant showed more antioxidant activity and could be used to isolate the pure antioxidant potent compound (Table 7).

Table 7. Antioxidant activity (DPPH-RSA)

Sample Code (Fraction)	IC50±SEM[μM]	% RSA (Radical Scavenging Activity
AR-WSF, Water soluble	470.87±4.77	71.19
AR-DCM, Dichloromethane	Inactive	36.189
Std: Gallic acid	4.3±0.43	93.13

Conclusions

Phytochemical analysis showed that the plant has large number of secondary metabolites. The UV absorption of dichloromethane and water soluble fraction showed the maximum absorption at 229 nm. The IR spectrometry of DCM fraction showed the broad band at 3359 cm^{-1}, 2923 cm^{-1}, 2856 cm^{-1}, 1737 cm^{-1}, 1622 cm^{-1}, 1456 cm^{-1} and 1064 cm^{-1}. Similarly the water soluble fraction showed the broad IR bands at 3411 cm^{-1}, 2925 cm^{-1}, 2854 cm^{-1}, 1743 cm^{-1}, 1458 cm^{-1} and 1074 cm^{-1}. The band position in IR spectrum indicated the phytoconstituents have O-H, C=C, C=O, COOH and C-O stretching. Several peaks in gas chromatogram indicated that both DCM and water soluble fraction of *Annona reticulata* has different phytoconstituents. The DCM fraction of *Annona reticulata* shows positive Brine shrimp lethality with LD_{50} 16.1140 μg/mL with respect to the standard drug etoposide LD_{50} 7.4625 μg/mL, and water soluble extract of *Annona reticulata* showed positive lethality with LD_{50} 25.70 μg/mL whereas the standard drug etoposide has LD_{50} 7.4625 μg/mL. Brine shrimp lethality of the dichloromethane and aqueous extracts of *Annona reticulata* were also recorded. Dichloromethane extract having LD_{50} 16.1140 μg/mL showed more potent activity than an aqueous extract with LD_{50} 25.70 μg/mL. This result indicated that the plant can be used as source for the investigation of active compound having high cytotoxic effect. DPPH-RSA antioxidant activity of water soluble fraction showed the IC_{50} 470.87±4.77 SEM [μM] and percentage radical scavenging activity was found to be 71.194%. The water soluble fraction showed weak antioxidant activity while DCM fraction has no activity.

Acknowledgements

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FACTORS AFFECTING FOOD PRICE INSTABILITIES IN NEPAL

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Abstract: *The study was synthesized to investigate the backdrop of long-run and short-run dynamics of the food price instability factors in Neplease food market. Using secondary data between January 2000 to the April 2013, the study used Johansen's cointegration test (JCT) and Vector Error Correction Model (VECM) to examine the effect of: world rice price (WRP), Indian common rice (IRP), official exchange rate (OER), crude oil price (COP), and national petrolium retail price (FRP) on domestic rice price, especially course rice (CRP) and medium rice price (MRP). The study fulfilled all the preconditions of JCT by conducting DF, ADF, Q- test, Breusch-Godfrey LM, and D-W test for identifying unit root, autocorrilation, spurious regression and normality test values. JCT results showed that CRP was cointeragted CI ≈ (1,0) in first order with WRP, IRP, FRP, COP and OER. Similarly, the medium rice price (MRP) was also cointegrated with the WRP, IRP, FRP, and OER in 1st order (CI ≈ (1,0)). These evidences confirmed that WRP_t, COP_t, IRP_t, and OER_t were major factors of price instability in a long-run. The dynamic of short-run relationships were tested by running Johansen's Cointegrating Vector Error Correction Model (VECM). However, results proved that no any long-run speed of adjustment to be corrected each month for reaching long-run equilibrium steady state position. Unlike it, the model quantified short-run coefficient of $lncourse_{t-1}$, and $lncrudeoil_{t-1}$ had effect on course rice while $lnmedium_{t-2}$ (L2D), $lnmedium_{t-1}$ (LD), and $lnoer_{t-1}$ had significant effect on MRPs.*

Keywords: *ADF, cointegration, ECT, instability, pass-through, unit root, and VECM.*

Introduction

In Nepal, food commodities are becoming expensive day-after-day by their skyrocketing domestic price movement in a constant manner. Major dietary habits of Nepalese population are rice, maize, wheat, millet, rice, potato, sugar and pulse, which together constitute 57 percent of the monthly food expenses (Agostinucci & Loseby, 2008). Microeconomic as well as macroeconomics causes of the price instabilities are reported from various mechanisms particularly domestic production shortfalls, increase in production cost, higher import cost, global food price increase, money inflation, irregular food supply due to political and communal strikes, rising price of vehicles, rise in petroleum products, monopolies like syndicates cum cartellings behaviors of the food items suppliers, international food price fluctuations, and exchange rate effects (Shrestha & Chaudhary, 2012; Agribusiness Promotion &

Market Development Directorate, 2013; Pant *et al.,* 2013; Nepal Rastra Bank, 2013). The consumers, in output marketing and producers cum suppliers (in the input marketing), have been severely criticizing current market functionaries and the government as the major price instability contributers. Similar to other developing countries, the prices of staple food that sharply rose from mid of 2007, continued up to the end of 2008 in Nepal but the price level of the food remained higher in the long-run even after 2008 (Food and Agricultural Organiation, 2010). The country, as a net importer of major food items, faced severe problems of food shocks, driven by the higher global price hike. These causes and impact of higher prices were the subject of much analytical and policy debate (Imai *et al.*, 2008). The major research question of the study was acquainting and analysing the role of dominant factors on fluctuating prices: cost of production, fuel price, retail price, stock, exchange rate or world food demand or world market price. However, the researcher did not find econometric analysis of measuring extent of price effect for the national rice market taken as sub-sector. In addition, there were no literatures that analysed short-term and long-term dynamics of rice price fluctuation in relation to world rice price, fuel price and exchange rate. Thus, the objectives of the research were: (i) analysing factors affecting rice price instabilities in relation to co-movement of international rice price, petroleum prices swings as well as exchange rate alignment and; (ii) assessing the long-run and short-run dynamics of domestic food price relation to world commodity price, fuel price and exchange rate.

Research methodology

Data and variables

The study used secondary data taken from five different sources from January 2000 to April 2013: i) monthly world rice price (FOB Thailand A1 USD) from Food Outlook of the FAO, ii) crude oil prices (Per barrel / month in Dubai rate) from World Bank Pink Datasheet online service, iii) monthly exchange rate data (USD to Nepalese Rupee) achieve from NRB Online service, iv) national retail price of rice from Agribusiness Promotion and Marketing Development Directorate (ABPMDD)/DoA, v) retail price of rice from DoA, India, and vi) monthly retail price of petroleum in Nepal taken from NOC Kathmandu.

The study focused on course and medium rice into account because of the coverage and uses of the Nepalese consumers and producers. Majority of the cultivation in Nepal is course and medium type rice varieties cultivated even in the adverse edaphic and climatic situation. There were three different kinds of world market prices of rice available. However, the study team selected Thai FOB 5% broken

A1 because Nepal imports mostly cheaper rice types. The other supportive data were collected from published documents of Central Bureau of Statistics (CBS), Nepal, Food and Agricultural Organization (FAO), Ministry of Agricultural Development (MOAD) Nepal, and International Monetary Fund e-library. Using the prevailing Nepalese Rupee-US $ exchange rate, all domestic prices were converted to US $ equivalents except nominal exchange rate. All the data series were transformed into natural log form to obtain the pass-through elasticity of the fitted model. The researcher only considered world rice price, fuel price, Indian rice price and exchange rate as the major factors of rice price instabilities by keeping constant for other important factors like cost of production, supply shortage and level of food production.

Empirical model: Multiple regressions

The study used multiple regression to determine the relationship of domestic food price to world rice price, Indian common rice, petroleum price (domestic and world crude oil) as well as exchange rate alignment to test the hypothesis of whether or not changes in regressors explain a significant influence to the national rice prices (Timmer, 2008). As shown in the Equation (1) and (2) in the initial steps, the study used pair-wise series (world rice price, Indian rice price, petroleum price, exchange rate) for domestic rice: course rice and medium rice) for testing general requirements of Gause-Markov's-OLS estimates (Gujrati *et al.*, 2012).

$$\ln CRP_t = \alpha_0 + \alpha_1 \ln WRP_t + \alpha_2 \ln IRP_t + \alpha_3 \ln OER_t + \alpha_4 \ln COP_t + \alpha_5 \ln FRP_t + U_t \text{ --------- (1)}$$

$$\ln MRP_t = \alpha_0 + \alpha_1 \ln WRP_t + \alpha_2 \ln IRP_t + \alpha_3 \ln OER_t + \alpha_4 \ln COP_t + \alpha_5 \ln FRP_t + U_t \text{ -------- (2)}$$

where, CRP_t, MRP_t were course rice price and medium rice price (USD/Mt) at time t; WRP_t: world rice price (USD/Mt) at time t; IRP_t: Indian common rice retail price in USD/Mt at time t; OER_t = official exchange rate (OER) 1USD/NRs at time t, COP_t = World crude oil price USD/Barrel at time t, FRP_t = fuel retail price (in USD/Barrel) at time t, U_t = Error term at time t;, a_0, a_1, a_2, a_3, a_4 and a_5 are slope coefficients to be estimated.

Testing unit root problem, spurious regression and autocorrelation

Time series data depicted in figure 1 showed the existence of stationarity, in lieu of that, the unit root test (URT) brought into analysis finding whether the root is close to unity. "No unit root problem" was the precondition of cointegration test. In this line of a time series set, "stationary" refers to a condition wherein the data series have constant mean and constant variance. Most of the time series data reflected trend,

cycle and seasonality effect. These deterministic patterns must be corrected to make the series stationary. Otherwise, nonstationary time series properties could produce invalid inferences: spurious regression, autocorrelation etc. If these non-stationary time series data differentiated in certain times order, the resulting time series considered at-least mean stationary. Such a unit root problem was tested by using the Dickey-Fuller (DF) test with an Autoregressive Moving-Average (ARMA) process to decide the order of integration of the series (Sjo, 2008) as per explained in equation 3.

$$y_t = \alpha y_{t-1} + \mu_t$$ …………………….…........................….. (3)

where, μ_t is a white-noise process, which is an infinite time series of jointly distributed random variables with a constant mean and finite variance (σ^2). If $\|a\| < 1$ and significant in the Equation 3, the process was (weak) stationary otherwise $\|a\| > 1$ the process was non-stationary. Transforming a non-stationary process into stationary (at least mean stationary), so-called different filters of first order were used as follows:

$\Delta Y_t = bY_{t-1} + u_t$……………………………………....…... (4) or

$\Delta Y_{t-1} = Y_{t-1} (a-1) + u_t$ ………………………………..…… (5)

If a-1=b, the final Equation (5) would be same as Equation (4). For the value of a=1, b would be 0, if $\|a\| < 1$ then b would be -2<b<0. Ultimately, for time series process if the b is not significantly equal to zero and -2<b<0, then *a* is not significantly equal to 1 and if $\|a\| < 1$, the process is weak stationary. The significance of parameter "b" in the Dickey-Fuller Equation (4) verified setting null hypothesis (H0) and alternative hypothesis (HA). Thus, H0:b=0 and HA: -2<b<0,for the case $\hat{t} \geq DF_{n-K}$ (n = number of observations and k = number of regressor except constant). If H0 is accepted, the conclusion comes at the process is not (weak) stationary and otherwise in case of $\hat{t} \leq DF_{n-K}$.

Advance analysis to DF test of the unit root test was proceeded by using augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981) to decide the order of integration of the series to overcome the problem of autocorrelation in the error term (u_t) as:

$$\Delta y_t = a + b y_{t-1} + \sum_{i=1}^{m} a_i \Delta y_{t-i} + u_t$$ ....(6)

where, the number of m could increase until the error term u_t became a white-noise process. For testing autocorrelation, H0: no autocorrelation of ε_t and HA: +ve or –ve autocorrelation. b and α are estimators to be tested by using OLS method (Frank, 2009). Before moving to ADF rest, another test was spurious regression (SR), which is

$R^2 > d$ i.e as rule of thumb, SR could occur under estimated R^2, would be higher than Durban and Watson statistics value (d) (Granger and Newbold, 1973). Conducted another the technique of autocorrelation test was Q-statistics where, correlograms were compared in the stationary and non-stationary results. Finally, Breusch-Godfrey LM test for autocorrelation was used to reduce the effect of autocorrelation.

Testing Johansen's cointegration model

To determine the long-term dynamics of price fluctuation, the study used Johansen's Cointegration test by conducting two tests: Maximum statistics (Lamda-max test) and trace test. Lamda-max test was based on the log-likelihood ratio and conducted sequentially for r = 0,1,..,k-1 where test statistic involved a maximum generalized eigenvalue. H_0: cointegration rank = r against H_A: the cointegration rank = r+1. Another estimator trace test worked on log-likelihood ratio ln (L_{max} (r) /L_{max} (k)), and is conducted sequentially for $r = k$-1, 1, 0. The test statistic measured the trace (= the sum of the diagonal elements) of a diagonal matrix of generalized eigenvalues. H_0: cointegration rank = r against H_A: the cointegration rank = k. The latter implied X_t had trend stationary. Both tests had non-standard asymptotic null distributions. Moreover, Johansen also derived likelihood ratio tests of the cointegrating restrictions on trend parameter. The principle behind the cointegration is two process Y_t and X_t which are said to be cointegrated of an order k and m in which k ≥ m ≥ 1, symbolically co-integrate between two or more process expressed as: Y_t, X_t ~CI (k, m). The both processes must have the same order (k ≥ 1) of integration, and it existed a significant linear combinations like $\varepsilon_t = Y_t - \alpha X_t$ so that ε_t is integrated of (k-m) -th order.

Under using this principle: testing rule for trace statistics:

i) H_0: No zero cointegration among variables, and H_A : 0 cointegration of variable
ii) H_0: There is 1 cointegration, H_A: no possible of 1 cointegration
iii) H_0: There is 2 cointegration, H_A: No possible of 2 cointegration and so on as par.

Regarding to testing H_0 (s), the normal guideline was comparing trace statistics with 5% critical value. In other words, variables cointegrated in 0 order, if rejected, succeeding H_0 came into effect. Once found cointegration, it stopped there and matched the results with the maximum statistics. As per the guideline, H_0: there were 0,1,2,3 or 4 cointegration. Results compared between max statistics value and 5% critical value (see tables 2 and 3). The reliability of the cointegration test would increase if both trace and max statistics gave uniform order (rank) of integration.

Setting vector error correction model (VECM)

As soon as fundamental requirements of cointegration and non-spurious regression cointegrating relationship existed, then VECM was running for analysing

the short-term disturbances and adjustment mechanism to estimate the speed of adjustment (Acharya *et al.,* 2012; Dhungel, 2014). The VEC model was:

d (CRP) = bo+ b₁d (WRP)+b₂d (IRP)+b₃d (FRP)+b₄ d (COP)+b₅ d (OER)+b₆ U$_{t-1}$+V-- (7)

where, d (CRP) : first difference of course rice price, d (WRP) : first difference of world rice price, d (IRP) : first difference of Indian common rice price, d (COP) is first difference of crude oil price, d (OER) is first difference of official exchange rate, d (FRP) : first difference of fuel retail price, U$_{t-1}$: One period lag of residual obtained from the OLS estimation at level, B$_0$: constant in the model, b$_1$, b$_2$, b$_3$, b$_4$, and b$_5$ were short-term parameters to be estimated, and V = error term. The parameter b$_6$ was estimator of long-run equilibrium between the same variables, which was also called error correction term (ECT) or coefficient. The sign of ECT must be negative and significant at 5 percent to explain long-term equilibrium. As per sign of the short-term estimators (b$_1$, b$_2$, b$_3$, b$_4$, and b$_{5)}$, interpretations were done to explain the targeted variables (regressand). Another way of setting VECM includes the variable's co-integration (or long run) relationship with other variables as one of the explanatory variables as per Equation 8 (Acharya *et al.,* 2012).

$$\Delta y_t = \alpha + \mu(y_{t-1} - \beta x_{t-1}) + \Sigma_{i=0}^{i=t} \partial_i \Delta x_{t-1} + \Sigma_{i=0}^{i=t} \gamma_i \Delta y_{t-1} \text{-------------------- (8)}$$

The equation 8 included lagged differences in both x and y which had a more immediate impact on the value of Δy$_t$. for example, if Δx$_t$ increases by one percent point, then Δyt will increase by δ percentage point. The value of β indicates the percentage point that y has to change in the long run in response to changes in x. Therefore, part of the change in Δy$_t$ is explained by y correcting itself in each period and ultimately reaching the long-run path. All estimators were estimated by the OLS and the significance level was tested by using t-statistic and stepwise selection process. The overall "goodness of fit" of the model was tested by f-test and R-square test. In order to test autocorrelation of the model and normal distribution of residuals, the study followed Lagrange-multiplier test where χ^2 values were compared with the *p*-value for respective lag order. There, H$_0$: no autocorrelation and H$_A$: autocorrelation of VECM. Additionally, Jarque-Bera test was conducted for H$_0$: normal distribution of residuals or otherwise for H$_A$.

The author used Stata version 12 to analyse above stated series of tests and analyses as well as to plot figures and graphs.

Imperial findings

Graphs of non-stationary and stationary time series data

Almost all graphs in figure 1 (1a-d) showed non-stationary trend at level form during the study period ranging from January (m1) 2000 to April (m4) 2013. The level form data changed to the first difference of respective price in natural log form indicated by CRP, MRP, FRP, WRP, IRP, FRP, COP, and OER.

Figure 1. Time series data trend: 1 (a): Medium rice trend, above left, 1 (b): Fine rice trend above right, 1 (c): Domestic course rice, Indian course rice and world rice trend (below left), and 1 (d): Domestic fuel price and world crude fuel price trend (below left).

All graphs showed in figure 2 presented non-stationary i.e. no trend at the first difference form.

Figure 2. Natural Log form first difference level stationarity of the variables: 2(a): Course rice price, 2(b): Medium rice price, 2(c): Fine rice price, 2(d): World rice price, 2(e): Indian common rice retail price, 2(f): Official exchange rate, 2(g): Domestic fuel price, and 2(h): World crude oil price
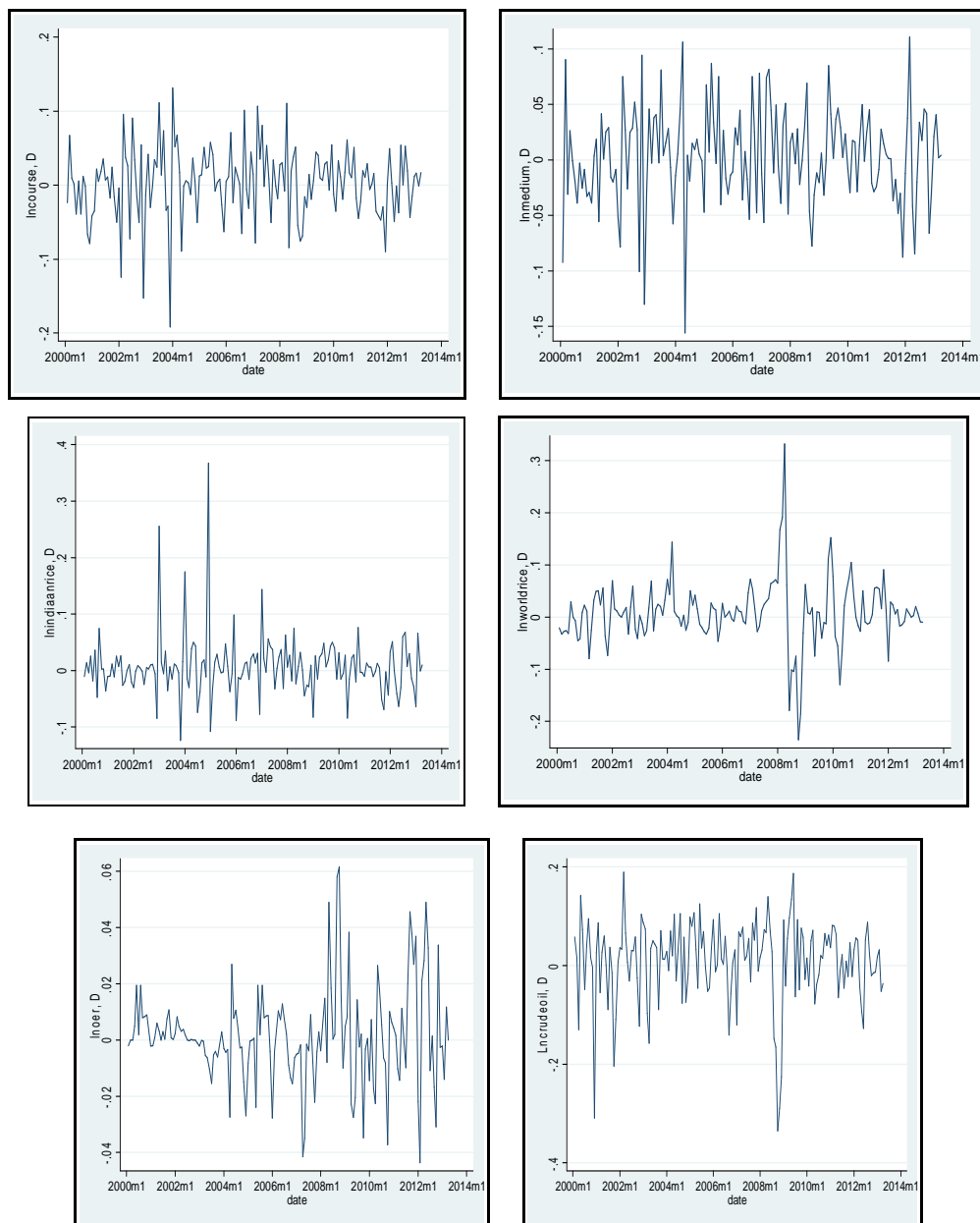
Source: Own analysis from various data source (2014)

Results of unit root tests

Table 1 presents DF test statistics for the level form and the first difference form of the food price series and its selective determinants. Analysing all above conditions, DF test results showed an acceptance of null hypothesis of tested variables, i.e these variables were nonstationary at level form. Other tests were at a higher p-value (>5%) under MacKinnon test and graphs depicted in figure 1 proved the results. The problem in time series was the presence of trend and positive autocorrelation. In order to correct these problems, the first difference at lag 2 was taken into account by using AIC and BIC criteria.

Then, ADF test as per Equation (6) was run for individual variables as indicated in table 1. MacKinnon approximate p-value for Z (t) showed that H_0 of existence of unit root was rejected at 1% level of significance for all of these in their first difference. It was confirmed all variables integrated in the first I (I) order. Q-statistics and corresponding p-value confirmed autocorrelation at level from but the figure showed no evidence of autocorrelation and partial correlation in the tested variables at the first difference.

Table 1. Unit root test results

Variables	Variable form	Level form		1st difference form	
		Test statistics	*p*-value	Test statistics	*p*-value
Domestic course rice	Ln CRP_t	-0.91	0.787	-7.630	0.00**
Domestic medium rice	LnMRP_t	0.827	0.409	-7.338	0.00**
Domestic fine rice	LnFRP_t	1.184	0.238	- 7.781	0.00**
World rice price	LnWRP_t	1.589	0.114	-6.206	0.00**
Indian common rice	LnIRP_t	1.504	0.135	-8.15	0.00**
Fuel retail price	LnFRP_t	2.230	0.294	-7.189	0.00**
World crude oil	LnCOP_t	1.230	0.221	-6.406	0.00**
Official exchange rate	LnOER_t	1.054	0.294	-6.890	0.00**

Note: ** Indicates significance at 1% level. Source: Own analysis (2014)

Results of Johansen's cointegration test

The study tested three preconditions of Johansson's cointegration approaches: i) non-stationary time-series data ii) stationary after the first difference in the same order, and iii) no autocorrelation and spurious regression. After fulfilling the above pre-conditions, the lag selection procedure was applied to confirm the lag length for Johansen's cointegration test. An appropriate lag selection criterion (LSC) based on FPE, Akaike Information Criterian (AIC) and HQIC criteria specified 2 lag length as the best, considering the guideline of "lower is the value, better is the result" (See appendix 1).

Table 2. Co-integration test results as domestic course rice as target variable

Trace test statistics				Maximum statistics (Lamda-max test)			
Maximum rank	Eigen value	Trace statistics	5% critical value	Maximum rank	Eigen value	Maximum statistics	5% critical value
0		128.79	94.15	0		66.83	39.37
1	0.345	61.97	68.52	1	0.345	27.85	33.46
2	0.161	34.11	47.21	2	0.161	19.57	27.07
3	0.116	14.55	29.68	3	0.116	10.64	20.97
4	0.065	3.92	15.41	4	0.065	3.65	14.07

Source: Own estimation from surveyed data (2014)

Table 2 explains the results of trace statistics and maximum statistics when using Ln CRP_t as the target variable over $LnWRP_t$, $LnIRP_t$, $LnFRP_t$, $LnCOP_t$, and $LnOER_t$. To explain the trace statistics values, normal guideline of the comparison has been followed between trace statistics and 5% level of critical value in a given maximum rank. Normal guideline of comparing trace statistics was more than 5% of critical value, i.e. 128.79 > 94.15. Thus, the rejection of H_0 meant rejection of 0 cointegration. Immediately moving to H_0: 1 cointegration as per the guideline and found that 61.97 < 68.52. There, the researcher could not reject H_0; the accepted H_0 and concluded the first order cointegration among the variables. The study also matched cointegration by using maximum statistics as per the same guideline applied earlier: H_0: there was 0, 1, 2, 3, 4 cointegration, that needed a comparing value of max statistics with the 5% critical value. First H_0: 0 was compared by 66.83 > 39.37. Thus, the rejected H_0, meant the rejection of 0 cointegration. The immediate step H_0: 1 (first order) cointegration indicated no rejection of H_0 (i.e. 27.85 < 33.46). Hence, both statistics confirmed that the tested variables were cointegrated in the first order. It meant that there was a long-run associations or these variables were moving together in a long run (see also appendix 2).

Table 3. Co-integration test as domestic medium rice as target variable

Trace test statistics				Maximum statistics (Lamda-max test)			
Maximum rank	Eigen value	Trace statistics	5% critical value	Maximum rank	Eigen value	Maximum statistics	5% critical value
0		80.34	68.52	0		35.82	33.46
1	0.203	44.52	47.21	1	0.203	32.92	27.07
2	0.188	11.60	29.68	2	0.188	7.55	20.97
3	0.047	4.05	15.41	3	0.047	3.86	14.07
4	0.024	0.197	3.76	4	0.024	0.197	3.76

Source: Own estimation from surveyed data (2014)

A similar process was followed to explain the medium rice price as a targted variable, which is depicted in table 3. Only differ than earlier model was that the crude oil was omitted from the model because it's slope coefficient was nonsignificant. Appropriate LSC criteria (FPE, AIC and HQIC) determined the most suitable lag order 2 (appendix 1 ii). Then, trace statistics at first, as per the normal guideline, showed 1st rank cointegration among variables while comparing trace statistics with 5% critical value (44.52<47.21) after rejecting H_0: 0 (80.33> 68.52). Max statistics also confirmed 1st level cointegration. The study, thus, confirmed the market cointegration of MRP with WRP, IRP, OER, and FRP, meaning that the medium rice price was interdepedendent to the tested extraneous variables (see appendix 2). The results of Huda (2010) for Bangladesh, Mohammad *et al.* (2012) for Bangladesh, Navin *et al.* (2008) and Acharya *et al.* (2012) for India also used the same method while confirming cointegration results.

Same articles also referered positive as well as negative feedbacks to the domestic market in a country that has no price stabilization policy (Alam *et al.,* 2012). The extent of price transmission depended on three key factors: i) the exchange rate at which the dollar was exchanged to domestic currency, ii) existent trade policy and the restriction or barrier that control the flow of commodities across the border, iii) the speed of adjustment of world price shock in the domestic economy. The transmission of cereal price to domestic price varied across countries. Sometimes, domestic pass-through was not completed as international prices rose up as in 2008 (Dawe, 2008; Peter, 2008). Price changes in one market would induce the same change in another market after correcting its transaction costs. The likelihood ratio tested confirmed that transaction costs associated with the trade between Bangladeshi and the world rice market had no complete pass-through from the world to the Bangladeshi rice market (Alam *et al.,* 2012). In this case, the speed of adjustment was to be tested through VECM.

Results of vector error correction model (VECM)

At first, D_lncourse (variable form of first difference course rice) was taken as the targeted variable over independent variables: D_WRP, D_IRP, D_OER and D_FRP. The results showed the status of long- run or speed of adjustment and short-run dynamics as there were significant relations of the coefficients. The CE_1 denoted cointegrating equation 1 at the first lag difference which was called as an error correction term (ECT_{t-1} or U_{t-1}). Guideline of the model was ECT_{t-1} coefficient must be negative and significant at 5% level as per OLS method. However, the result showed ECT_{t-1} value 0.0067 which was neither negative nor significant at 5% level of siginificance (because z-statistics was 0.23 and corresponding p-value respecting z-statistics was 0.819) (See appendix 3). It meant that no long-term causality ran from

WRP, IRP, OER, COP and FRP into CRP or there was no need of speedy adjustment. However, the short-run coefficients like $lncourse_{t-1}$, and $lncrudeoil_{t-1}$ were significant at 10% and 5% levels. It meant that course rice first month lag and crude oil first month lag length had short-run effect on domestic course rice instabilities. The significance of joint effect of lag 1 and lag 2 under VECM on price variability was tested through Granger causality method. Based on results, only lag 1 and lag 2 effect of COP was significant at 5% level (because prob>chi^2 =0.0345). Meaning that COP_{t-1} and COP_{t-2} had short-term effect on CRP, as it was mentioned by many literatures in neighbouring countries (Acharya *et al.,* 2012).

In a same vein, the variable D_medium rice price (D_MRP) was tested with D_WRP, D_IRP, D_OER and D_FFP. Result showed ECT $_{t-1}$ =-0.0124, which was negative but significant at 38.1% level. It meant that there was no long-term causality needed correcting any kinds of speed adjustment running from WRP, IRP, COP, OER and FRP to MRP. Short-run dynamics like $lnmedium_{t-1}$ (LD), $lnmedium_{t-2}$ (L2D), $lnoer_{t-1}$ were significant at 2.1%, 8.7% and 2.3% level level. It means that the first and second month lag of medium rice and first month of official exchange rate had short-run effect on MRP causing instability but rest of short-term coefficients of the selected variables had no significant role in price instabilities. Lagrange-Multiplier test, for both outcomes, confirmed no autocorrilation effect in all VECM results.

Conclusions and policy recommendations

The study used Johansen's co-integration test by fulfilling all the required conditions in order to determine the domestic rice price instabilities in relation to WRP, IRP, DFP, and OER as factors by using time series data over thirteen years. The cointegration results showed that the domestic course rice price was cointeragted CI ≈ (1,0) in 1st order with WRP, IRP, FRP, COP and OER. Similarly, medium rice price was also cointegrated with the WRP, IRP, FRP, and OER in 1st order (CI≈ (1,0)). The calculated correlation coefficient among FRP_t and COP_t, CRP_t and COP_t, as well as CRP_t and FRP_t were 0.92, 0.89 and 0.91, respectively for the period between January 2000 and April 2013. These results confirmed that WRP_t, COP_t, IRP_t, and OER_t were major exogenous factors of shocking domestic rice prices i.e these were major factors of price instabilities in a long-run. Results' of the dynamics of short-run relationships were tested by running Johansen's cointegrating VECM which confirmed no any long-run speed of adjustment to be corrected each month for reaching the long-run equilibrium of steady-state. Unlike it, the same model quantified the short-run coefficients of $lncourse_{t-1}$, and $lncrudeoil_{t-1}$, which had effect on course rice while $lnmedium_{t-2}$ (L2D), $lnmedium_{t-1}$ (LD), and $lnoer_{t-1}$ had significant effect on medium rice prices but the rest of short-term coefficients of the selected variables had no role in price instability.

The above inferences lead to the conclusion that Nepalese rice market was interdependent with international as well as Indian rice market, fuel price and exchange rate, i.e. the significant cointegration relationship results showed that the world rice price, Indian common rice and fuel price had pass-through effects into the domestic prices or shocked Nepalese rice market. Cointegration of two levels of market along with short-run effects of the selected variables on domestic rice price variebilities could lead to an unexpected positive and negative effects. The results of the study are supportive if our policy makers in lieu of saving Nepalese food market or continually these external effects on domestic prices.

Further, Sanogo (2008) reported Nepal had specific spatial integration evidences in mid-west and far-west Nepal. Referring the study of Alam *et al.* (2012), Pyakuryal and Thapa (2010) and from above results of this study, it can be concluded that the politicians made Neplease food maket open which meant the rate of cointegration of two markets increased eventually. While an increased cointegration with the world market can improve the situation of consumers of net importing countries (Acharya *et al.*, 2012), no integration will lead to higher level of trade barriers (Alam *et al.*, 2012).

Thus, this study can suggest policy makers and politician to bring more price insulation mechanism to inhibit price instabilities; otherwise, price instability will continue to exist in future. New question for the policy makers: does Nepal respect pass-through externality influence or would like to mute/stabilise it further ? Nepalese policy documents contained a very limited price stabilization programme in comparison to the neighbouring countries– India, China, Bangladesh, and EU– irrespective of well-addressed mechanisms in Agreements on Agriculture (AoA) under the WTO (Chand, 2008). Thus, the research suggests that we adopt a dual strategy. On the one hand, we should continue working on price stabilizing programmes and on the other hand, we should work an reducing the cost of production, arranging coordinated supply, and focusing on climate-smart rice cultivation. Semi-developed and developed countries like Germany, France, Russia, China, Vietnam and India are even today adopting the food self-sufficiency as one of the price stabilizing policies (Chand, 2008; Bhandari, 2011). Thus, to maintain uniform price movement throughout the year, an adoptation of food-self-sufficiency as well as food self-reliance policies is strongly recommended. For this, Nepal Rastra Bank should maintain stable fiscal and exchange rate policy.

Acknowledgements

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http://www.imf.org/external/np/res/commod/index.asp

Appendices

Appendix 1. Lag lenth selection criteria

i)   For course rice

```
. varsoc lncourse lnworldrice lnindiaanrice lnoer lndomfuel Lncrudeoil, maxlag(8)

  Selection-order criteria
  Sample:  2000m9 - 2013m4                        Number of obs      =        152

  ┌─────┬──────────────────────────────────────────────────────────────────────┐
  │ lag │    LL      LR      df    p      FPE      AIC      HQIC      SBIC        │
  ├─────┼──────────────────────────────────────────────────────────────────────┤
  │  0  │ 584.408                        2.0e-11  -7.61064  -7.56215  -7.49127   │
  │  1  │ 1661.44  2154.1   36  0.000  2.2e-17  -21.3085  -20.969   -20.4729*   │
  │  2  │ 1725.09  127.29   36  0.000  1.6e-17* -21.6722* -21.0418* -20.1204    │
  │  3  │ 1754.77  59.378   36  0.008  1.7e-17  -21.5891  -20.6678  -19.3212    │
  │  4  │ 1773.21  36.862   36  0.429  2.2e-17   -21.358  -20.1457  -18.3739    │
  │  5  │ 1797.72  49.036   36  0.072  2.6e-17  -21.2069  -19.7037  -17.5066    │
  │  6  │ 1827.47  59.488   36  0.008  2.9e-17  -21.1246  -19.3304  -16.7081    │
  │  7  │ 1854.73  54.521   36  0.025  3.3e-17  -21.0096  -18.9245  -15.8769    │
  │  8  │ 1887.39  65.324*  36  0.002  3.6e-17  -20.9657  -18.5897  -15.1168    │
  └─────┴──────────────────────────────────────────────────────────────────────┘

  Endogenous:  lncourse lnworldrice lnindiaanrice lnoer lndomfuel Lncrudeoil
   Exogenous:  _cons
```

ii)   For medium rice type

```
. varsoc lnmedium lnworldrice lnindiaanrice lnoer lndomfuel, maxlag(8)

  Selection-order criteria
  Sample:  2000m9 - 2013m4                        Number of obs      =        152

  ┌─────┬──────────────────────────────────────────────────────────────────────┐
  │ lag │    LL      LR      df    p      FPE      AIC      HQIC      SBIC        │
  ├─────┼──────────────────────────────────────────────────────────────────────┤
  │  0  │ 504.524                        9.6e-10  -6.57268  -6.53227  -6.47321   │
  │  1  │ 1481.16  1953.3   25  0.000  3.5e-15  -19.0943  -18.8518  -18.4974*   │
  │  2  │ 1530.59  98.849   25  0.000  2.5e-15* -19.4156* -18.9711* -18.3215    │
  │  3  │ 1550.49  39.806   25  0.031  2.7e-15  -19.3486   -18.702  -17.7571    │
  │  4  │ 1566.91  32.841   25  0.135  3.1e-15  -19.2357  -18.3871  -17.1468    │
  │  5  │ 1583.75  33.679   25  0.115  3.4e-15  -19.1283  -18.0777  -16.5421    │
  │  6  │ 1598.72  29.935   25  0.227  4.0e-15  -18.9963  -17.7437  -15.9127    │
  │  7  │ 1611.34  25.246   25  0.449  4.8e-15  -18.8334  -17.3788  -15.2525    │
  │  8  │ 1630.96  39.232*  25  0.035  5.2e-15  -18.7626  -17.1059  -14.6843    │
  └─────┴──────────────────────────────────────────────────────────────────────┘

  Endogenous:  lnmedium lnworldrice lnindiaanrice lnoer lndomfuel
   Exogenous:  _cons
```

Appendix 2. Results of Johansons's Cointegration Test

i)   Cointegration for course rice as target variable

```
. vecrank lncourse lnworldrice lnindiaanrice lnoer lndomfuel Lncrudeoil, trend(constant) max

                      Johansen tests for cointegration
Trend: constant                                      Number of obs =      158
Sample:  2000m3 - 2013m4                                      Lags =        2

                                                    5%
maximum                                    trace   critical
  rank    parms       LL      eigenvalue  statistic   value
    0       42     1732.4273        .     128.7976    94.15
    1       53     1765.8416    0.34490    61.9690*   68.52
    2       62     1779.7675    0.16161    34.1173    47.21
    3       69     1789.5511    0.11648    14.5501    29.68
    4       74     1794.8685    0.06509     3.9153    15.41
    5       77     1796.6959    0.02287     0.2604     3.76
    6       78     1796.8261    0.00165

                                                    5%
maximum                                     max    critical
  rank    parms       LL      eigenvalue  statistic   value
    0       42     1732.4273        .      66.8286    39.37
    1       53     1765.8416    0.34490    27.8517    33.46
    2       62     1779.7675    0.16161    19.5672    27.07
    3       69     1789.5511    0.11648    10.6348    20.97
    4       74     1794.8685    0.06509     3.6550    14.07
    5       77     1796.6959    0.02287     0.2604     3.76
    6       78     1796.8261    0.00165
```

ii)   Cointegration for medium rice as target variable

```
. tsset date, monthly
        time variable:  date, 2000m1 to 2013m4
             delta:  1 month

. vecrank lnmedium lnworldrice lnindiaanrice lnoer lndomfuel, trend(constant) max

                      Johansen tests for cointegration
Trend: constant                                      Number of obs =      158
Sample:  2000m3 - 2013m4                                      Lags =        2

                                                    5%
maximum                                    trace   critical
  rank    parms       LL      eigenvalue  statistic   value
    0       30     1554.8913        .      80.3386    68.52
    1       39     1572.8023    0.20286    44.5165*   47.21
    2       46     1589.2602    0.18806    11.6008    29.68
    3       51     1593.0332    0.04664     4.0547    15.41
    4       54      1594.962    0.02412     0.1971     3.76
    5       55     1595.0606    0.00125

                                                    5%
maximum                                     max    critical
  rank    parms       LL      eigenvalue  statistic   value
    0       30     1554.8913        .      35.8221    33.46
    1       39     1572.8023    0.20286    32.9158    27.07
    2       46     1589.2602    0.18806     7.5461    20.97
    3       51     1593.0332    0.04664     3.8576    14.07
    4       54      1594.962    0.02412     0.1971     3.76
    5       55     1595.0606    0.00125
```

Appendix 3. Results of Vector Error Correction Model

i)   VCEM considering course rice as target variable

```
. vec lncourse lnworldrice lnindiaanrice lnoer lndomfuel Lncrudeoil, trend(constant) lags(3)

Vector error-correction model

Sample:  2000m4 - 2013m4                       No. of obs    =       157
                                              AIC           = -21.59491
Log likelihood =  1784.201                    HQIC          = -20.89128
Det(Sigma_ml)  =  5.42e-18                     SBIC          = -19.86239

Equation          Parms     RMSE     R-sq     chi2     P>chi2

D_lncourse          14     .046889   0.1147   18.53344  0.1836
D_lnworldrice       14     .048202   0.4372   111.1007  0.0000
D_lnindiaanrice     14     .051701   0.1605   27.33221  0.0174
D_lnoer             14      .01655   0.1680   28.86765  0.0109
D_lndomfuel         14     .034363   0.2913   58.76875  0.0000
D_Lncrudeoil        14     .074209   0.2971   60.42898  0.0000
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
D_lncourse						
_ce1						
L1.	.0067713	.0295337	0.23	0.819	-.0511137	.0646563
lncourse						
LD.	-.1753606	.0920841	-1.90	0.057	-.3558421	.0051209
L2D.	.0042926	.0882553	0.05	0.961	-.1686847	.1772698
lnworldrice						
LD.	.0179977	.078854	0.23	0.819	-.1365534	.1725487
L2D.	-.0548573	.0807382	-0.68	0.497	-.2131014	.1033867
lnindiaanrice						
LD.	.099235	.0835421	1.19	0.235	-.0645046	.2629746
L2D.	.0266899	.0824257	0.32	0.746	-.1348615	.1882413
lnoer						
LD.	-.2893179	.3364422	-0.86	0.390	-.9487325	.3700968
L2D.	.055925	.3433757	0.16	0.871	-.6170791	.728929
lndomfuel						
LD.	-.003789	.1224109	-0.03	0.975	-.2437101	.236132
L2D.	-.0791027	.1232142	-0.64	0.521	-.3205982	.1623928
Lncrudeoil						
LD.	.1362208	.0574525	2.37	0.018	.023616	.2488256
L2D.	.0683795	.0573556	1.19	0.233	-.0440354	.1807944
_cons	.001872	.0043071	0.43	0.664	-.0065696	.0103137

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           L1.     .0888043    .0303603     2.93    0.003     .0292992    .1483094

      lncourse
           LD.    -.1469934    .0946614    -1.55    0.120    -.3325262    .0385395
          L2D.     .0384316    .0907254     0.42    0.672    -.139387     .2162501

    lnworldrice
           LD.     .6567053    .081061      8.10    0.000     .4978287    .8155818
          L2D.    -.1667018    .0829979    -2.01    0.045    -.3293747   -.0040288

   lnindiaanrice
           LD.     .0863941    .0858803     1.01    0.314    -.0819283    .2547164
          L2D.     .1373506    .0847326     1.62    0.105    -.0287223    .3034236

         lnoer
           LD.    -.1359649    .3458586    -0.39    0.694    -.8138353    .5419054
          L2D.     .5552491    .3529861     1.57    0.116    -.136591    1.247089

      lndomfuel
           LD.     .1764897    .125837      1.40    0.161    -.0701462    .4231256
          L2D.     .1050766    .1266628     0.83    0.407    -.1431779    .353331

     Lncrudeoil
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          L2D.     .0337021    .0589609     0.57    0.568    -.081859     .1492633

         _cons     .0020768    .0044276     0.47    0.639    -.0066011    .0107547
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D_lnindiaanrice
         _ce1
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      lncourse
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          L2D.     .0768094    .0973128     0.79    0.430    -.1139202    .2675389

    lnworldrice
           LD.     .0475306    .0869466     0.55    0.585    -.1228817    .2179429
          L2D.    -.008996     .0890243    -0.10    0.920    -.1834803    .1654883

   lnindiaanrice
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         lnoer
           LD.    -.9237371    .3709706    -2.49    0.013    -1.650826   -.196648
          L2D.    -.0844292    .3786157    -0.22    0.824    -.8265024    .657644

      lndomfuel
           LD.    -.0337788    .1349737    -0.25    0.802    -.2983225    .2307649
          L2D.    -.1332203    .1358595    -0.98    0.327    -.3995      .1330594

     Lncrudeoil
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         _cons     .0111599    .0047491     2.35    0.019     .0018519    .0204679
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    lncourse
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        L2D.   -.0820924    .0646781    -1.27    0.204    -.2088592     .0446744

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        L2D.    .1199385    .0591692     2.03    0.043     .0039689     .2359081

 lnindiaanrice
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        L2D.    .1248943    .0604059     2.07    0.039     .0065009     .2432877

       lnoer
        LD.    -.7704385    .2465626    -3.12    0.002    -1.253692    -.2871846
        L2D.   -.2048825    .2516439    -0.81    0.416    -.6980954     .2883304

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        L2D.   -.1768793    .0902979    -1.96    0.050    -.3538599     .0001013

   Lncrudeoil
        LD.    -.0387228    .0421042    -0.92    0.358    -.1212455     .0437999
        L2D.    .0446105    .0420332     1.06    0.289    -.0377731     .1269941

      _cons     .007862    .0031564     2.49    0.013     .0016755     .0140485
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D_Lncrudeoil
       _ce1
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    lncourse
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        L2D.   -.1787791    .1396771    -1.28    0.201    -.4525413      .094983

  lnworldrice
        LD.     .035766     .1247982     0.29    0.774    -.2088339     .2803659
        L2D.    .4816973    .1277802     3.77    0.000     .2312526      .732142

 lnindiaanrice
        LD.     .1593894    .1322178     1.21    0.228    -.0997528     .4185316
        L2D.    .0473937    .1304509     0.36    0.716    -.2082854     .3030729

       lnoer
        LD.    -1.107922    .5324697    -2.08    0.037    -2.151544    -.0643008
        L2D.    .5440912     .543443     1.00    0.317    -.5210376      1.60922

    lndomfuel
        LD.    -.1588739    .1937335    -0.82    0.412    -.5385845     .2208367
        L2D.    .1352719    .1950048     0.69    0.488    -.2469305     .5174743

   Lncrudeoil
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        L2D.    .0473066    .0907738     0.52    0.602    -.1306067     .2252199

      _cons    .0059503    .0068165     0.87    0.383    -.0074099     .0193105
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CORRUPT ADULTS AND CASTRATED ADOLESCENTS: QUESTIONING AETONORMATIVITY IN ROBERT CORMIER'S YOUNG ADULT NOVELS

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Abstract: *The paper analyzes the implicit ideology in Cormier's four novels, namely, The Chocolate War (1974), Beyond the Chocolate War (1985), Tunes For Bears To Dance To (1992) and The Rag and Bone Shop (2001) from the perspective of young adult literature. Although Cormier's novels are primarily about teen-age rebellion and are targeted for adolescent demography, these novels do not fail to teach them that they will be "castrated" unless they find their own routes out of their cocoons of abject desires, and conform to the social expectations. The paper argues that Cormier's novels ironically serve adult interest in spite dealing with the subject matter related to young adult.*

Keywords: *Young adult literature, castration, aetonormativity, abjection, obsession, infantile sexuality, irony, the unconscious, misrecognition, the lack, intimidation, ego, father figure.*

"They murdered him." Robert Cormier's (1974) masterpiece *The Chocolate War* begins with this proleptic statement that sums up the fate of an individual (him) when he goes against established social norms. A little later in the novel, Jerry the adolescent protagonist is severely beaten in "his groin" by his football coach. As an attempt for revenge, he cocks his arm and searches for the receiver, but the Goober, his friend, catches him from behind and says, "Coach is testing you, testing and he's looking for guts" (p. 7). Jerry undergoes several attacks like this, physical as well as psychological, throughout the novel. We do not know whether he dies by the impact of the attack in the final showdown, however, his self-image is doubtlessly shattered. Even if Jerry does not die physically, the death of his spirit of rebellion is definitely representative of the murder of the adolescent ego commonly found in Cormier's novels.

Beginning with this jolt of violence from the couch in the name of "coaching" or "testing his guts" the fourteen year old Jerry encounters a number of trials and tortures, constantly perpetrated by both adults and peers at school primarily because he refuses to sell the "Mother's Day" chocolates, the school's fund-raising campaign. However, he keeps resisting the corrupt world that fails to empathize him for his family tragedy, the death of his mother. Whenever he is in trouble, he thinks of his dead mother, but never shares anything with his living father. Towards the end, Jerry is beaten to death, again in "his groin," by Emile Janza, known as "the animal" among the members of The Vigils, the unofficial group of students whose activities, including

pranks and intimidation, control both the underclassmen and the teachers. This group keeps Trinity High School under constant internal pressure. All other kids in the school remain frenzied spectators, as if all thirsty for blood. On the verge of death, Jerry shares with the Goober, the only sympathizer, his realization about what he needs to know. He says, "They tell you to do your thing but they don't mean it. They don't want you to do your thing, not unless it happens to be their thing, too. It's a laugh, Goober, a fake. Don't disturb the universe, Goober, no matter what the posters say" (p. 187). If we look at its sequel *Beyond the Chocolate War*, this expression is the only act that saves Jerry's life, however, he no longer remains a rebellion hero. He is an outcast, an "abject" or a "castrato" waiting to be healed and accepted by the adult world.

Like Jerry, many of Robert Cormier's protagonists are adolescents grappling with unbearable social conditions such as physical and emotional abuse, negative peer pressure, broken trust, and death. The parents of these adolescents are not only incapable of ensuring the children's emotional, economic and psychological safety essential for their socialization, but oftentimes, parents are often involved in suppressing the desires of the adolescents' growing self. When Cormier was asked in an interview by Roger Sutton, about the reason behind his focus on the portrayal of this kind of world in his novels he said, "I'm very much interested in intimidation. And the way people manipulate other people. And the obvious abuse of authority. I guess I'm sort of an anti-authority figure" (Senick, 1999, 4). Perhaps this is why the father-figures in his novels are either absent, are constantly ill or too obsessed with material gains. On the other hand, his protagonists, who are often "abject" and inarticulate, defy the intimidation around the social institutions like education, law, religion, business, etc. But, most of his novels end in the death or defeat of the innocent, non-conformist hostages, diseased teenagers, and civic-minded citizens. The father-figures appear either helpless or indifferent to improve the situation. Even if the heroes don't die, they give in before the social pressure or find an escape route. The questions that generally arise in the mind of a reader at the end of his novels are: why is there always a conflict between the adult and the adolescent in Cormier's novels? Why does his hero have a very negative image of the father? Why doesn't the adolescent hero share their troubles with their parents, particularly the father? Why is the father-son relation so ineffectual? And finally, why do the fathers fail to provide their sons with safe world to grow up?

As Cormier is primarily known as the writer of Young Adult fiction, all of Cormier's novels are written from the perspective of an adolescent. These young heroes critique the adult world, at home, school, church or at the workplace, of being corrupt and hypocritical. As the author is an adult, there is enough room for

questioning the authenticity of the adolescent voice, which, in Mike Cadden's (2000) terms, is "inherently ironical." Cadden argues, "Novels constructed by adults to simulate an authentic adolescent's voice are inherently ironic because the so-called adolescent voice is never – and can never be – truly authentic" (p. 146). In spite of delving deeper into this issue now, this paper will rather explore what Cormier achieves by creating adolescent heroes and pitting them against adults. It will also look into how realistic he could be as he claimed above in his interview with Roger Sutton. Based on four of his novels, *The Chocolate War* (1974), *Beyond the Chocolate War* (1985), *Tunes For Bears To Dance To* (1992) and *The Rag and Bone Shop* (2001), I will argue that Cormier uses writing as a means for working through his relationship with his own fantasized self as well as that of his son. And by constantly putting the adolescents on trial, Cormier is trying to teach the adolescents that they need to come out of their position of liminality to be accepted as a member of the community. The society achieves this goal by castrating the adolescent ego through various social means and Cormier is no exception in this regard. For this, the paper will analyze the implicit ideology in Cormier's novels particularly the ones that hail at the young heroes to grow out of their adolescence by saying, "you grow or you will die."

In *Disturbing the Universe*, Roberta Trites (2000) declares that adolescent novel is a manipulative genre. Trites writes, "Books for adolescents have many ideologies. And they spend much time manipulating the adolescent reader" (p. x). No matter how realistic the adolescent novels try to appear, their main purpose is to teach the adolescents that they must learn their place in the social power structure during adolescence. Trites adds, "They must learn to negotiate the many institutions that shape them: school, government, religion, identity politics, family, and so on. They must learn to balance their power with their parents' power and with the power of the other authority figures in their lives" (p. x). Cormier uses exactly the same ideology to hail at the adolescents for accepting it.

Another reason why adolescent novels are manipulative is that the authors use narratives both to arouse and sustain desire. Desire like Freud's notion of Eros, is a force including sexual desire but larger and more polymorphous, which seeks "to combine organic substances into ever greater unities." Peter Brooks (1984) contends, "Narratives both tell of desire –typically present some story of desire – arouse and make use of desire as dynamic of signification" (p. 37). Brooks argues that desire is always there at the start of the narrative, often in a state of initial arousal, often having reached a state of intensity such that movement must be created, action undertaken, and change begun. Brooks adds, "One could no doubt analyze the opening paragraph of most novels and emerge in each case with the image of a desire taking on shape, beginning to seek its objects, beginning to develop a textual energetic" (p. 38). In *The*

Chocolate War, the beginning sentence "They murdered him" clearly states the desire underlying in the whole narrative. This beginning not only creates in the readers the desire to resist the murderous force, it also hints at the Freudian theory of the inherent death drive among people.

Hence, narratives cater to the desires of both the writer as well as the readers. According to Brooks, a writer uses narratives to explore more fully the shaping function of his own desire, and to "subjugate the listeners." The readers, on the other hand, learn to suppress their desires by identifying with the characters who suffer even when they exhibit neurotic behavior under the influence of the desires suppressed in the unconscious. Such unconscious desire, in the later life of the subject, becomes a motor of actions whose significance is blocked from consciousness, since interpretation of its scenarios of fulfillment is not directly accessible to consciousness. Brooks writes,

> Narratives portray the motors of desire that drive and consume their plots, and they also lay bare the nature of narration as a form of human desire: the need to tell as a primary human drive that seeks to seduce and to subjugate the listener, to implicate him in the thrust of a desire that never can quite speak its name – never can quite come to the point – but that insists on speaking over and over again its movement toward that name. (Brooks, 1984, p. 61)

Thus, desire, as the very intention of narrative language and the act of telling, seems to stand in close relation in Cormier's narratives, too.

In *Beyond the Pleasure Principle*, Freud (1959) also suggests how the dynamic of repetition in narratives, from jokes to longer fictional works, produces forward and upward movement. Freud believes that repetition, the re-experiencing of something identical, is clearly in itself a source of pleasure. Talking about repetition in children's play, Freud writes,

> In the case of children's play we seemed to see that children repeat unpleasurable experiences for the additional reason that they can master a powerful impression far more thoroughly by being active than they could be merely experiencing it passively. Each fresh repetition seems to strength the mastery they are in search of. Nor can children have their pleasurable experiences repeated often enough. And they are inexorable in their insistence that the repetition shall be an identical one. (p. 65)

For Freud, the compulsion to repeat is instinctual. He adds, ". . . an instinct is an urge inherent in organic life to restore an earlier state of things which living entity has

been obliged to abandon under the pressure of external disturbing forces" (p. 67). Freud also links this instinct for repetition with "death drive." He states, "If we are to take it as a truth that knows no exception that everything living dies for *internal* reasons – becomes inorganic once again – then we shall be compelled to say that *'the aim of all life is death'* and looking backwards, that *'inanimate things existed before living ones'*" (emphasis in the original, p. 70-71). Cormier's novels have perfect examples of heroes with Freudian repetition compulsion and death drive.

First of all, Jerry becomes psychologically disturbed by the death of his mother. Extremely traumatized and obsessed by the mother's image, Jerry often fails to understand what he is doing and why. For him, selling the Mother's Day Chocolates is like selling the image of his mother, his only source of "pleasure" while, for Freud, the source of all pleasures is rooted in sex. To Freud, such an obsession of a son towards his mother or her image is closely connected with infantile sexuality, which he defines as "Oedipus complex." Freud writes,

> It may be that we were all destined to direct our first sexual impulses toward our mothers, and our first impulses of hatred and violence toward our fathers; our dreams convince us that we were. King Oedipus, who slew his father Laius and wedded his mother Jocasta, is nothing more or less than a wish-fulfilment – the fufilment of the wish of our childhood. (Freud, 1959, p. 308)

As Freud argues that our hatred towards our fathers have roots on our first sexual impulses toward our mothers, Jerry's anger on the death of his mother reflects the same. When his mother dies Jerry develops an extreme sense of guilt, of not being able to do anything about saving her. When he says he could not do anything about it, it could either mean that he was not able to do anything for saving her life from death or not being able to do anything against his father who was somehow responsible for her death.

> And then she got sick. And died. Watching her ebb away, seeing her beauty diminish, witnessing the awful alteration of her face and body was too much for Jerry to bear and he sometimes fled her bedroom, ashamed of his weakness, avoiding his father. . . . He was angry at the way the disease had ravaged her, he was angry at his inability to do anything about saving her. His anger was so deep and sharp in him that it drove out sorrow. He wanted to bellow at the world, out against her death, topple buildings, split the earth open, tear down trees. (Cormier, 1974, p.48)

The trauma of mother's death and his inability to do anything becomes the driving force behind Jerry's rebellion against the corrupt world. Every time Jerry

remembers his mother, he becomes more aggressive. And therefore selling the Mother's Day chocolates is the most loathsome job, which he resists at all costs.

Jerry even tries to find his mother's image in his father, remembering the saying that people who have been married a long time begin to resemble each other. "He squinted his eyes, the way one inspects a fine painting, searching for his mother there in the face of his father. And without warning, the anguish of her loss returned, like a blow to his stomach, and he was afraid that he would faint" (p. 51). But this misrecognition does not provide a lasting compensation. As he had witnessed the inability of his father to save his mother, Jerry even hated "to think of his own life stretching ahead of him that way" (p. 50). It is only the thought of the mother that provided him some rest, but the father could never be a source of inspiration for him. Looking at the father Jerry thinks,

> Was this all there to life, after all? You finished school, found an occupation, got married, became a father, watched your wife die, and then lived through days and nights that seemed to have no sunrises, no dawns and no dusks, nothing but a gray drabness. Or was he being fair to his father? To himself? (p. 52)

Thus, Jerry implicitly blames his father for being unable to save his mother. Jerry does not see any use in sharing his problems with his father. He thinks that his father is doing nothing but "actually sleeping his life away, sleeping even when he was awake" (p. 92). Therefore for him, his father could never be a role model. The father provides him just the means to live, but no guardianship for his emotional and psychological growth.

The first problem Cormier might have perceived in the adolescents like Jerry is that their first desire is to free themselves from the boundaries created by the father. In his world of adolescents, the father is almost non-existing, either absent, mentally unbalanced, corrupt or obsessed with money. Cormier's adolescent heroes then become independent and begin to face the world on their own. Jerry's father is almost sleepwalking after the death of his wife. Jason's father in *The Rag And Bone Shop*, is away from home, and Henry's father in *Tunes For The Bears To Dance To* is undergoing treatment of depression after the death of his first son.

However, it is not as easy for these heroes to fight the corrupt world alone as it is to break the boundary. The peer pressure they get at school becomes unbearable. As soon as they break out of the family, the first and most immediate power center, school becomes another power center where children are tested. Both peers and teachers pose threats, creating another obstacle in the process of self formation. Peers bully him, while teachers impose other restrictions in the name of education. The

following passage about Obie, another character in *The Chocolate War* sequel, clearly reflects what a school life is like for an adolescent:

> About the two tests today, he had either flunked or scored no higher than a D on, thus falling further behind in his studies. Angry thoughts. Angry at his parents and all grown-ups who thought that school life was a lark, a good time, the best years of your life with a few tests and quizzes thrown in to keep you on your toes. Bullshit. There was nothing good about it. Tests were daily battles in the larger war of schools. School meant rules and orders and commands. To say nothing of homework. (p. 153)

Although Obie tries to liberate himself from the corrupt world, he fails to do so because he does not even have as much will power as Jerry does. He also repeatedly tries to escape from the grips of The Vigils, but finally falls victim to it.

Repetition is another salient characteristic of Cormier's novels. The heroes undergo the similar situation again and again, impeding their efforts to work through their trauma. Through the repetitive reference to the chocolate (of the Mother's Day) he is repeatedly questioned and put on trial. Even though he knows that The Vigils will not leave any escape route, he develops a compulsive desire to remain within their reach. This can also be related with the death drive. Jacques Lacan writes, "I explain that essential affinity of every drive with the zone of death and reconcile the two sides of the drive – which, at one and the same time, makes present sexuality in the unconscious and represents, in its essence, death" (1981, p. 199). The last showdown and Jerry's annihilation would not have been possible if he had refused to participate in it. But the death drive within him leads him towards the trial.

Next, why doesn't Jerry share his fight against the undue imposition from Brother Leon, the acting Headmaster and The Vigils? Perhaps the implied author sees himself being ignored when Jerry ignores his father. Cormier would never want his son to be happy by negating him as Jerry does to his father. So he puts a hurdle after another in Jerry's life so that he would realize that the world out there cannot be a safer place by ignoring one's father. He therefore brings in the contexts of religion, workplace, school, law, etc., in one way or another to constrict the freedom of the adolescents like Jerry. Here, Cormier must be trying to get across the message that a dialectical tension through repetition and retrogression is essential in the emergence of an adolescent as a subject. Is it only Jerry's desire to disturb the universe? Certainly not. Cormier is himself working through his own desire of disturbing the universe that he has not come to terms. For him, the desire in an adolescent has to be suppressed so as to make them realize that the world out there is not as easy as they fantasize it. So Cormier

ironically tries to disturb the universe of the adolescents by stinging them awake with the realization that they should give up their path of rebellion.

In Lacanian schema, desire is inaugurated with the subject's assumption of "lack." This lack is inherent in signification. Whenever we use words to talk about objects or experiences, there is always a gap, a mediation of the referent through language that necessarily makes the referent other than what it is. Karen Coats (2004) argues,

> Lacan uses a bar between the signifier and the signified to symbolize this gap; think of this bar as a little guillotine that severs (castrates) being from meaning. As the subject emerges into signification, she sacrifices being for meaning, thus assuming as the condition of her identity this symbolic castration. Our physical drives get displaced into a rhetoric of desire that can never completely satisfy. (p. 80)

As models of rebellious adolescents who are bound to retreat, Cormier makes the portrayal of the very fragile heroes on purpose. To me, his intent is to demonstrate that adolescents lack determination and moral agency, in spite of their strong will powers. As their strength is specifically the outcome of the trauma of transition from childhood to adulthood and quest for selfhood, their rebellion is transitory and often withdrawn at the end. For more sustained rebellion directed for larger social welfare, the revolutionary drive in the adolescent characters needs taming and channeling towards a constructive end. Unless intervened, guided or even suppressed by mature moral force, they can't become instrumental in the fight against social evils.

"Age" is the primary site of identity construction in adolescent novels. Although opinions vary in terms of age, heroes in adolescent novels are generally between eleven and nineteen. The subjects, whether dissenting or submissive, identified by the liminality of their age (between childhood and adulthood) as adolescents, are put under pressure through restrictions maintained by various social institutions such as family, school, church, workplace etc. According to social constructionists, identity is not something that is imprinted on passive bodies, colors or ages by monolithic social structures; it is a reiterative process of relations of identification between the body, color or age and social structures. Judith Butler, for instance, maintains that the subject is the product of "specific restrictive normative frames" (qtd. in Moses, 2000, p. 2). Though Butler raises this argument while talking about the body, particularly the lesbian body, I strongly believe that this notion also applies well in the case of the adolescent subjects, defined by their age characterized by transition. If patriarchy is a dominant culture that marginalizes the women, aetonormativity, that the adult is always right, is another cultural construct, which reifies the idea that liminality is the defining characteristics of adolescence.

In the same line, Julia Kristeva (1990) defines the adolescent as "one of those mythic figures that the imaginary, and of course, the theoretical imaginary, gives us in order to distance us from certain of our faults – cleavages, denials, or simply desires? – by reifying them in the form of someone who has not yet grown up" (p. 8). According to Kristeva, "abjection" is the feeling of horror produced by (for example) the sight of a corpse, rotten food, faeces, skin on milk, etc. Kristeva says, "The horror has a double force: on one hand, it produces a sense of helplessness and fear of psychic annihilation; on the other hand, it generates the energy to expel the horrifying object, thus securing the boundaries of identity" (qtd. in Falconer, 2007, p. 36). The adolescent identity is the product of such dual force. Kristeva maintains that the adolescent structure is often seen as fluid and inconsistent through the eyes of "a stable, ideal law." Kristeva further writes,

> Like the 'open systems' of which biology speaks concerning living organisms that live only by maintaining a renewable identity through interaction with another, the adolescent structure opens itself to the repressed at the same time that it initiates a psychic reorganization of the individual –thanks to a tremendous loosening of the superego. (1990, p. 8)

Thus, for Kristeva "adolescent" is less an age category than "an open psychic structure." And to affirm the subject-adolescent with a permanent status, the novelist should present himself as an adolescent by recognizing the subject position. Hence, writers of adolescent novels have a larger responsibility towards adolescents than other adults.

Since adolescents are closely attached with adults both financially and emotionally, the dominant culture (of the adults) that influences the adolescent world comprises of parents or other adults connected with them in course of their birth, growth and socialization. Roberta Trites argues that "[t]he role of parents in adolescent literature is one of the defining characteristics of the genre" (p. 55). Trites asserts, "Parents of teenagers constitute a more problematic presence in the adolescent novel because parent-figures in YA [Young Adult] novels usually serve more as sources of conflict than as sources of support" (p. 56). However, unlike in other adolescent novels where parents are themselves the intimidating figures, biological parents in Cormier's novels are weak and ineffectual. Therefore there are other parent-figures like teachers at schools, bosses at the workplaces and police or interrogators who represent the adult figures to pose constant threats upon the adolescent protagonists.

In *The Chocolate War*, Jerry becomes the victim of Brother Leon, a cruel sadist adult and the assistant Headmaster of Trinity High School. Besides him, Jerry is also

targeted by The Vigils, an informal group of adolescent boys, led by Archie Costello and other adolescents but senior by age. Beneath its team games and school spirit, Trinity, like other institutions, like society itself, is riven by spiteful rivalries, exclusive divisions, and multiple temptations and betrayals. Brother Leon picks anyone for his target and intimidates him in order to make all students work in his favor to fulfill his ambition of occupying the position of the Headmaster. There comes some resistance to Brother Leon's intimidation from the Vigils, however, this group also falls under his unfailing grip and the group becomes ancillary to legitimatize corruption. Manipulating his corrupt intent, The Vigils further intimidate the children by imposing different assignments on them such as unscrewing the furniture in Room Nineteen (for a prank) and refusing to sell chocolates and later on selling them again. One hierarchy mirrors the other. No one is safe from Brother Leon and The Vigils; anyone may be picked on, irrespective of virtue or innocence. To refuse to conform, to say "no" to the assignment and thus to challenge the twin authority of the Brother Leon and the Vigils, is to suffer utter torture and humiliation.

In this novel, Jerry is the only character who refuses to conform and embarks on a mission of "disturbing the universe." The first protest he makes against Brother Leon is when the latter intimidates Bailey by blaming him of cheating only on the pretext of exceptional performance. While everyone in the class remains silent, Jerry ventures to say, "Aw, let the kid alone" (p. 38). Though Jerry did not face Brother Leon directly, this Herculean maneuver stops Brother Leon from further intimidating Bailey, so he begins to praise Jerry sarcastically for being "The bravest of all." Brother Leon says, "You turned this classroom into Nazi Germany for a few moments. Yes, yes, someone finally protested. *Aw, let the kid alone.*" Mimicking the deep voice perfectly. "A feeble protest, too little and too late"" (p. 38-39). Brother Leon, thus, makes transference of his fascist nature upon adolescents and blames them to have turned the classroom into Nazi Germany.

Jerry is completely inarticulate in both parts of the sequel. He does not share what is going on in his mind with anybody. Does this silent resistance change the world around him? His refusal does "disturb the world," but he fails to change it for better because he lacks a moral agency. As Anita Tarr (2002) argues, Jerry does not dissent for the good of many and cannot move out of his own cocoon. His rebellion is a mere illusion of a moral dilemma. Tarr writes,

> The common reading of *The Chocolate War* is that because Jerry refuses to sell the chocolates, even after his Vigils' assignment is over, he is a hero, a rebel against the corrupt world of Trinity – that is Brother Leon, Archie, and Emile. This is the way that many of us would *like* Jerry to be, a Braveheart screaming "freedom" even as he is tortured, the

individual fighting against the system. A close reading of the novel, however shows us that there are simply not enough narrative cues to support this. In fact, I offer an opposite interpretation: Cormier presents only the *illusion* of moral decision making and the *illusion* of a rebel hero. Jerry is no moral agent and his refusal to sell chocolates is *not* the result of the moral dilemma. (emphasis in the original, p. 96)

According to Tarr, Cormier is dishonest even with himself. He doesn't care how teens read his books. He creates young characters who are terrified, alone and defeated, never giving opportunity for an honest, emotional, romantic relationship. She further writes, "Cormier creates these nightmares as he writes in the dark of the night while all the times the ones [he] love[s] are asleep and safe under [his]roof" (p. 120-21).

Although Jerry does not buzz from his determination while Archie's stooges continue to torture, his actions do not bring any change in the intimidating ambience of Trinity. "Good guys" are continuously victimized. The Vigils also terrorize Brother Eugene who becomes psychologically damaged. The Goober slowly keeps himself aloof from The Vigils' activities but Trinity still remains a battlefield under the control of Brother Leon, Archie, and his followers. Even at the final showdown, the Trinity is terrorized by The Vigils with the remote control in the hands of Brother Leon. This phenomenon is likely to make the readers feel that Cormier finds it difficult to acknowledge the resistance of the adolescent subjects like Jerry. Therefore Jerry remains an abject, an excluded subject leading a life that is "unlivable" as Butler describes. Cormier does not seem to have empathy upon Jerry, the adolescent. He would perhaps want Jerry to change, but Jerry's refusal leads to his castration at the end of the novel.

It also seems that, for Cormier, all adolescents are essentially abject. The only difference between Jerry and other adolescents is that Jerry is fighting the battle all alone, while others are disturbing the Trinity through the activities planned and implemented by Archie, who is also another abject character. According to Karen Coats, "The Vigils, and more specifically, Archie, embody the perverse superego against which Jerry sets himself" (p. 147). She argues that many of Jerry's classmates find his persistent refusal to sell the chocolates and his temptation to see his act of refusal as a heroic assertion of agency and individualism. "But for Jerry, it is an utterly passive resistance." Coats (2004) says,

> [Jerry] takes no energy or joy from his refusal, feels no satisfaction in it. Rather, it is as if he cannot help what he is doing. The unconscious connection between his mother's body and the chocolates is far too strong, far too taken up with death-drive energy, for him to sublimate

> the connection and expel it. Unable to abject his mother's body, then, he becomes himself abject. He falls into the abyss that gapes at the boundary of his subjectivity, the abyss of abjection that ultimately leads to his getting beaten almost to death. (p. 147-48)

The world around Jerry is never receptive to him, unless he conforms to its standard. This makes him more terrified, stubborn and inarticulate in *Beyond The Chocolate War*. Jerry says to the Goober, "Know what I keep thinking, Goober? How many Archie Costellos there are in the world? Out there. Everywhere. Waiting" (Cormier, 1985 p.160). While, Jerry, Archie, and brother Leon are significant presences in this sequel, other characters now receive more attention, and the traumas are spread more widely, although Jerry turns away from withdrawal, going back to school as a means of coping with his humiliation, and achieves a kind of victory, a fact regarded by some reviewers, as a sign of Cormier's softening with the passing of the years, the narrative refuses the temptation of the happy ending. Again the good guys like Jerry and the Goober are victimized, whereas Brother Leon and The Vigils continue their acts of intimidation.

David Caroni's suicide in *Beyond The Chocolate War*, is also the result of failing to conform to the norms established by Brother Leon and his "evil pass-fail tests." It is for the same reason that David makes a murderous assault on Brother Leon before committing suicide.

> "Tell me what this is all about," he demanded, his voice crackling with sudden authority. But a false authority, Caroni knew.
>
> "It's about the F you gave me." Caroni said, exactly as he had planned to say the words for so long. "And about this," he added, drawing his arm from behind his back and brandishing the butcher knife.
>
> "Put that down," Leon snapped, immediately becoming the teacher, as if this office wore a classroom and Caroni his only student. (Cormier, 1985, p. 233-34)

Like David here, Cormier's other adolescent heroes are headed towards tortures leading to death due to their reluctance to conformity.

Henry in *Tunes For Bears To Dance To* (1992), is another example of an adolescent who is entrapped between the pressures from family and workplace. In this novel, too, the "castration" of an adolescent begins as early as at the age of eleven. Henry is tempted, corrupted, and then castrated. After the death of his elder brother Eddie, Henry's family loses its stable course. The father fails to provide financial stability to the family while he is undergoing treatment of depression. His mother works as a waitress in a restaurant for a living. In spite of being a young boy of eleven, Henry is

bound to work after school at Mr. Hairston's grocery store. Unlike Jerry in *The Chocolate War*, who suffers at school, Henry is intimidated at the workplace. At the same time, Henry gets acquainted with a Holocaust survivor called Mr. Levine, who is carving a miniature village out of wood, recreating his village that the Nazis had destroyed. Gradually, the racist grocer, who knows everything about the deteriorated financial condition of Henry's family, begins to blackmail him by demanding him to destroy Mr. Levine's miniature village. The major tension of the story is built upon the conflict in the boy's mind evoked by this blackmail about whether to follow the order of the grocer for the sake of the family or to listen to his own inner voice. As demanded by the grocer, Henry destroys the model village but in a vary slapstick manner. However, the writer seems to have redeemed Henry by making him renounce the reward. The rebellious energy in Henry gets crushed by the cultural, religious and financial needs.

Written from the adolescent point of view, adult figures in Cormier's novels are either satanic or ineffectual. If the parents are powerful, family becomes a hell for the adolescents. If parents are ineffectual, the adolescent heroes encounter other satanic figures at school, church, workplace or government offices. The conflict in *Tunes for Bears To Dance To* is set up between an adult satanic figure in the workplace and a pre-adolescent boy. Not only is the bad guy dehumanized, but so is the victim. Henry follows Mr. Levine, one of the ineffectual adult figures, and finally destroys his work of art due to the intimidation from the racist grocer. Why does Henry not share about the case of the bargain with anybody else? Why should he just remain voiceless, if he is determined to defy the orders of the grocer? The only plausible answer is that Cormier can't believe in adolescents acting responsibly. The sons defy the rules of the fathers or father-figures because they cannot resolve their Oedipal difficulties. The adult's response is therefore necessarily directed towards castrating them.

Portraying the extent of intimidation adults can perpetrate upon the adolescents is one of the major goals of Cormier's novels. Cormier's another novel *The Rag and Bone Shop* (2001) also perfectly supports my argument. This novel presents an in-depth study of the minds of two complicated characters, namely, Trent, an ambitious and renowned interrogator who holds a perfect record wrenching confessions out of criminals, and twelve-year-old Jason Dorrant, a suspect of murdering his neighboring girl Alicia Bertlett. Jason is determined not to confess the guilt simply because he is innocent. The murder attracts much publicity including the attention of a senator. The local police, anxious to solve the mystery, call on the expertise of Trent to get Jason, the last person seen with the victim, to confess the crime. "The important thing was getting Trent here, not engaging Alvin Dark in a battle of egos. He wanted to turn Trent loose on the boy, get him to admit his guilt. The prospect was almost as sweet as the thought of a good night's sleep" (p. 43).

The interview between Trent and Jason evolves into a taut sinister mind game as the interrogation expert twists the boy's thoughts and manipulates his words. Jason parries the insinuations and accusations against him to the best of his ability, but finds himself questioning his own sense of reality.

> Trent knew irrevocably that the boy was innocent, knew in the deepest part of his being, past all doubt and deception, that Jason Dorrant had not murdered Alicia Bartlett. . . . Trent frowned in dismay and disappointment. He thought of Braxton and the senator waiting for the confession, the town outside gripped by fear and suspicion, waiting for him to deliver the goods, deliver the murderer so that they could all sleep easy and not worry tonight if a door wasn't locked or if a son or daughter stayed out late. The senator's promise echoed in his mind. You can write your own ticket. (p. 131)

As a result of such pigheadedness of the interrogator, the tension mounts when it becomes increasingly evident that Trent is more concerned with getting Jason to say the words he wants to hear than discovering what really happened on the day Alicia died. The chilling result of the questioning leaves an indelible mark on Jason. At the end, Jason is held free of charge but his ego is completely shattered. In an adult eye, he could be a complete abject but this abjection is left unresolved because Cormier does not provide a poetic justice on the part of his protagonist on purpose. They are just adolescents! They need to learn to adjust in line with the social norms, legal system and cultural standards.

Finally, Lacan's formulation that "desire is the desire of the other" means a lot in Cormier's novels. The adolescents in these novels desire to enter into the discourse of the big Other, the symbolic order, and try to break the incongruities they see in it. The "Real," in this sense, a "pure life instinct" appears as "uncodable materiality" in the eyes of the fathers and father-figures as lost in the adolescents' coming into being of the subject. The adolescents become the "abjects" trying to break the boundary, to "disturb the universe." The subject obviously seeks to recover it through the introjections of certain objects acting as representatives of the wholeness, be it the Mother's Day Chocolate in *The Chocolate War*, or the model village in *Tunes For Bears To Dance To,* as both of them relate to the notion of motherhood. The adults, on the other hand, continue to intimidate them, to "castrate" them, so that status quo can be maintained. It could also be that Cormier was trying to work through his own Oedipal relation with his son by projecting his fantasies upon other father figures like Brother Leon, Mr. Hairston and Trent, the interrogator.

Cormier's novels succeed to get favor of both adult and young adult readers for two distinct reasons. The adult readers find it very useful to teach their young ones

that they need to conform to the social norms in order to be accepted by the society. Unless they come out of their Oedipus complex they will be castrated by the social systems. The young readers, on the other hand, don't bother to understand this implicit ideology. They find these novels fascinating because they identify with the rebellious characters like Jerry, Jason and Henry who show their guts to challenge the unjust social structures. As all the heroes in these novels lack controlling fathers, they get intimidated by other adults and seniors outside the family. Apparently, the heroes rebel against the fascist father figures, power centers like schools, churches, police, law, etc. However, Cormier does not fail to teach them that they will be castrated unless they find their own routes out of their world of abject desires to conform to the social expectations.

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CHARACTERIZATION OF KAMEROTAR CLAYS OF MADHYAPUR THIMI MUNICIPALITY OF BHAKTAPUR, NEPAL

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Abstract: *Kamerotar clay of Madhyapur Thimi Municipality of Bhaktapur, Nepal, was characterized using chemical, X-ray diffraction (XRD), Fourier transforms infrared (FTIR) spectroscopic and thermal including thermo-gravimetric (TGA) and differential thermal (DTA) analyses. The clay sample consisted mainly of vermiculite and muscovite minerals in addition of feldspars and quartz. The chemical compositions of both the bulk (< 63 μm) and fine (< 2μm) clay samples showed high amount of SiO_2 and low amount of $Al2O_3$ indicating a low amount of clay minerals content in the locally deposited Kamerotar clay sample. The clay sample contained considerable amount of $Fe2O_3$ and MgO which is unfavorable composition of a raw material for the porcelain production without modification and purification.*

Keywords: *Vermiculite, muscovite, XRD, FTIR, TGA/DTA.*

Introduction

Clay minerals are one of the important groups of natural minerals formed by chemical weathering and/or hydrothermal activities on different types of rocks (Jackson & Sherman, 1953; Fanning & Jackson, 1966). They are naturally occurring layer-structured and fine-grained hydrated alumino-silicates of mostly monocline or triclinic symmetry that may contain sodium, calcium, potassium, magnesium, iron, titanium and other ions. In fact, clay minerals make up about 40% of the natural minerals in the sedimentary rocks (Velde & Meunier, 2008). Clay minerals are defined as the materials having less than 2 μm in an equivalent spherical diameter particle size (Worrall, 1986). However, engineers and soil scientists define the clay minerals as the materials having the particle size less than 4 μm without any implications about its mineralogy (Worrall, 1986).

The clay minerals is structurally composed of tetrahedral silicate and octahedral aluminate sheets which join together to form a layer. The tetrahedra are linked through their corners to form a silicate tetrahedral sheet while the octahedral are

edge-linked resulting in an aluminate octahedral sheet in clay minerals. In 1:1 type clay minerals, one tetrahedral sheet (T) is attached to one octahedral sheet (O), forming a 1:1 (or TO) layer. Similarly, in 2:1 type clay minerals, two tetrahedral silicate sheets are attached to one octahedral aluminate sheet forming 2:1 (or TOT) type clay minerals. Commonly, the layers of clay minerals are stacked parallel to each other forming the characteristic layered structure of the materials (Grim, 1953; Worrall, 1986). Hence, all clay minerals are called as alumino-silicates layered materials which occur naturally. Depending on the way that the silicate tetrahedral and/or aluminate octahedral sheets combine, different types of layers are formed in the clay minerals. The most usual clay minerals are classified into four different groups based on the structural units; they are kaolin, montmorillonite or smectite, mica and chlorite (Worrall, 1986).

The kaolin group is 1:1 (TO) type clay minerals in which both the tetrahedral and octahedral layers are stacked one above the other, exposing surfaces of oxygen and hydroxyl that can interact with each other due to hydrogen bonding between the layers. Kaolinite, halloysite, nacrite and dickite are grouped under the kaoline type clay minerals. The montmorillonite or smectite group constitutes a group of phyllosilicates with 2:1 (or TOT) layer clay minerals. The oxygen atoms of the silicate tetrahedral sheet of one layer face the oxygen atoms of the aluminate tetrahedral sheet of the adjacent layer, with the interchangeable cations as well as water molecules between the layers. Montmorillonites (Na-montmorillonite and Ca-montmorillonite), nontronite, beidellite, hectorite and saponite are some examples of the montmorillonite or smectite group clay minerals and they have characteristics of swelling behavior (Worrall, 1986).

The mica group is the 2:1 (TOT) type clay minerals in which the negative charge of the clay particles is compensated by non-exchangeable K^+, Na^+, Ca^{++}, Mg^{++} or Fe^{++} ions, which are located in the interlayer regions embedded in the trigonal holes of oxygen-atom plane. Potassium mica (or muscovite), sodium mica (or paragonite), calcium mica (or margarite), lithium mica (or lepidolite), mixture of iron (II), magnesium and potassium mica (or biotite), and mixture of potassium and magnesium mica (phlogopite) are some examples of the 2:1 type mica group clay minerals (Worrall, 1986).

The vermiculite mineral is structurally related to mica minerals and regarded as phlogopite or biotite in which the potassium is replaced by hydrated magnesium ions. The vermiculites group is less expandable than the smectites minerals since water molecules and magnesium ions act as bridges holding the 2:1 type layers together. Vermiculite has very high cation adsorption capacity due to the significant substitution of aluminum for silicon in the tetrahedral sheet as well as some

substitution of magnesium for aluminum in the octahedral sheet (Worrall, 1986). The chemical weathering of the 2:1 type layer silicates was reported to follow the weathering of dioctahedral and trioctahedral mica minerals to vermiculite or chlorite mineral (Fanning & Jackson, 1966).

Chlorite group clay is also the 2:1 type clay mineral in which the charge-compensating cations between the layers are replaced by an octahedral magnesium hydroxide sheet. Some of the magnesium cation may be replaced by aluminum ion so that this sheet may carry a net positive charge that compensates the negative charges of the layers. Consequently, there are practically no interlayer water molecules in chlorite clay minerals. However, chlorite is not always considered as clay minerals, sometimes being classified as a separate group of clays within the phyllosilicates (Worrall, 1986).

Clay minerals are being used for various purposes from pre-historic times to modern age (Kingery, 1985). Clay minerals show a large variety of uses depending on their basic properties like physical properties, chemical as well as mineralogical compositions, structure and their finesses (Kingery, 1985; Worrall, 1986). Most of the natural clay minerals exhibit plasticity when mixed with water in certain proportions. Clay minerals are converted into a non-vitreous hard bodies by means of physical and chemical reactions when they are fired at high temperature in a kiln. It is because of these properties of the clay minerals, they are used for making different qualities of ceramic products like earthenwares, stonewares, sanitorywares and porcelains.

Clay minerals are also used in many other industrial processes such as paper making, cement production, petrochemical industries and chemical industries. When a small amount of clay minerals is added to water, slurry forms because the clay distributes itself evenly throughout the water. This property of clay mineral is used by the paint industry to disperse pigment (color) evenly throughout the paint. Clay mineral, being relatively impermeable to water, is also used as sealants in dams or as barrier materials against toxic seepage in landfills ('lining the landfill, preferably in combination with geotextiles). The mineralogical composition, structure and small grain size of different types of clay minerals results in specific properties, which makes them a very interesting materials for adsorption studies. The clay minerals play an important role in the environment by acting as a natural scavenger of pollutants and hence many researchers use natural clay minerals to remove different pollutants from contaminated waters (Bhattarai, 1994; Bhattacharyya & Gupta 2007; Wu *et al.*, 2009; Panuccio, 2009; Wang *et al.*, 2011; Adhikari, 2013; Duwal, 2013). Moreover, clay minerals also exhibit medicinal values. Specific clay minerals proved valuable in the treatment of bacterial diseases, including infections for which there are no effective antibiotics, such as Buruli ulcer and multidrug-resistant infections (Haydel *et al.*, 2008).

Clay minerals deposit in Nepal have been studied by a few researchers in the past. Most of the research works were concerned only with physical properties (Bhattarai, 1994), chemical as well as mineralogical studies (Bhattarai *et al.*, 1992; Bhattarai & Okada, 1992a) and geological studies (Stocklin & Bhattarai, 1981; Bhattarai, 2001). However, comprehensive studies of ceramic properties of porcelain raw materials deposited in Panchmane area (Kathmandu), Daman area (Makawanpur) and Deurali VDC (Bhojpur) of Nepal were carried out in details since 1990s (Bhattarai & Okada, 1992a; Bhattarai & Okada, 1992b; Bhattarai, 1998; Bhattarai & Okada, 1999; Bhattarai & Okada, 2000; Bhattarai & Bhattarai, 2001). However, no detailed research work has been carried out yet on the clay minerals deposited in Kamerotar area of Bhaktapur, Nepal. In this context, the main objective of this research work is to characterize the clay minerals deposited in Kamerotar area using chemical and mineralogical analyses, X-ray diffraction (XRD), infrared (IR) spectroscopy and differential thermal analysis (DTA) techniques.

Materials and methods

Clay sampling site

The clay sample for the present study was collected from Kamerotar area of Bhaktapur, Nepal. The clay sample is commonly known as '*Kamero Mato*' in Nepali and '*Takucha*' in Newari (Duwal, 2013), and it occurs as deposit over a wide area. One clay sample was collected from the sampling site of Kamerotar area that generally represents the whole clay deposited areas of the sampling site. It is being used by local people for various purposes. Mostly, it is used for wall painting to impart white color to the soil plastered walls of the traditional Nepali houses. Besides this, it is frequently used for treatment of cuts and wounds in dogs and other pets. It was believed that it eases the labour pain during the delivery of babies so it is also fed to pregnant women at the time of delivery (Duwal, 2013). These trends show the need for further study on medicinal values of '*Kamero Mato*'.

According to local people, it is mixed with kaolinite and other clay minerals for the production of traditional ceramic products. Kamerotar sampling site of Madhyapur Thimi municipality is located within the latitude of 27° 40′ 30″-27° 40′ 50″ north and within the longitude of 85° 23′ 40″-85° 24′ 20″ east. The Kamerotar area is accessible either by Araniko highway or Kathmandu-Sanothimi-Bhaktapur road.

Preparation of bulk clay sample

The bulk clay sample was prepared by using US standard sieve, mesh no. 230 (< 63 μm). The organic matter contained in the bulk clay sample was removed by treating with excess amount of 30% by volume of H_2O_2 on a boiling water bath until

effervescence ceased as described elsewhere (Pansu & Gautheyrou, 2003). The treatment was repeated two or three times, washed with distilled water and dried overnight on a hot oven at 110°C. It was found that 4.56% of the organic matter remained in the bulk clay sample.

Separation of fine clay particles

The separation of the fine clay particles (< 2 μm) was carried out following an elutriation process based on Stoke's law using "calgon" (0.05% w/w) as a deflocculant and concentrates by using $MgCl_2$ (0.25 g/L) as described elsewhere (Worrall, 1986). The diluted hydrochloric acid was used as a flocculant. The separated fine clay particles (< 2 μm) were washed by distilled water using a centrifugal machine until it was free from chloride ion. It was estimated that about 34.15% of the fine clay particles remained in the collected bulk clay sample from the sampling site.

Chemical analysis

The chemical composition of both the bulk and fine clay samples was analyzed using X-ray fluorescent method for SiO_2, atomic absorption method for Fe_2O_3 and Al_2O_3, EDTA-tittration method for CaO and MgO, flame photometric method for K_2O and Na_2O and gravimetric method for ignition loss at 1000°C.

X-ray diffraction analysis

The powder X-ray diffraction (XRD) analysis was carried out to find the structure and the type of the clay minerals present in the clay sample of Kamerotar area of Bhaktapur. XRD analysis was carried out for the bulk clay (< 63 μm), calcined the bulk clay at 800 and 1000°C, and fine clay (< 2 μm) samples. The structure and phases of each clay specimen was characterized using a D8 Advance Diffractometer (Bruker, Germany) with Cu Kα radiation (λ= 0.15418 nm) at a scanning speed of 2°/minof in 2θ mode. Identification of the clay minerals was made based on their basal spacing (d-spacing) using JCPD standard cards.

FTIR spectroscopic analysis

The Fourier transform infrared (FTIR) spectrum of both the bulk and fine clay samples was recorded using IR Prestige-21 FTIR Spectrometer (Shimadzu, Japan) in the range of 4000-400 cm^{-1} to identify functional groups present in the clay minerals.

Thermal analysis

In order to obtain more information about the characterization, both thermogravimetric analysis (TGA) and differential thermal analysis (DTA) curves were recorded for the fine clay minerals of Kamerotar clay sample using thermal analyzer (Seiko, model 320).

Results and discussion

Chemical analysis

Table 1 shows the reported chemical compositions of both the bulk clay (< 63 μm) and the fine clay (< 2 μm) samples of Kamerotar area of Bhaktapur, Nepal. The amount of SiO_2 is decreased with the increase of Al_2O_3 in the fine clay sample than in the bulk indicating that the amount of clay minerals in the fine clay sample is more than in the bulk. Similarly, the amount of MgO and K_2O is higher in the fine clay sample than in the bulk. This indicates that Kamerotar clay sample constitutes clay minerals having MgO and K_2O with SiO_2 and Al_2O_3 mainly. On the other hand, the amount of Fe_2O_3, Na_2O and CaO in the fine clay sample is found to be lower than in the bulk. It was reported that a considerable amount of Fe_2O_3 and K_2O present in the natural clay sample is attributed to be iron-bearing muscovite, analogous to potash mica (Worrall, 1986). Furthermore, a considerable amount of Fe_2O_3 and MgO contained in the bulk clay sample compared to the standard clay materials used for porcelain production indicated that the Kamerotar clay minerals is not a suitable raw material to produce white wares without modifications and purification.

XRD analysis

Figure 1 shows the XRD patterns of the bulk (<63 μm), bulk calcined at 800°C and fine (<2 μm) clay samples. The reflection peaks at 1.449 nm, 1.00 nm, 0.720 nm, 0.256 nm, 0.199 nm, 0.166 nm and 0.150 nm are assigned for the vermiculite clay mineral which is clearly observed in both the bulk and fine clay samples as shown in Figs 1(a) and 1(c). However, the peaks at 1.00 nm, 0.72 nm, 0.199 nm and 0.166 nm are clearly observed in the fine clay sample than in the bulk clay sample. In contrast, the peak intensity at 1.449 nm of vermiculite for the fine clay minerals is significantly decreased as compared to the bulk clay sample. Furthermore, it was reported that the dioctahedral vermiculite showed the d (060) peak at 0.150 nm (Guidotti, 1984).

Table 1. Chemical composition of the bulk and fine clay samples of Kamerotar area

| Oxides	Weight (%)	
	Bulk Clay (< 63 μm)	Fine Clay (<2 μm)
SiO_2	66.50	60.18
Al_2O_3	14.42	15.95
Fe_2O_3	3.86	1.86
MgO	2.01	8.43
K_2O	2.16	2.64
Na_2O	0.90	0.45
CaO	0.56	0.24
LOI at 1000°C	7.83	9.96
Miscellaneous	1.76	0.29

The presence of mica minerals in the clay sample is indicated by its characteristic basal (001) spacing at 1.00 nm with second-order basal spacing (002) at 0.496 nm. Similarly, peaks at 0.448 nm, 0.335 nm, 0.256 nm and 0.150 nm may be attributed for mica minerals. Furthermore, it is important to identify whether the mica is of muscovite type (potash mica) or paragonite (soda mica). The peaks for d (001) at 1.00 nm and for d (002) at 0.496 nm, not at 0.96 nm and 0.48 nm, respectively, indicates that Kamerotar clay mineral contains mostly of muscovite type of mica because the d (001) and d (002) values are generally used to differentiate between the muscovite and the paragonite mica. The similar behavior was reported by Guidotti in the muscovite type mica minerals (Guidotti, 1984). The peak for d (060) at 0.150 nm must be due to a mineral of dioctahedral mica group for which fall in the range 0.148-0.152 nm (Guidotti, 1984). The intensity of these peaks for mica minerals are decreased in the fine clay minerals as in Fig. 1(c) than in the bulk clay sample as shown in Fig. 2(a). These results revealed that the amount of mica minerals in the fine clay minerals is less than in the bulk clay sample.

Strong reflection peaks at 0.427 nm, 0.334 nm, 0.246 nm, 0.228 nm, 0.213 nm, 0.182 nm, 0.154 nm and 0.138 nm are assigned for quartz. A strong reflection at 0.334 nm is due to the presence of both the quartz and mica mineral in both clay samples. The 0.331 nm peak for mica minerals is overlapped with quartz's peak. Quartz is not a clay mineral although it is very often present in the fine clay-size fraction, that is $< 2\mu m$. If this reflection is present in the clay sample, then it automatically checks the reflection at 0.427 nm, the second most intense reflection of quartz. The intensity of the second most intense reflection peak at 0.427 nm for the quartz is remarkably decreased for the fine clay minerals as compared to the peak for the bulk clay sample. Less intense reflection peaks at 0.370-0.383 nm, 0.331-0.319 nm are assigned for feldspars, mostly of potassium-feldspars (i.e., muscovite).

The 1.449 nm reflection peak is generally due to the presence of vermiculite or/and chlorite minerals (Grim, 1953; Worrall, 1986). It was reported that the vermiculite was differentiated from chlorite by collapsing 1.45 nm peak to 1.00 nm upon heating at 550°C or high temperatures (Whittig & Jackson, 1955; Khoury & El - Sakka, 1986). It was reported that the intensity of the 1.45 nm diffraction peak for vermiculite mineral was decreased significantly and was finally collapsed to 1.0 nm diffraction peak after heating the clay sample for 2 hours at 500°C (Whittig & Jackson, 1955). In the present study, 1.449 nm peak of the bulk clay sample is completely collapsed to 1.00 nm after heating the bulk clay sample at 800°C for 2 h and the intensity of the reflection peak at 0.72 nm is also collapsed for the bulk clay sample as shown in Fig. 1(b). Similar behavior was observed for the fine clay sample heated at 600°C and 800°C which is not presented here. It is reported that the collapse of the

1.45 nm basal spacing on heat treatment and relatively low intensity of the second-order basal spacing at 0.72 nm pointed to a structure more closely linked to vermiculite type clay minerals than to chlorite (Wang *et al.*, 2011). Consequently, the clay sample of Kamerotar area consists of vermiculite minerals, not chlorite. It is noteworthy to mention here that the muscovite type mica (i.e., potassium mica) with significant paragonite (i.e., sodium mica) solid solutions was only observed in single-mica assemblages in middle-grade metamorphic rock, for which it was reported the highest Na/ (Na+K) ratio observed was ~ 0.31 (Guidotti, 1984). However, this ratio of Na/ (Na+K) in the present study is found to be 0.29 and 0.20 for the bulk and the fine clay samples, respectively. These results revealed that the major mica in the fine clay of Kamerotar is of muscovite. Consequently, major clay minerals identified in Kamerotar clay sample of Bhaktapur, Nepal, are vermiculites, mica (mostly of muscovite), feldspars and quartz based on XRD analysis.

Figure 1. XRD patterns of the (a) bulk clay (b) calcined the bulk at 800°C and (c) fine clay samples of Kamerotar area
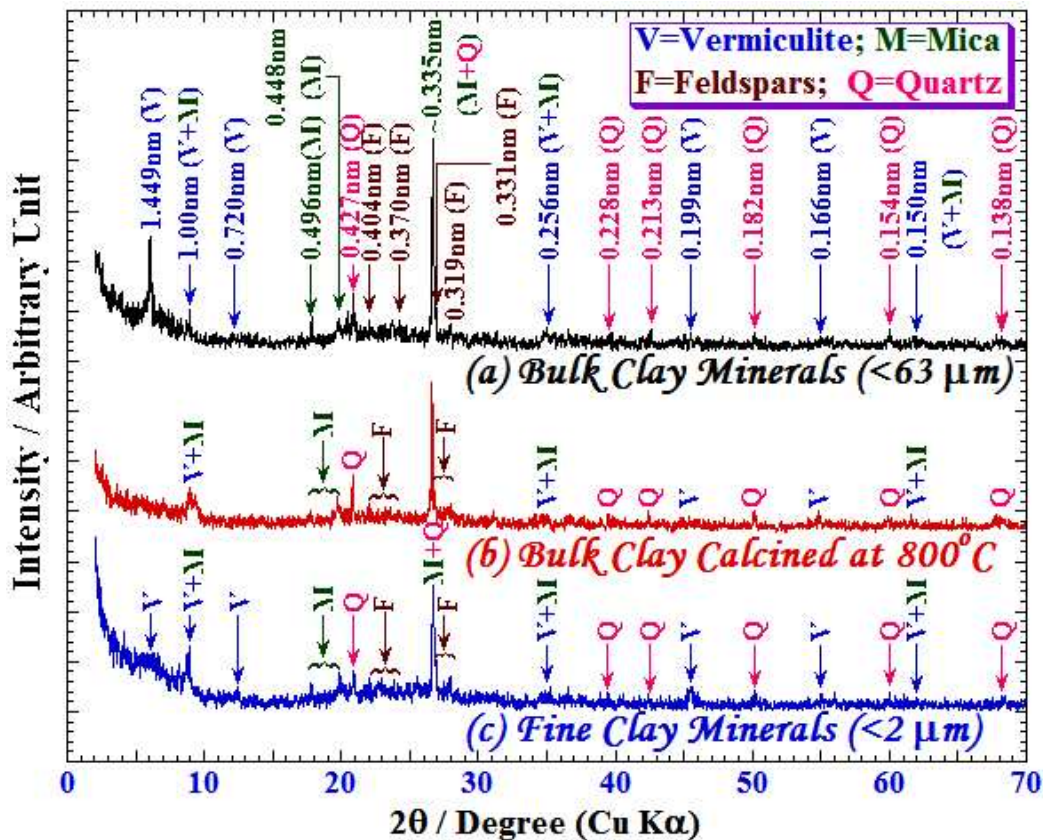
FTIR analysis

The FTIR spectra of both bulk and fine clays were taken to identify functional groups present in Kamerotar clay samples for their characterization. Three main absorption bands are observed in the 3800-3000 cm^{-1} region for both bulk and fine clay samples as shown in Figs 2 and 3, respectively. A strong band at 3618 cm^{-1} is attributed to Al-OH-Al with Al-Mg-O stretching vibrations. In general, inner hydroxyl group putting between the tetrahedral and octahedral sheets of the clay minerals give the absorption band near 3620 cm^{-1} (Madejova, 2003). Therefore, the band at 3618 cm^{-1} for both bulk and fine clay minerals may be associated to the inner hydroxyl group. The position of OH band at 3567 cm^{-1} was characteristic for the clay minerals in which FeFeOH grouping dominates in octahedral sheets (Rusel & Fraser, 1994). Therefore, the bands at 3557 cm^{-1} and 3564 cm^{-1} for Kamerotar bulk and fine clay samples, respectively, may be due to the FeFeOH grouping in the octahedral sheets of the clay minerals. On the other hand, it was reported that the interlayer cation modifies both the position and intensity of the broad band near 3400 cm^{-1} which was attributed to the stretching H-O-H vibrations (Farmer, 1974). Hence a broad band at 3418 cm^{-1} for the bulk clay and 3402 cm^{-1} for the fine clay samples is attributed to OH-stretching vibrations of hydroxide in the interlayer sheets of the Kamerotar clay minerals.

Figure 2. FTIR spectra of Kamerotar bulk clay (< 63μm) sample
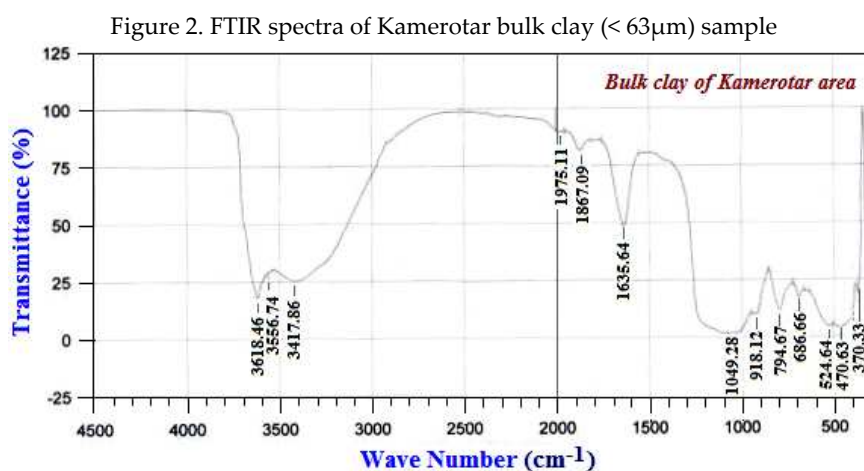
The absorption peak at 1638 cm^{-1} corresponding to H-O-H bending mode of adsorbed water by clay minerals is shifted to 1636 cm^{-1} for the clay sample of Kamerotar area. Furthermore, it is meaningful to mention here that the vermiculites showed the H-O-H bending vibration mode at 1635 cm^{-1} (Wang *et al.,* 2011) which is in good agreement with the band of H-O-H stretching vibration of the clay minerals. Consequently, a conclusion can be drawn that Kamerotar clay minerals consist of vermiculite type of clay minerals. The IR spectrum of the clay minerals of Kamerotar

area shows Si-O stretching and bending as well as OH bending absorption bands in 1300-400 cm^{-1} range (Figs 2 and 3). Different arrangement within the layers (1:1 versus 1:2 and/or di-octahedral versus tri-octahedral character) is reflected in the shape and positions of the IR bands. Only one broad and complex Si-O stretching bands at 1088 cm^{-1} and 1049 cm^{-1} is present in the IR spectrum of Kamerotar clay sample in bulk and fine clay samples, respectively which represents the presence of vermiculite clay minerals as well as the amorphous silica in both the bulk and fine clay minerals. FTIR bands near 687 to 694 cm^{-1} and near 525 to 532 cm^{-1} are probably due to the Al-O-Si and the Mg-O linkages of vermiculite. Ravichandra & Sivasankar (1997) have reported that the IR peaks at 680 and 530 cm^{-1} for Al-O-Si and Mg-O of the vermiculite minerals. The Al$_2$O bending band of the clay minerals near 918 cm^{-1} arises from vibrations of inner OH group of the clay minerals. Results, obtained from the FTIR spectroscopic analyses revealed that Kamerotar clay minerals consist of vermiculite type of minerals.
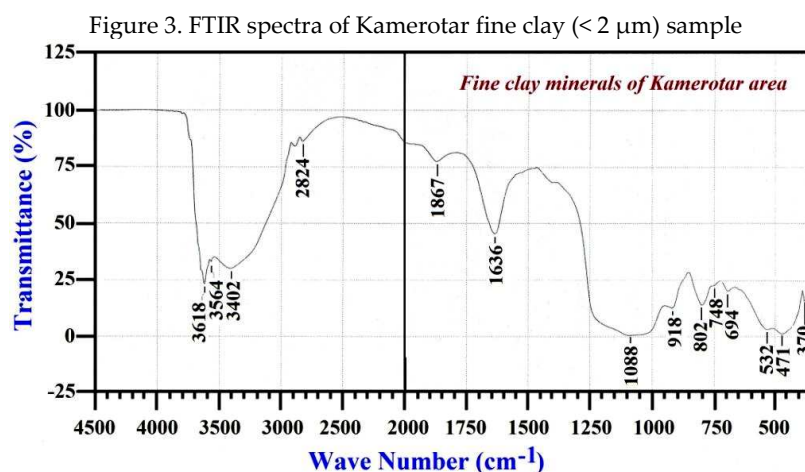
Figure 3. FTIR spectra of Kamerotar fine clay (< 2 μm) sample

Thermal analysis

In order to obtain more information about the characterization of Kamerotar clay minerals, thermal analysis was carried out. The thermo-gravimetric analysis (TGA) and differential thermal analysis (DTA) curves obtained for the fine clay minerals are shown in Fig. 4. Behavior of the natural vermiculite agrees with previous report for this vermiculite type of hydrated alumina-silicate (Grim, 1953). There was an initial weight loss started from 30°C and observed as a strong endothermic peak centered at 99°C due to the removal of hygroscopic water from external surfaces and interlayer of vermiculite crystallites. The weight loss for this process was found to be about 5.64%. After this, the weight loss continues in a very slight slope in the TGA curve and a fused type of endothermic peak at about 417°C with a very broad and small shoulder at 265°C in the DTA curve is due to the hydroxylation of water molecules coordinated

to magnesium and other cations in the clay minerals. This revealed that the fine clay mineral of Kamerotar is of polycationic nature. It was reported that the temperature of the dehyxoylation peak of clays increase from vacancies to Fe to Al and to Mg composition (Rodriguez *et al.*, 1994). On the other hand, it was also reported that the Mg-saturated clay minerals showed a low-temperature peak for vermiculite type clay mineral with endothermic peaks at about 110° and 295°C (Khoury & El-Sakka, 1986). There is no any endothermic peak at around 615°C indicative of the absence of illite or/and chlorite types minerals in the fine clay minerals of Kamerotar area of Bhaktapur, Nepal. A third endothermic peak centered at about 897°C was due to phase changes by the loss of hydroxyl groups of the clay sample. The weight loss phenomena in the TGA curves correspond to a total weight loss (from 30° to 1000°C) of about 10.8% of the initial weight of the fine clay minerals of Kamerotar area.

Figure 4. DTA and TGA spectra of fine clay (< 2 μm) minerals of Kamerotar area of Bhaktapur, Nepal
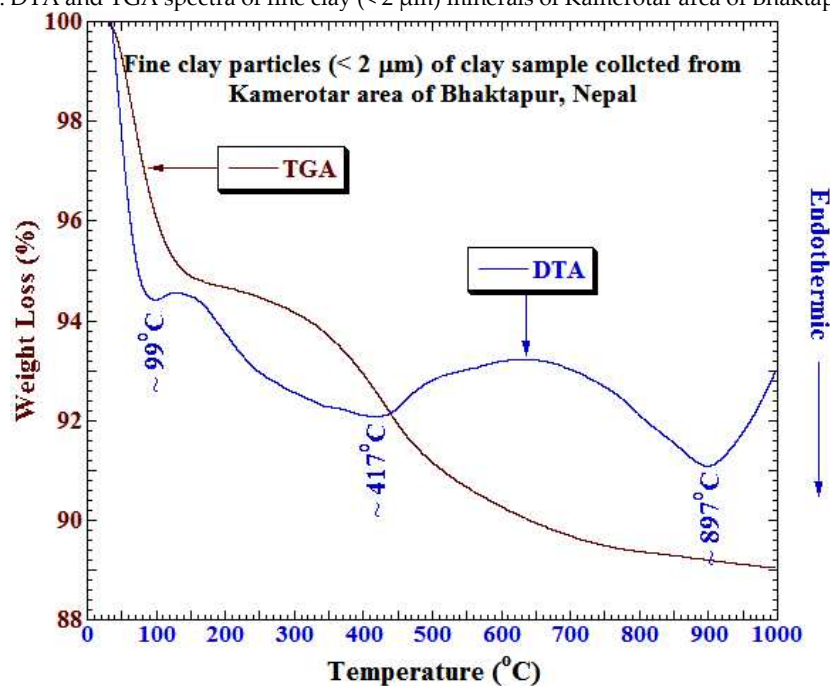
Conclusions

The major clay minerals identified in Kamerotar clay sample are dioctahedral vermiculites, micas, feldspars and quartz based on the chemical, XRD, FTIR and DTA analyses. A considerable amount of Fe_2O_3 and K_2O present in the clay sample is attributed to iron-bearing muscovite, analogous to potash mica. Furthermore, the considerable amount of Fe_2O_3 and MgO contained in both the fine and bulk clay samples compared to the standard clay raw materials used for the porcelain

productions indicated that the Kamerotar clay sample is not a suitable raw material for the production of a good quality whitewares, especially for porcelains, without modifications and purification.

Acknowledgements

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DIETARY DIVERSITY AND NUTRITIONAL STATUS OF WOMEN OF CHILD BEARING AGE IN SANGLA VILLAGE, NEPAL

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Abstract: *Malnutrition among women, particularly in child bearing age group, is a major concern in Nepal. This is an important issue because nutritional conditions of this group have direct implications on prenatal as well as post natal child growth and development. With this concern in mind this study was conducted in Sangla village to observe and analyze the dietary diversity and nutritional status of this group with special focuses on the adequacy of nutrient intake. The study utilized both qualitative and quantitative methods that included household survey, observation, as well as measurements of food intake, Body Mass Index (BMI) and Middle Upper Arm Circumference (MUAC). The study found that majority of the respondents had medium or high dietary diversities and their nutritional status was normal both in terms of MUAC and BMI. However, a significant proportion, almost one third, was moderately or mildly malnourished— mainly under nourished; and some were obese. There is a tendency of over consumption of fat, very low mean intake of beta carotene and foliate; mean intake of thiamine, riboflavin, niacin, calcium and iron is also on the low side. Protein intake is adequate, vitamin C exceeded the requirement. There is a need to bring awareness regarding balanced dietary requirements of this group. There is also a need for preparing and publishing national food and nutrition guideline, developing a system to ensure nutritional adequacy, and assessing affordability to check whether low intake is economic compulsion.*

Keywords: *Women, child bearing age, dietary diversity, food variety, nutrient intake, nutritional status.*

Introduction

Malnutrition may be caused by inadequate as well as imbalanced or an excess intake of food. Inadequate intake of food can cause chronic energy deficiency, underweight, stunting, wasting, anemia, iodine deficiency, vitamin A deficiency, etc. Whereas excess intake may cause obesity or over-weight. Even in condition when food is sufficiently available, poor monotonous diets low in quality and/or dietary diversity can cause nutritional inadequacy. Women of child bearing age in developing countries usually disproportionately suffer more from food deficiency because of their diet often lack micronutrients like iron, calcium, Vitamin A, Vitamin C, folic Acid, Thiamin, Riboflavin, Niacin and Zinc. Deficiency of micronutrients in a mother results in poor fetal growth and development.

The Nepal Demography Health Survey 2011 shows that 18 percent women of reproductive age are thin or undernourished (BMI < 18.5 kg/m^2) and 11 percent

women are overweight (BMI 25-29 kg/m^2) and 2 percent are obese (BMI 30 kg/m^2). Rural women are more likely to be thin (19%) compared to urban women (14%) where as overweight/obese women are more in urban area (26%) and rural women (11%). The prevalence of anemia is associated with maternity status. Pregnant women are more anemic (33%) than women who are breast feeding (39%) and women who are non-pregnant and non-breast feeding (33%). Higher cases of anemia were found among women in rural areas (36%) than in urban areas (28%).

Ajani (2010) in Nigeria, Onyango *et al.* (1998) and Tarini *et al.* (1999) in Nigeria and Kenya; Steyn and Nel (2011) in South Africa, Arimond *et al.* (2009) in Bangladesh reported that in the context of the developing countries diets are unbalanced; they tend to be starchy staples-dominated food and often include little or no animal products and few fresh fruits and vegetables. Such diet is at risk of leading to deficiencies or excesses of several micro or macronutrients (Tontisirin *et al.,* 2002). Although other aspects of dietary quality such as high intakes of fat, salt and refined sugar have not typically been a concern for developing countries. Recent shifts in global dietary and activity patterns resulting from increases in income and urbanization are making these problems more relevant for countries in transitions as well (Popkin, 1994).

Studies of dietary variety appeared in the early 1980s (Guthrie & Scheer, 1981). Since that time several studies (Krebs-Smith *et al*., 1987; Wahlqvist *et al.,* 1989; Allen *et al.,* 1991; Miller *et al.,* 1992; Taren & Chen, 1993; Kant *et al.,* 1995; Hsu-Hage & Wahlqvist, 1996; Onyango *et al.,* 1998; Hath *et al.,* 2000; Bhargava *et al.,* 2001) testified the need and various benefits of high dietary variety in terms of nutrient adequacy. These studies and also many others such as Ogle *et al.* (2001) in Vietnam, Savy *et al.* (2005*)* in Burkina Faso and Bernstein *et al.* (2002) in America have shown positive association between dietary diversity and energy intake as well as other nutrient intake. Bernstein *et al.* (2002) pointed out that more varied and diversified diet as reflected by food variety score (FVS) and dietary diversity score (DDS) are associated with the higher anthropometric indices (BMI and MUAC) indicating a better nutritional status. Especially, BMI was statistically significant with DDS as the influencing factor.

In Nepal, NLSS (2012) had undertaken a survey of dietary diversity. However the purpose of the survey was to establish the national average. Although it has pointed out the inadequacy of micronutrients, it lacked the details involving FVS and relation between DDS and FVS with micronutrients.

This article is based on a study carried out to understand dietary diversity and nutritional status of women in an out-skirting VDC in Kathmandu valley, focusing on the women of child bearing age. The main objective of this study is to understand the conditions of dietary diversity and nutritional status of the women of child bearing age in a Nepalese village.

Materials and methods

Both qualitative and quantitative methods were used in this study. The study was conducted in 50 households in Sangla Village Development Committee (VDC) which lies in the outskirt of Kathmandu valley. The VDC is well connected by roads and communication to Kathmandu. Subsistence farming is the main occupation in the village. Each of the households was selected ensuring that it has one married women of child bearing age. The selected households were contacted by visiting them and the purpose of the study was explained. If more than one woman of childbearing age were interested in participating in the study, one woman was randomly chosen by lottery. The respondent households consisted of Chhestri (24%), Brahmin (24%), Newar (22%), Dalit (20%) and Tamang (10%). About 58% of the respondents were literate and had school education, 16% have passed school leaving certificate (SLC) examination. Majority (46%) of the respondents were in agricultural profession followed by business (20%), housewives (14%), working as daily wage laborers and small shop keepers. Eight percent respondents belonged to middle class, 12% to lower class and the rest 8% in higher class. The selected houses were also visited to observe and inquire about the family food consumption. VDC office was consulted for general information.

Interview schedule and semi-structured questionnaire for individual respondents, observation list and instruments to estimate BMI and MUAC, constituted the main study tools. To obtain information on dietary diversity and food intake of respondents, the 24 hour dietary recall method were used. A scale of 9 food groups was used in assessing the dietary diversity of respondents. A point was awarded to each food group consumed over the reference period, and sums of all points were calculated for the dietary diversity score for each individual. The nutrient intake of each respondent was calculated based on the Food Composition Table for Nepal (2012) and the nutrient intakes were then compared with ICMR Recommended Dietary Allowance, (RDA, 2010) for women.

The study listed and analyzed food variety and food diversity in relation to nutritional status of women of child bearing age. This study was limited to a VDC in the hilly outskirt of Kathmandu valley as a case; therefore, the result may not be generalized for the country.

Results

Dietary habit of the respondents

Basically, two types of diet groups were identified in the village -- vegetarian and non-vegetarian. Vegetarians in the village included those who do not eat meat and fish whereas non-vegetarians eat meat, fish, poultry, etc. Ninety percent of the respondents were found to be non-vegetarian and only 8 percent were vegetarians.

Fifty percent of the respondents usually had four meals per day; 38% had three meals and 12% had two meals a day. All have two main meals; breakfast in the morning and tiffin in the afternoon are additional meals in the case of those who had four or three meals in Sangla VDC.

Frequency of food intake

Food intake frequency of the respondents on daily, weekly and monthly basis is listed in Table 1. All respondents consumed cereal every day. Rice, maize and millet are the most common food item in this group. More than 80 percent respondents had rice both for lunch and dinner; 20 percent respondents said they eat corn mush mostly in the evening. Green leafy vegetable is another regular item. Most of the cereals and the vegetables consumed in the village are grown locally. Sugar, ghee or oil is daily consumable items.

Table 1. Distribution of respondents by frequency of food items intake in Sangla VDC

Food items	Frequency in terms of % of the respondents					
	Daily	Weekly	two/week	Once/month	Two/month	Total
Rice	100	-	-	-	-	100
Dhindo (corn mush)	6	14	10	10	22	62
Dal/pulses/legumes	52	10	18	12	8	100
Green leafy Vegetables	94	4	2	-	-	100
Other vegetables	52	34	14	-	-	100
Fruits	-	16	-	26	6	48
Milk and milk products	18	-	-	2	-	20
Ghee/oil	96	4	-	-	-	100
Meat/Fish	-	36	18	18	16	88
Egg	-	-	-	16	24	40
Sugar & other sweet things	100	-	-	-	-	100
Others (Biscuit, bread, Puff, Dough nut, Dal moth, Instant noodles, beaten rice)	32	8	10	12	-	62

Vegetables such as cabbage, cauliflower, green onion, green garlic, and green broad beans were eaten seasonally, as available. Most of the respondents usually had potato curry mixed with *gundruk*, soybeans and other vegetables. Fifty two percent respondents consumed pulses/lentils daily. Majority of them had pulse soup with rice mostly in lunch rather than in the dinner.

Meat is taken on weekly basis by 54% and on monthly basis by 34%. Eggs are consumed once or twice a month by 36%. Twenty six percent of respondents reported that they consume fruit once a month and few said they had once a week. Fish is eaten rarely. Sugar was mainly taken daily in tea. The daily consumption of milk and dairy products such as curd, butter milk was low and was reported by only 18 percent respondents (Table 1).

Dietary diversity and food variety of the respondents

This study has adopted nine food groups recommended by FAO (2011) for such studies with modification to suit local context of the study area. In this framework, less than four food groups consumed indicates low dietary diversity score (DDS), four to five groups indicates medium DDS, and more than six groups indicates high DDS (Table 2). All the dietary diversity scores were calculated from 24 hour dietary recall method.

Dietary diversity score

Table 2 consists the percentage of the respondents in three score categories–low (<4), medium (4-5) and high (> 6). The DDS of respondents ranged from 3-8 (out of 9 groups). Results show that majority of the respondents (60%) consumed 6 or more food groups. The overall mean DDS among respondents was 5.7 (out of 9). This indicates high side of nutrient intake pointing to diets of higher nutrient quality and proxy indicator of nutritional adequacy. Thirty four percent respondents consumed from 4-5 food groups considered medium side and the rest of 6 percent respondents consumed less than 4 food groups which indicates a poor dietary diversity. As DDS increased, the percentage of consumption also increased in most of the food groups except starch as everybody with less than 4 DDS value consumed starch.

Table 2. DDS of the respondents based on 24 hours of intake

Dietary diversity score	Respondents	
	Frequency	**Percentage**
Low DDS < 4	3	6.0
Medium DDS 4-5	17	34.0
High DDS 6 and more than 6	30	60.0
Total	50	100

Source: Field survey, 2014

Considering the diet within each category of the diversity score, the respondents with low scores had a very basic diet and consumed only three food groups at the most. In most cases, these groups were cereals, leafy vegetables or other vegetables and condiments, which are the basic ingredients of the diet. The respondents with

medium scores often consumed milk and curd and vegetables in addition to these groups, and also a meat, pulses, fat and sugar; however, some times, the respondents who had higher DDS scores had higher frequency of having meat, pulses, fat, sugar and fruits.

Food variety score

Table 3 consists of the food variety score of the respondents, based on the total food items consumed by the respondents in the past 24 hour period divided into three groups – fewer than 4 foods items consumed on the previous day indicates a low food variety, 4-8 food items indicates medium variety and more than 8 food items that of high variety. The dietary diversity assessment in terms of food items consumed called food variety score (FVS) shows similar results as in the dietary diversity score; 60% of the respondents are consuming high side of dietary diversity while the rest 40% are consuming medium. However, unlike in the case of food group assessment, none of the respondents is in the low side of consumption.

Table 3. FVS of the respondents based on 24 hours intake

Food variety score	Women of child bearing age	
	Frequency	Percentage
Low FVS fewer than 4	0	0
Medium FVS 4-8	20	40
High FVS > more than 8	30	60
Total	50	100

Source: Field survey, 2014

Overall, 68 kinds of food items were reported as consumed by the respondents. Food variety score of a respondent ranged from 4 to 16. The mean food variety score was 9.08. Vegetable food group shows the most varied in terms of individual food items (n=27), followed by the cereal (n=13) and pulses and legumes group (n=11). Consumption of food items from meat and meat products, milk and milk products and fruits was low.

DDS and meal consumption per day

There was generally a positive link between the DDS and meal consumption per day. The more varied and/or diversified the diet, as reflected by more intake of meal per day, the higher the meal frequency reflecting a higher DDS (Table 4). In some cases different dietary varieties were found even while taking two meals a day. It might be due to the dietary diversity within the food groups but not across the food groups.

Table 4. DDS and meal consumption per day

Dietary diversity score	Meal frequency		
	Two meals percentage	Three meals percentage	Four meals percentage
Low DDS < 4	4	6	0
Medium DDS 4-5	4	12	20
High DDS 6 and more than 6	4	20	30
Total	6	38	50

Source: Field survey, 2014

Results reveal that 30 percent respondents who had 6 and more DDS had four meals a day whereas 20 percent respondents had the same meal frequency that had medium DDS (Table 4). Surprisingly, different dietary scores were found even in the two-meals intake per day.

Nutritional status of the respondents based on BMI and MUAC

Anthropometric measurements mainly BMI and MUAC were applied to assess the nutritional status of women of child bearing age in the present study. BMI is widely accepted as one of the best indicators of nutritional status in adults. According to WHO, a prevalence of over 20% with a BMI less than 18.5 constitutes a serious public health problem. The healthy range of BMI is 18.5-24.9 kg/m^2 as recommended by WHO (1995). BMI below the normal range indicates underweight which denotes chronic energy deficiency and thinness. Similarly, an above the normal range indicates over nutrition and obesity.

MUAC is another anthropometric measure, which has been used to evaluate the nutritional status of adults and has been found to be particularly effective in determining malnutrition among adults in developing countries.

Table 5 lists the prevalence of underweight and overweight/obese among the respondents based on the BMI indicator.

The mean BMI was 21.98. Among the total respondents, 68 percent respondents (N= 34) were found to be normal and 12 percent were moderately underweight or thin. Eight percent respondents were found mildly thin and no respondent was found severely undernourished. Furthermore, the data indicated that 10 percent respondents were overweight or pre-obese whereas only 2 percent respondents were obese.

Table 5. Nutritional status of respondents by BMI

BMI Status	BMI Range*	Respondents**	
		Frequency	Percentage
Chronic energy deficiency			
Normal	18.5-24.9 kg/m2	34	68
Mild	17.0-18.4 kg/m2	4	8
Moderate	16.0-16.9 kg/m2	6	12
Severe	< 16.0 kg/m2	0	0
Overweight in respondents			
Overweight/pre-obese	25.0-29.9 kg/m2	5	10
Obese	30-39.9 kg/m2	1	2
Extremely obese	40 and above	0	0
Total		50	100

Sources: *BMI WHO, 1995 **Field survey, 2014

The nutritional status assessed by MUAC showed that 78 percent respondents were normal or had an acceptable nutritional status. Eighteen percent respondents were found to be severe to moderately under-nourished, and the rest of four percent respondents were mildly under-nourished. The mean MUAC was 24.61. Results indicate that the nutritional status of respondents was nearly the same by as per the BMI indicator and MUAC measurement. In one case, the respondent's BMI was normal where as her MUAC was below the acceptable level.

Table 6. Nutritional status of respondents by MUAC

Degree of MUAC*	Respondents**	
	Frequency	Percentage
Acceptable (> 23.6 cm)	39	78
Mild Undernutrition ((22.0 and 23.6 cm)	2	4
Severe to moderate Undernutrition (< 22.0 cm)	9	18
Total	50	100

Sources: *Ferro-Luzzi & James, 1996, **Field survey, 2014

Mean nutrient intake by the respondents

The mean energy intake of women of child bearing age was 2204 kcal/day which was fairly less compared to recommended requirements. The mean values of protein and fat were 54.12 g/day and 27.34 g/day, respectively. Respondents met the mean fat intake but little bit exceeded with reference to RDA (which was 25 g). The Mean Beta Carotene and dietary Folate intakes were extremely low at 993.88 mg and 88.9,

respectively compared to RDA 2400 mg. and 200 mg. Similarly, the mean iron intake was also low (18.15 mg) according to iron requirement. The mean intake of Vitamin C was exceeding with reference to RDA (Table 7). This is because the respondents had lots of vegetables in their diet. The mean intake of thiamin, riboflavin and niacin was less than the required level though they consumed foods were high in thiamin and riboflavin content such as cereals and vegetables. This may be due to the consumption of a limited variety and amount of foods.

Table 7. Mean Nutrient intake per day by respondents

Nutrient	RDA, ICMR (2010)*	Mean nutrient intake per day observed in the field**
Energy (Kcal)	2230	2204
Protein (gm)	55	54.12
Fat (g)	25	27.34
Calcium (mg)	600	531.34
Iron (mg)	21	18.15
Beta-carotene (mg)	2400	993.88
Vitamin C (mg)	40	109.01
Thiamine (mg)	1.1	0.87
Riboflavin (mg)	1.3	0.66
Niacin (mg)	14	11.02
Dietary folate (mg)	200	88.9

Source:* RDA ICMR, 2010 **Field survey 2014

Relationship between the dietary diversity and nutritional status

There was generally a clear and positive link between the overall dietary quality and women's nutritional status. In fact, more varied and/or diversified the diet, as reflected by FVS and DDS, higher the BMI, reflecting a better nutritional status (Table 8). Although other studies have shown that dietary diversity is significantly associated with nutritional status indicators especially among child bearing women, the relationship observed between the dietary diversity and nutritional status (BMI status) among the respondents in this study was not highly prominent.

The findings show that the overweight and obese respondents had lower diversity scores. The majority of the respondents (42%) who were normal had higher diversity of food than those with lower and medium DDS. Surprisingly, the underweight respondents did not belong to lower DDS category. No significant difference in DDS between groups/terciles was observed among respondents in BMI

grades. There was no relation between individual Dietary Diversity Scores and the respondents' nutritional status. Likewise, the same result was found regarding BMI and food variety scores.

Table 8. BMI and dietary diversity scores and food variety scores

BMI	BMI and dietary diversity scores			BMI and food variety score		
	<4 low DDS (%)	4-5 medium DDS (%)	6 and more high DDS (%)	Low FVS (fewer than 4) (%)	Medium FVS (4-8) (%)	High FVS (more than 8) (%)
Underweight	0	4	16	0	4	16
Normal	2	24	42	0	26	42
Overweight	2	4	4	0	6	4
Obesity	2	0	0	0	2	0
Total	6	32	62	0	38	62

Source: Field survey 2014

Conclusion

There is a medium to high dietary diversity in the village, but the nutritional adequacy remains low almost in every aspect except in terms of protein, fat and vitamin C. In terms of BMI, the majority are within the normal condition. Traditionally, food practices included fixed items: tea in the morning; *dal bhat tarkari* as the main morning and evening meals; beaten rice, beans, for afternoon tiffin. Festivals and rituals that occured frequently; in such occasions, some food items were considered to be essential. The traditional food practices ensured a higher side of dietary diversity among all the respondents. However, there is a lack of conscious effort to ensure appropriate quantity and proportion of food items causing imbalance in nutrient intake and inadequacy in terms of important nutrients like carotene, thiamine, and riboflavin, iron, folate and calcium.

Overall, the higher side of dietary diversity is encouraging; however, there are variations in terms of economic status, caste and ethnic groups. There is a need to survey to establish the extents of the implication of social and economic factors in dietary.

Targeted interventions are recommended to improve the production and availability of variety of vegetables to support greater dietary diversity amongst the entire population. Similarly, public education campaigns are necessary to improve the consumption of fruits, vegetables, and proteins amongst households that can currently afford to such foods but are not consuming them. The government should plan and prepare strategies to ensure at least minimum level of nutritional adequacy among all the citizens in line with its commitment regarding the food security.

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RISK PERCEPTION BY CUSTOMERS OF USED MOTORBIKE IN NEPAL

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Abstract: *Consumers are likely to perceive various risk factors in buying products. Based on the combination of secondary research and exploratory survey, this article identifies the principal risk factors of durable goods in Kathmandu Valley. The survey was carried out in Kathmandu valley among participants who had already purchased or intended to buy second-hand motorbike. The results identified that the second-hand motorbike shoppers in Kathmandu valley mainly perceive socio-psychological, functional, physical, and time risks. They perceived higher physical risks with increase in their age. And, their perception of socio-psychological, functional and physical risks varied in relation to their gender, occupation, and income. The findings of this research shall help the second-hand motorbike sellers to formulate their marketing strategies by focusing on minimizing the perceived risk factors, in order to increase their sales.*

Introduction

When it comes to buying goods, consumers have two choices; either they can buy new goods or they can opt out for second-hand goods. What are the major perceived risks of second-hand goods buyers? Do the buyer's demographic variables affect the principal perceived risk factor? The research subject has been studied based on the perceived risk factors of second-hand motorbike shoppers in Kathmandu valley. Literally, there is no distinct definition of second-hand but it excludes itself from purchase or sale of goods or things that are new. In general, a second-hand or used good is the one that is purchased by or otherwise transferred to a second or end user. The perceived risk is considered an uncertainty regarding the possible negative consequences of using a product or service. It is a combination of uncertainty with the possibility of serious outcomes (Bauer, 1967).

There may be a positive or negative orientation toward buying of any second-hand product. The focus of this study is the negative orientation (such as perceived risks) of Nepali consumers towards second-hand motorbikes. This study is quite relevant because social and cultural orientation of Nepali consumers is generally resistent towards buying second-hand goods. In addition to that, if we refer to Watson (2008), Nepalese are likely to have negative orientation towards second-hand shopping because most of them have poor upbringing.

Buying used goods on the second-hand market works to buyer's advantage as they can acquire goods at relatively lower prices (Razzouk & Voight, 1985). In the

context of Nepal, in particular, Kathmandu valley, an increasing trend in second-hand sales of the objects like books, motorbikes, furniture and cars has been observed. The most significant is the sales of second-hand motorbikes as provided by www.hamrobazar.com (accessed on 18 April 2014), one of the leading online second-hand goods portals in Nepal, where 2036 motorbikes, 1185 cars and 819 home appliances including furniture were offered for sale. This is also evident from our physical observation where we can easily find second-hand motorbike sellers compared to any other second-hand object sellers in Kathmandu valley.

In fiscal year 1990/1991, Department of Transport Management of Nepal registered 3763 motorbike sales within Kathmandu Valley whereas in last fiscal year (2013/2014), 60044 were registered. It is an approximate annual average growth rate of 13 percent. However, no official records are observed stating second-hand motorbike sales. But, according to the editor of *Auto Nepal*, there is approximately 10 percent market share of second-hand motorbike sales in Kathmandu valley. Beyond monetary gain, one can wonder about the status of the perceived risk usually associated with symbolic products (Midgley, 1983), which increases in the context of buying second-hand goods.

No study has been conducted in Nepal in the area of durable second-hand goods sales and their perceived risks. So, this study shall contribute to bridge the knowledge gap in the area of second-hand sales in particular context of Nepal. It has two basic objectives. First, to identify the principal perceived risks factors in reference to second-hand motorbike consumers. Second, to find the relationships between those identified principal perceived risk factors and the consumer demographic variables.

Identification of principal perceived risks shall have positive effect in resolving the perceived risks towards second-hand motorbikes and help increase its share in Nepali market. The knowledge out of this research shall also help second-hand motorbike sellers to devise better strategies in reducing perceived risk of consumers and ultimately improve their overall sales.

This study has been organized into four sections. Firstly, the theoretical literatures were reviewed to identify the research variables, and a conceptual framework for study was developed. Secondly, a mini-research survey using structured questionnaire was conducted, and the representative samples for analysis were collected. Next, an exploratory factor analysis method was used to identify the principal perceived risk factors from the collected data. Finally, the implications of the findings, their limitations and additional research needed in this field of study were discussed.

Literature review

Theoretical framework

Consumers make decisions regarding the products or services they buy. Because of the outcome (or consequences) uncertainty of of such decision, they perceive some

degree of 'risk', also referred as 'perceived risk'. The main subject of this study (perceived risk) is guided by the theory of human perception. According to Schiffman *et al.* (2010), perception is defined as the process by which an individual selects, organizes, and interprets stimuli into a meaningful and coherent picture of the world.

Perceived risk

When buyers plan to purchase a product or service, they often hesitate to take action because they cannot be certain that all of their buying goals will be achieved with the purchase (Roselius, 1971). In other words, buyers may perceive a certain degree of risk in most purchase decisions (Cox & Rich, 1967). Dowling and Richard (1994) defined the concept of perceived risk as "the consumer's perceptions of the uncertainty and adverse consequences of buying a product or service". Perceived risk is a combination of uncertainty with the possibility of serious outcome (Bauer, 1967). Cox and Rich (1967) and Cunningham (1967) first described the perceived risk as comprising of two components: uncertainty and adverse consequences. Total or overall perceived risk for a specific product is a combination of fixed component, product category risk (PCR), and the variable component of the product specific risk (PSR) (Dowling & Richard, 1994).

Perceived risk theory was initially used by marketing researchers to understand the effect on consumer behaviour of making purchase decisions under such conditions of imperfect information (Bauer, 1967), in which a consumer attempts to identify buying goals and match such goals with product or brand offerings (Cox & Rich, 1967). Both the probability and outcome of each purchase event is uncertain, and so it differs from the economic view of risk, which implies that a decision maker has a prior knowledge of both the consequences of alternatives and their probabilities of occurrence (Dowling, 1986).

In this study, perceived risk is defined as the potential for loss in pursuing a desired outcome while engaged in second-hand motorbike shopping.

Perceived risk of second-hand goods

There may be a positive or negative orientation toward the buying of second-hand goods. A positive orientation toward second-hand shopping invokes the concept of motivation to identify determinants of a person's actions, including wishes, needs, emotions, feelings, passions, areas of interests, beliefs, values, fantasies, imaginary representations, personal complexes, conditioning, habits, deep-seated attitudes, opinions, and aspirations (Denis & Dominique, 2010). On the contrary, Watson (2008) in his literature review has cited social stigma of second-hand consumption as the negative orientation.

According to Tan (1999), since 1960s, there have been numerous studies designed to understand the concept of perceived risk and its impact on consumer behavior.

Perceived risk is the uncertainty that consumers face when they cannot foresee the consequences of their purchase decisions (Schiffman *et al.*, 2010). Thus, perceived risk is taken as one of the factors of study about drawbacks, dissatisfaction or judgments of second- hand shopping. Denis and Dominique (2010) concluded that the second hand shopping motivations are revealed and validated as polymorphous enthusiasts, thrifty critics, nostalgic hedonists, and regular specialist shoppers segments. However, second-hand shopping remains relatively unstudied even as it raises crucial issues, including the repeated circulation of used objects useful for life and thus reducing the conventional retailers of a substantial proportion of their revenues. So, this research can help bridge this knowledge gap, i.e. impact of perceived risk in the area of second-hand shopping.

Measures of perceived risk

Karnik (2014), in the context of online shopping in India, identified eight major dimensions of perceived risk factors, namely Society Image Risk, Quality Risk, Long Time Risk, Information Misuse Risk, Computer Usage Health Risk, Delivery Risk, Additional Cost and After-Sale Risk and Counterfeit Product Risk.

Despite different situations for identifying perceived risk, numerous studies have argued that the following six types of risks are usually involved in purchase decisions: social, financial, physical, performance/functional, time, and psychological risks (Jacoby & Kaplan, 1972; Garner, 1986; Kim & Lennon, 2000). However, we have used the term 'functional risk' instead of 'performance risk' in reference to Schiffman *et al.* (2010). In the following section, each of these six types of perceived risk is defined from the perspective of the durable second-hand goods shopping.

1. *Functional risk*: It is the perception that a product purchased may fail to function as originally expected (Kim & Lennon, 2000). For example, risk that the second-hand motorbike might break down unexpectedly in the journey.

2. *Physical risk*: It refers to the perception that a product may be dangerous to health or safety when it does not work properly (Roselius, 1971). For example, risk perceived by consumer to self and others (pillion riders) of accidents arising from a second-hand motorbike.

3. *Financial risk*: It is the perception that a certain amount of money may be lost or required to make a product work properly (Garner, 1986). For example, risk of finding cheaper substitutes of second-hand motorbikes in the market.

4. *Social risk*: It refers to the perception that a product purchased may be disapproved by family or friends (Dowling & Richard, 1994). For example, risk that the second-hand motorbike buyer may be humiliated by its purchase in front of family and friends.

5. *Psychological risk*: It is the perception that a negative effect on a consumer's peace of mind may be caused by a defective product (Jacoby and Kaplan, 1972). It is the risk perceived by the consumer that a poor product choice will bruise his or her ego. For example, the risk that the consumer's ego might be hurt when his or her second-hand motorbike is lend to friends.

6. *Time risk*: It is the perception that time, convenience, or effort may be wasted when a product purchased needs to be repaired or replaced (Bauer, 1967). For example, the risk perceived by consumer that he may have to spend a lot of time to find second-hand motorbike or spend much time for its replacement if it does not perform as expected.

Researchers have shown that each type of perceived risk could be grouped in case of a certain type of product (Garner, 1986; Stone & Gronhaug, 1993). For instance, Garner (1986) examined the differences in perceived risks in relation to the types of products. They revealed that the financial, psychological, and social risks significantly affect buyers' purchase decisions for tangible products, while time and financial risks were considered more important in the purchase of services.

Conceptual framework

As discussed above, second-hand shoppers, in general, perceive six different types of risks: functional risk, physical risk, financial risk, social risk, psychological risk and time risk. And, these risks have been considered as the main variables in this study. In this research, perceived risk factors in the context of second-hand motorbike shoppers within Kathmandu valley have been studied in reference to the demographic variables especially age, gender, income and level of education.

Figure 1. Conceptual framework of study
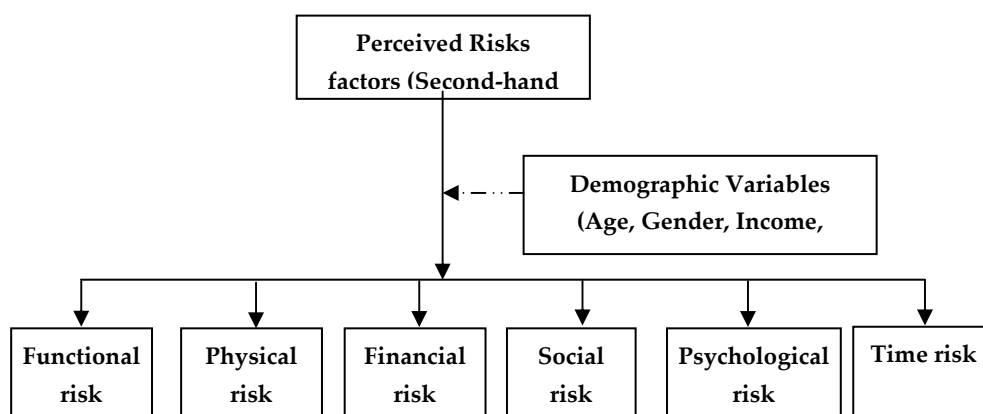
Research methodology

Research design

The Kathmandu valley was selected as the study area because it is the most populous city in the country, and it also accounts for the maximum number of new and second-hand motorbike sales. The researchers administered survey questionnaire to 57 participants in the Kathmandu valley who were second-hand shoppers of motorbikes (who already bought motorbikes) or who had an intent to purchase second-hand motorbikes (who visited second-hand motorbike showrooms). Due to close personal administration of the survey, hundred percent responses was received. The administered questionnaire (Annex 1) has been analyzed using SPSS (statistical package for social science), a software tool.

Sampling

Convenience sampling was used to select the participants within the Kathmandu valley. The intended sample size was more than 50 persons. Researchers, their peer groups and close-aid circles have been used as enumerators for the data collection. In this process, the peer groups and close-aid circles were thoroughly oriented about the questionnaires and the target respondents.

Data collection method

This research is based on primary data, collected through structured questionnaire using the survey method. The items and scale used in this research questionnaire were adopted from Zheng *et al.* (2012) and revised before the use.

Researchers identified and collected data from respondents by visiting few possible second-hand motorbike selling shops at Pulchowk and Balkumari area in Lalitpur and Balaju, Kalanki-Rabibhawan area in Kathmandu. The respondents had visited the shop with the intent to purchase a second-hand motorbike. Apart from that, data were collected through peer enquiry about the persons in their respective offices and close friend groups who had already bought and were using second-hand motorbikes. Similarly, the researchers also administered survey questionnaire through their colleagues pursuing M.Phil. at KUSOM (Kathmandu University School of Management) who in turn in selected respondents within their respective friend circles.

Data analysis

The collected data was analyzed using statistical software (SPSS ver.17). Data were analyzed for Principal Component Analysis with 25 iterations for convergence

and considering the factors with eigenvalues greater than 1. And, the rotation of data was carried out using Kaiser Normalization VARIMAX rotation method with 25 iterations for convergence which conversed in 6 iterations. And, for the treatment of missing values, 'replace with mean' option was chosen.

Two risk items that were meant to measure financial risk were eliminated for further analysis due to cross-loading values. Thereafter, rotation component matrix with remaining data was analyzed with the same parameters of principal component analysis which is shown in Table 1. The component matrix clearly yielded four distinct factors with minimum loading of 0.716.

The items in respective yielded factors were regrouped as socio-psychological risk, physical risk, functional risk and time risk factors. The reliability of the regrouped four factors was tested with Cronbach alpha analysis. The minimum value of Cronbach alpha for each factors were above 0.6 as shown in Table 1. Although, Minimum required Cronbach's alpha value is 0.70, it was compromised in this research because of the importance of the factors.

In order to know whether the mean of some factors are significantly higher to others, paired-sample value of the factors were analyzed and tabulated in Table 2. Correlation of risk factors with the age of the respondent had been computed as shown in Table 3.

Finally, analysis of variance (ANOVA) of risk factors with other demographic variables namely gender, occupation, education and income level have been computed as shown in Table 4.

Results

The result of analyzed data obtained in the form of rotation component matrix after elimination of cross loading items is shown in Table 1. The items with loading value above 0.718 have been taken which yielded four distinct factors. These four factors have been categorized as Socio-Psychological, Functional, Physical, and Time factors. The items within the factors have been tested for their reliability with Cronbach's alpha analysis, and the values are mentioned in the Table 1.

Table 1. Factor analysis

Items	Perceived risk factors			
	Socio-psychological	Physical	Functional	Time
If I buy second hand motorbikes, my relatives would think differently of me	.833	.036	-.072	.219
If I buy second hand motorbikes, my friends would think differently of me	.831	-.017	-.012	.074
I would be embarrassed to lend my second hand motorbike to my friends	.774	.201	.150	.018
The thought of second hand motorbike buying makes me feel uncomfortable	.716	-.181	.298	-.115
Using second hand motorbike will cause danger to my safety	.066	.905	.143	.101
Using second hand motorbike will bring more accidents	-.011	.735	.198	-.240
Second hand motorbike would have pickup problem	.138	.090	.821	.079
Second hand motorbike would fail to start to my expectation	.036	.226	.802	-.025
I would have to spend more time if i need to replace my second hand motorbike	.079	.133	-.014	.894
It's much time consuming to buy a second hand motorbike	.074	-.343	.082	.732
Cron-bach's alpha	.808	.696	.625	.604

While analyzing the significant difference between the means of individual factors yielded in Table 1, the paired-sample value of the factors were analyzed and tabulated in Table 2 below.

No significant difference has been observed in the consumers' perception between socio-psychological risk and physical risk, and functional risk and time risk. However, consumers perceived higher functional risk to socio-psychological risk, higher time risk to socio-psychological risk, higher functional risk to physical risk and higher time risk to physical risk. Among four perceived risk factors, consumers prioritized time risk, functional risk, socio-psychological risk and physical risk in the descending order.

Table 2. Consumers perception of risk factors on purchase of second-hand motorbike

		Mean	**Standard deviation**	**T**	**Sig (p-value)**
Pair 1	Socio-Psychological	2.6140	.98998	-2.948	.005
	Functional	3.1053	.99882		
Pair 2	Socio-Psychological	2.6140	.98998	1.611	.113
	Physical	2.3333	.92743		
Pair 3	Socio-Psychological	2.6140	.98998	-3.915	.000
	Time	3.2807	.99560		
Pair 4	Functional	3.1053	.99882	5.156	.000
	Physical	2.3333	.92743		
Pair 5	Functional	3.1053	.99882	-.942	.350
	Time	3.2807	.99560		
Pair 6	Physical	2.3333	.92743	-4.941	.000
	Time	3.2807	.99560		

The bi-variate and partial correlation of risk factors with the age of consumers is shown in Table 3 below. It is found that the age of the consumers have non-significant correlation with other risk factors except physical risk factor. Physical risk factor is found to be inversely correlated with age of consumers i.e. with increase of age, physical risk perception of consumer towards second-hand motorbike purchase decreases and vice versa.

Table 3. Bivariate and partial correlations

		Socio-psychological	**Functional**	**Physical**	**Time**
Age of respondent	Pearson Correlation	-.116	-.119	-.365**	-.037
	Sig. (2-tailed)	.390	.378	.005	.784

**. Correlation is significant at the 0.01 level (2-tailed).

The analysis of variance (ANOVA) of risk factors with other demographic variables namely gender, occupation, education and income level is shown in Table 4 below.

Table 4. One-way ANOVA: Effects of demographic variables on perceived risk factors

Demographic items\ Risk factors	Statistics	Socio-psychological risk	Functional risk	Physical risk	Time risk
Gender	F	.730	3.150	4.218	.760
	P	.788	.081	.045	.387
Occupation	F	1.161	.135	2.129	.395
	P	.333	.939	.107	.757
Education	F	.152	.835	.684	.151
	P	.859	.440	.509	.861
Income Level	F	.070	1.668	6.443	.451
	P	.933	.201	.004	.640

Significant variation was observed between consumers in terms of gender in the perception of functional risk and physical risk. While analyzing the perceived mean value on functional risk, female (mean=3.444, N=18) has been observed to be higher than male (mean=2.948, N=39). Similarly, for physical risk, mean value for female (mean=2.694, N=18) was higher than male (mean=2.167, N=39). Thus, female consumers perceived comparatively higher functional and physical risk.

Regarding consumers in terms of occupation, no variation was observed on the consumer perception of functional and time risk of second-hand motorbike purchase. Also, according to the results obtained in one-way analysis of variance, no variation was observed in consumer education categories on perceived risk factors of second-hand motorbike purchase.

Finally, significant variation was observed in consumer income level categories on perception of functional risk and physical risk of second-hand motorbike purchase. While analyzing perceived mean value on physical risk, consumers having income level between NPR 25,000 and NPR 50,000 perceived highest level of risk (mean=2.694, N=18).

Summary of findings, discussions and implications

Summary of findings

This research was conducted based on the interest of researchers regarding the various kinds of perceived risks of consumers during their purchase decision. The theoretical review identified six different types of perceived risks i.e. functional risk, physical risk, financial risk, social risk, psychological risk and time risk (Schiffman *et al.*, 2010). Out of six perceived risks factors, this research found only four principal perceived risk factors to be relevant in the context of Nepali consumers namely, Socio-Psychological, Functional, Physical, and Time (Schiffman *et al.*, 2010). However,

consumers did not show concern about financial risk. Among these four perceived risk factors, Nepali consumers had priority of time risk (mean=3.281), functional risk (mean=3.105), socio-psychological risk (mean=2.614) and physical risk (mean=2.333) in the descending order.

In addition, we studied the relationship of perceived risk factors in reference to demographic variables. Physical risk factor has been found to be inversely correlated with the age of consumers. And, perception of functional and physical risk has been found to be varied across genders. Likewise, consumers in different occupations perceived different socio-psychological and physical risks. Finally, variation has been found in the perception of functional and physical risk among consumers with different level of education and income level.

Discussions

Although our reference literature (Schiffman *et al.*, 2010) identified six perceived risk factors but our research findings resulted in only four main perceived risk factors. The consolidation of social and psychological risk for Nepali consumers may be due to the thin demarcation between individual and social understanding in the Eastern classical society like Nepal. This finding is consistent with Mitchell (1998) where it is stated that psychosocial risk is a combination of social and psychological risk, combining possible loss of self-image or social embarrassment resulting from a purchase.

Interestingly, Nepali consumers did not perceive financial risk factor significantly while purchasing second-hand motorbikes. This may be due to two reasons. First, financial value of second-hand goods (especially automobiles) gets depreciated significantly where net financial loss to the customer is insignificant. Second, second-hand buyers usually estimate the financial value of second-hand goods (including the initial cost of maintenance) before the purchase of second-hand motorbikes.

Consumers have perceived time risk as the highest among all other perceived risk factors. This may be due to perception that time, convenience, or effort may be wasted when a product is purchased, repaired or replaced. In Nepal, at present, there are a few outlets for second-hand motorbike sales which is making the buying less accessible. In addition to that, the replacement of second-hand motorbike is much limited. It is implied that consumers are not patient to wait for a long time because they usually feel delighted in receiving new things as soon as possible. So, second-hand consumers may have perceived higher time risk as they are likely to wait longer for purchase and replacement.

The reason for high perception of physical and functional risk by female consumers may owe to specific socio-cultural influence. Women are likely to be more

careful towards safety and the functionality of the motorbikes compared to men. Furthermore, women feel particular concern regarding the physical risk to others (particularly children) from the use of motorbikes. Likewise, consumers having income level between NPR 25,000 and NPR 50,000 may have perceived higher physical risk as they mostly belong to working class who are self-independent, bread-winners and hold high responsibility towards family members.

Implications

With the help of these research findings, second-hand motorbike sellers can effectively devise the marketing and communication strategies to address four perceived risk factors of Nepalese consumers and improve their overall sales. In addition to this, the second-hand motorbike sellers may devise their marketing plan by addressing specific perceived risks of the relevant demographics. This research shall also contribute to the scholars by providing specific knowledge on the perceived risks in the context of second-hand purchase especially in the automobile sector.

The primary limitation of this study has been its scope. Next, we couldn't validate the scale used for research. In addition, we had limited our study to only few areas within Kathmandu valley with limited respondents. So, the future research should test the findings of this research in a large sample size for better generalization.

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ANNEXURE

Annex 1. Survey questionnaire for measuring perceived risk of second-hand motorbike buyers

> *You are about to participate in a Market Research Activity on the perceived risk of second-hand motorbike buyers or prospective. Your participation is purely voluntary and at any time you have the choice to opt out of this activity.*

For each of the following statements, please indicate your score ratings from 1 to 5, using the following

1	2	3	4	5
Disagree strongly	*Disagree slightly*	*Neutral*	*Agree slightly*	*Agree strongly*

Please indicate your score ratings for each statement by placing the appropriate score in the line following that question.

1. Second-hand motorbike would fail to start to my expectation...

2. Second-hand motorbike would have pick-up problem...

3. Using second-hand motorbikes will cause danger to my safety..

4. Using second-hand motorbike will bring more accidents..

5. I would incur high maintenance costs if I buy second-hand motorbikes......................................

6. I would not get right 'value for money' while buying second-hand motorbikes.......................

7. If I buy second-hand motorbikes, my relatives would think differently of me...........................

8. If I buy second-hand motorbikes, my friends would think differently of me.............................

9. The thought of second-hand motorbike buying, makes me feel uncomfortable.........................

10. I would be embarrassed to lend my second-hand motorbike to my friends...............................

11. It's much time consuming to buy a second-hand motorbike..

12. I would have to spend more time if I need to replace my second-hand motorbike...................

Age: _____   **Gender:** Male / Female / Others

Address: _____

Occupation: 1. Business Person   2. Job Holder   3. Student   4.Others

Education: 1. Up-to Higher Secondary Degree   2. Bachelors Degree
                3. Masters Degree and above

Income Level (except students):
1. < NPR 25,000 per month   2. NPR 25,000 to 50,000 per month   3. > NPR 50,000 per month

<<< Thank you very much for taking the time to help us with our study>>>

PREVALENCE AND FACTORS ASSOCIATED WITH OBESITY AMONG ELDERLY WOMEN

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Abstract: *Although many researches has been carried out within or outside the country regarding the prevalence of and the factors associated to obesity with target group like adult women and adolescent girls, elderly women still remain insufficiently studied. And no such documentation has been reported yet. So, this research was carried out to determine the prevalence and the factors associated with obesity among elderly women of Ward no 5 of Biratnagar Sub-Metropolitan City, Morang, Nepal. It was a community based, analytical, cross-sectional study carried out among 106 elderly women aged 60 years and above, using lottery method, simple random sampling technique. Personal face-to-face interviews and semi-structured questionnaire were used to collect data. The BMI was calculated by using the formula: weight in kg/height in m². The obtained data was entered, processed and analyzed using SPSS version 16. The prevalence of underweight, normal weight, overweight and obesity among elderly women was found to be 2.8%, 38.7%, 47.2 and 11.3% respectively and was not associated with factors like family history, consumption of fast food, life style pattern, physical activity and use of medications. But descriptive statistics showed that people having family history of obesity are at risk of getting it. In addition to that doing exercise or involvement in physical activity can help reducing obesity. Therefore, various awareness campaigns should be carried to target the elderly population for the creation of healthy habits so that they can maintain their weight.*

Keywords: *Body mass index, elderly women, factors, obesity, occurrence.*

Introduction

Obesity is an epidemic of the 21st century and is a major risk factor for many other metabolic disorders. These days, it has achieved considerable attention as a major health hazard. The Body Mass Index (BMI) is a simple index of weight-for-height commonly used to classify overweight and obesity in a person. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). The WHO and National Institutes of Health (NIH) have defined a BMI greater than or equal to 25 kg/m^2 as overweight and BMI greater than or equal to 30.0 kg/m^2 as obesity (WHO, 2013).

Currently, 7% of the world's population is over 65 years of age. By 2000, the prevalence of obesity among people aged 50-69 years had increased to 22.9%, and for those above 70 years of age to by 15%, representing the increase of 56% and 36% respectively, since 1991 (Villareal *et al*., 2005).

The prevalence of obesity in the United States is increasing in all age groups. During the past 30 years, the proportion of older adults who were obese has been doubled (Patterson *et al.* 2004). In US, the obesity figure is projected to rise from current 12% to 20% by 2030 (Yan *et al.*, 2004). These substantial increases among older people suggest that obesity among older Americans is likely to become a greater problem in the future (Center on an Aging Society, 2003). Moreover, as the aging population increases in number, so too will the number of chronic illnesses, which often accompany aging, increases in the society (Flood & Newman, 2007). Chronic conditions such as arthritis, diabetes, hypertension, and heart diseases, are among some of the most common, debilitating and costly chronic conditions in older adults. Another study also suggests that obesity increases the aged individual's susceptibility to disability and poor health outcomes such as arthritis, stroke and diabetes (Reynolds *et al.*, 2005). Obesity leads to adverse metabolic effects on blood pressure, cholesterol, triglycerides, and insulin resistance. Risk of coronary heart disease, ischaemic stroke and type 2 diabetes mellitus increases steadily with increasing BMI. Raised BMI also increases the risk of cancer of the breast, colon, prostate, endometrial, kidney and gall bladder ("Obesity," 2014). Even if obesity remains stable until the year 2030, the number of diabetes cases is estimated to be more than double worldwide with the greatest risk in people aged 65 years and older (Wild *et al.*, 2004). Simply stated, obese elderly individuals are more likely to become disabled and will live a larger portion of their remaining years with a chronic condition, reducing their quality of life and adding to the public health care burden.

In most of the Asian countries, the prevalence of obesity has increased by many folds in the past few decades and the magnitude varies between the countries. The South East Asian Region (SEAR) and Western Pacific are currently facing an epidemic of diseases associated with obesity such as diabetes and cardiovascular diseases. The prevalence of obesity in SEAR Regions of WHO is 3% with highest 7.8% in Thailand, 5% each in India and China (WHO, 2013). Findings from a study of India showed that obesity was more prevalent among the urban and high socio-economic status groups, especially among women.

A study of 14,425 subjects in Nepal found that 32% were obese, 28% were overweight, 6.3% were diabetic and 34% had hypertension. Prevalence was higher in the less educated, those working at home and women (Sharma *et al.*, 2011). Nepal is one of the low and middle income countries hit with both infectious disease burdened with rising incidences of non-communicable disease frequently characterized by obesity. The low health literacy rates complicate strategies to address the challenge (Vaidya *et al.*, 2011). According to findings from the WHO MONICA project, women generally have higher rates of obesity than men. Many other studies have also shown that the prevalence of obesity among women was higher than men. In the WHO

regions for Africa, Eastern Mediterranean and South East Asia, women had roughly doubled the obesity prevalence of men. In low and lower middle income countries, obesity among women was approximately double than men (Obesity, 2014). Himes (2000) found that older men are less likely than older women to be obese. Obesity has been linked to a variety of factors.

No surveys or researches regarding the prevalence and the factors associated to obesity among elderly women of Biratnagar Sub-Metropolitan City have been documented yet. Therefore, this study intends to determine the prevalence and factors associated to obesity among elderly women of Ward no 5 of Biratnagar Sub-Metropolitan City, Morang, Nepal. This study further aims to be significant on providing information related to obesity for the program planners, policymakers and future researchers.

Methods

A community based, analytical cross-sectional study was carried out over a period of 14 days from 17th to 30th October 2013 in order to determine the prelaence and factors associated with obesity of elderly women in Ward no. 5 (out of 22 wards) of Biratnagar Sub-Metropolitan City, Morang district, an eastern district of Nepal. The study population was the elderly women aged 60 years and above. The elderly women aged 60 years and above residing in Ward no. 5 of Biratnagar Sub-metropolitan City were selected as the study population. The seriously ill women, women reluctant to participate in the study and women below 60 years of age were excluded from the study.

The study area was selected purposively. By using the formula, $n = z^2 pq/d^2$ the sample size was calculated where, n= sample size, z= reliability coefficient (1.96 at 95% confidence interval), d= precision of desired level (10%) p= prevalence rate = 50%. The total sample size was 106 including 10% methodological error. For the selection of the respondents, a complete list of elderly women of Ward no. 5 was taken from Biratnagar Sub-Metropolitan City. After that 396 small slips were made of respondents and kept in a box. Then that box was shaken and altogether 106 samples were drawn from that box without replacement method and procedure was stopped after the required sample size was met. So, the respondents were selected by using the lottery method, simple random sampling technique until the desired sample size was met. A semi-structured questionnaire consisting of socio-demographic characteristics, family history, food consumption habits, lifestyles, physical activity, smoking, use of medication and pre-existing medical conditions was developed. Then after the development of questionnaire, pre-testing was done among 10 elderly women of Ward no. 3 of Imadol VDC, Lalitpur district. During pre-testing no any significant changes were seen. So, the final version of questionnaire was made, translated into

Nepali language in order to enhance the validity and used for data collection. Then, the personal face-to-face interview technique was used to collect the information from the field.

The BMI was calculated by using the formula: weight in kg/height in m^2. While calculating BMI following things were considered; a) Standing height was measured with the respondents in barefoot, back square against the wall and eyes looking straight ahead using the measuring tape, b) Weight was measured in light clothing without shoes using the new weighing scale. The weighing scale was standardized to 0 before each use. Then the data was collected by the co-author herself for maintaining the reliability of the measurements. Prior to start u p of data collection process, ethical clearance was obtained from Institutional Review Committee (IRC)/ Stupa Health Care Cooperative Limited under Nepal Health Research Council after submitting a copy of research proposal. In addition to that written permission was also taken from Biratnagar Sub-metropolitan Office. The respondents were oriented about the purpose and objectives of the study and verbal consent was taken from each of the respondent before data collection. The respondents were further assured about the use of the information to this study only. The respondent's willingness of not participating in the data collection process was respected and any kind of physical and psychological harm was not caused to them. Also the respondents were not forced to participate unwilling in the study. All of the respondents participated well in the study. As a result, non-response rate and withdrawal rate was found to be zero.

The obtained data was edited daily at home and coding of the independent as well as dependent variables was done. After that, data was entered into Statistical Package for Social Sciences (SPSS) version 16 and analysis was done by using simple descriptive statistics like percentage, frequency, p-value and Chi-square value. The p-value less than 0.05 (5% level of significance) were considered to be statistically significant. Then the findings of the study were presented through academic table.

Results

Out of 106 respondents, 37.8% belonged to middle old category, 31.1% each belong to young old and old old categories. The mean age of elderly women was 70.4 years with standard deviation of 9.0 years. Majority of the respondents (97.2%) were Hindus. More than half of the respondents were (51.9%) were married followed by widowed with 47.2%. Majority of the respondents were housewife (91.5%). Among 106 respondents, 63.2% were illiterate and 36.8% were literate. The respondent who have primary, secondary and bachelors and above education accounted for 95.0%, 2.5% and 2.5% respectively (Table 1).

Out of total respondent, 38.7% belonged to normal range, 47.2% of respondents were overweight, 11.3% were obese and remaining 2.8% were underweight. This study showed that the prevalence of overweight and obesity among elderly women

was found to be 47.2% and 11.3% respectively. While the respondent's Body Mass Index (BMI) range was ranged from 16.8 to 40.0 with mean BMI and standard deviation of 25.2 and 3.9 (Table 2).

Among 106 respondents, 17% had a family history of obesity. Out of 10 obese respondents almost 50% had a family history of obesity and among them majority i.e. 60% of the respondents' sons were obese. When they were asked about the types of food they consumed, 65.1% of them answered that they were vegetarian by diet and 34.9% of them answered that they consume both vegetarian as well as non-vegetarian foods. Out of 106 respondents, 93.4%, 83.0% and 67.9% used to include vegetables, fruits and fried items two times in their daily meal plan. Similarly, 93.4% of the respondents did not consume fast foods. Majority of the respondents (81.1%) had a sedentary life style (but doing household works) and 18.9% had a non-sedentary life style. Almost 42.5%, 33.0% and 24.5% of elderly women used to spend three to four hours, one to two hours and more than five hours time by sitting without any purpose.

Regarding exercise habits of the respondents, 64.2% used to do some sorts of exercise. Minority of the respondents (6.6%) admitted that they smoke when they were asked about their smoking habit. Among smokers (7), 42.9% used to smoke three times a day while 28.5% smoked more than three times a day and remaining 28.6% smoked one to two times a day. Likewise, 42.9% and 42.9% of smokers used to consume three to four cigarettes per day and one to two cigarettes per day. More than half of the respondents (53.8%) did not use any kinds of medications. When 106 elderly women were asked about the presence of any pre-existing medical conditions in them, majority (80.2%) replied of not having any kind of diseases while 18.9% had diabetes mellitus and 0.9% had hyperthyroidism (Table 3).

In order to examine the association between different factors related to obesity and occurrence of obesity among the respondents, the Pearson Chi Square (χ^2) test was performed at degree of freedom of 1 in 5% level of significance. Exactly 22.2% of respondents who had family history of obesity had occurrence of obesity whereas 9.1% of elderly women having no family history of obesity had occurrence of obesity which indicates that family history can be linked to occurrence of obesity. But, significant association was not shown (Fisher's Exact Value= 0.119) between respondents having family history of obesity and occurrence of obesity. No significant relationship was established between consumption of fast foods and obesity of respondents) Fisher's Exact Value = 0.580). That means fast foods consumption does not have any effect for the occurrence of obesity. Among total respondents, 14% who had sedentary lifestyle had obesity while none of the respondents adopting non-sedentary lifestyle had obesity. But Fisher's Exact Value (0.117) shows that there is no significant difference between occurrence of obesity and sedentary and non-sedentary

lifestyle of the elderly women. Out of 106 respondents, 7.4% of respondents performing physical activity (exercise) had obesity instead of occurrence of obesity among 18.4% of respondents not doing any physical activity. This figure shows that occurrence of obesity is more than double among respondents not doing any physical activity when compared with the elderly women doing exercises. However, the Fisher's Exact Value of 0.112 indicates no significant difference between physical activity and occurrence of obesity among respondents.

Out of 106 respondents, 16.3% of respondents using any kinds of medications had obesity instead of 7.0% of respondents having obesity among non-users of medicines. This figure shows that occurrence of obesity is more than double among respondents using medications than that of medication non-users. But, the Chi-Square p-value of 0.132 indicates no significant difference between use of medications and occurrence of obesity among respondents (Table 4).

Table 1. Socio-demographic characteristics of the respondents

(Age categories, completed age in years)	Frequency (n=106)	Percent
Young old (55-64 years)	33	31.1
Middle old (65-74 years)	40	37.8
Old old (75 years and above)	33	31.1
Religion		
Hindu	103	97.2
Muslim	2	1.9
Others (Specify)	1	0.9
Marital Status		
Married	55	51.9
Widowed	50	47.2
Separated	1	0.9
Main Occupation		
Agriculture	8	7.5
Business	1	1.0
Housewife	97	91.5
Educational Status		
Literate	39	36.8
Illiterate	67	63.2
If literate, (n=39)		
Primary	37	95.0
Secondary	1	2.5
Bachelors and above	1	2.5

Table 2. BMI classification and prevalence of obesity of the respondents

BMI Categories	Frequency (n=106)	Percent
Underweight (<18.50)	3	2.8
Normal range (18.50-24.99)	41	38.7
Overweight (25.0-29.99)	50	47.2
Obese (>=30.0)	12	11.3
Occurrence of obesity		
Yes	12	11.3
No	94	88.7

Table 3. Information related to factors associated to obesity

Family history of obesity	Frequency (n=106)	Percent
Yes	18	17.0
No	88	83.0
Consumption of fast foods		
Yes	7	6.6
No	99	93.4
Life style pattern		
Sedentary	86	81.1
Non-sedentary	20	18.9
Physical activity		
Yes	68	64.2
No	38	35.8
Smoking Status		
Yes	7	6.6
No	99	93.4
Use of medications		
Yes	49	46.2
No	57	53.8

Table 4: Association between factors associated to obesity and occurrence of obesity

Factors associated to obesity	Occurrence of obesity		Chi-square value	P-value
	Yes	No		
Family history				
Yes (%)	4 (22.2)	14 (77.8)	—	0.119
No (%)	8 (9.1)	80 (90.9)		
Consumption of fast food				
Yes (%)	1 (14.3)	6 (85.7)	—	0.580
No (%)	11 (11.1)	88 (88.9)		
Life style pattern				
Sedentary	12 (14)	74 (86)	—	0.117
Non-sedentary	0 (0.0)	20 (100)		
Physical activity				
Yes (%)	5 (7.4)	63 (92.6)	—	0.112
No (%)	7 (18.4)	31 (81.6)		
Use of medications				
Yes (%)	8 (16.3)	41 (83.7)	2.274	0.132
No (%)	4 (7.0)	53 (93.0)		

** Fisher Exact value is taken because one cell have expected count less than 5 and it is 2×2 contingency table

Discussion

According to this study, 38.7% of respondents had BMI within normal range (18.50 to 24.99), 47.2% of respondents had BMI within range of 25.0 to 29.99, indicating overweight, 11.3% of respondents had BMI greater than or equal to 30 categorizing them as obese people and remaining 2.8% were regarded as underweight having BMI less than 18.50. But a study conducted by Sharma *et al*. (2011) showed dissimilar findings than this study with 10.6% people as underweight (BMI<18.50), 28.2% as overweight (BMI=22-24.99) and 32.5% as obese (BMI > 25). Perhaps this may be due to difference in BMI classification index as well as different study subjects. In this study overweight and obese people was found to be more than a study conducted by Shahi *et al.* (2013) and Vaidya *et al*. (2006). The prevalence of obesity in the present study is slightly less than the statistics of WHO, 2008 (14% of women in the world being obese (BMI ≥30 kg/m2) (Obesity, 2014). This may be due to the fact that obesity increases as the age increases.

In this study, 22.2% of respondents who had family history of obesity had occurrence of obesity whereas 9.1% of elderly women having no family history of obesity had occurrence of obesity which indicates that family history can be linked to occurrence of obesity. But "Genetic Factors," 2014, have shown that obesity risk is two

to eight times higher for a person with a family history as opposed to a person with no family history of obesity, and an even higher risk is observed in cases of severe obesity. But, significant association was not shown (Fisher's Exact Value= 0.119) in the present study between respondents having family history of obesity and occurrence of obesity.

This study showed that majority of the respondents (81.1%) had a sedentary life style bearing physically inactive life which is also supported by the statistics of the present study also like 42.5%, 33.0% and 24.5% of elderly women used to spend three to four hours, one to two hours and more than five hours time by sitting without any purpose. Among respondents, 7.4% of respondents performing physical activity (exercise) had obesity instead of occurrence of obesity among18.4% of respondents not doing any physical activity. However, the Fisher's Exact Value of 0.112 indicates no significant difference between physical activity and occurrence of obesity. While a study carried out by Vaidya *et al.*, 2006 showed that physical inactivity is more importantly associated with obesity in the older population.

In this study, minority of the respondents (6.6%) admitted that they do smoke when they were asked about their current smoking habit. This may be because of the fact that in Nepal women are culturally reluctant to adopt and share smoking habit openly. Out of 106 respondents, 16.3% of respondents using any kinds of medications had obesity instead of 7.0% of respondents having obesity among non-users of medicines. This figure shows that occurrence of obesity is more than double among respondents using medications than that of medication non-users. But, the Chi-Square p-value of 0.132 indicates no significant difference between use of medications and occurrence of obesity among respondents. Thus it can be stated that whether the respondents use medications or not, it does not influence has any influence on obesity.

Conclusion

From this study it can be concluded that the prevalence of underweight, normal weight, overweight and obesity among elderly women was found to be 2.8%, 38.7%, 47.2 and 11.3% respectively and was not associated with factors like family history, consumption of fast food, life style pattern, physical activity and use of medications. But descriptive statistics showed that people having family history of obesity are at risk of getting it. In addition to that doing exercise or involvement in physical activity can help in reduction of obesity.

Finally it is recommended to conduct various awareness campaigns to reduce the existing high prevalence of overweight and obesity in the elderly population which in turns help in the prevention of the occurrence of various non-communicable diseases and their complications. Moreover, further researches should be carried out in a large

scale so that the association of obesity with various contributing factors can well understand and established.

Limitation

None of the factors associated with obesity were found to be statistically significant even though the descriptive analysis supported it. This could be because of smaller sample size. Moreover, this study was limited to only one ward of Biratnagar Sub-Metropolitan City, Morang district. Therefore, the findings obtained from this study may lack generalizability; similar study should be carried out covering all the wards of Biratnagar Sub-metropolitan City, Morang district.

Acknowledgements

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KNOWLEDGE AND ATTITUDE ON THE PREVENTION OF SWINE FLU A (H1N1) AMONG NURSING STUDENTS IN POKHARA

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Abstract: *The purpose of the study was to examine the knowledge and attitude on the prevention of Swine Flu among nursing students. A cross sectional descriptive exploratory research design was adopted for the study. A total of 296 PCL nursing students from four private nursing colleges in Pokhara were included in this study. Nursing colleges were selected by using probability simple random sampling technique and students were selected by census method. Self administered questionnaire and five points Likert scales were used for data collection. The obtained data was entered in SPSS program version 16 and analyzed by using descriptive and statistic inferential. Study revealed that the mean knowledge score of respondents was 11.76 (SD=2.51).The majority (69.3%) of the respondents possessed an average level of knowledge regarding Swine Flu. Likewise, the mean score of the respondents' attitude was 41.91 (SD= 3.91). Majority (62.2%) of the respondents had neutral level of attitude toward the prevention of Swine Flu. The level of knowledge was significantly associated with the program year (p=.032) and level of attitude (p=0.017). Study concluded that PCL nursing students in Pokhara possessed an average knowledge and neutral attitude towards the prevention of Swine Flu. The nursing students needed to have better knowledge on Swine Flu to protect themselves, as well as others that they deal with in the hospital and the community. Based on the findings, it is recommended that an awareness programme on new emerging infectious diseases should be carried out on regular basis.*

Keywords: *Swine Flu (H1N1), knowledge, attitude, nursing students.*

Introduction

The new strain of influenza virus, H1N1, commonly known as "Swine Flu" appeared in Mexico and South-East Asia in April 2009 and soon spread to neighboring United States and Canada and then globally (WHO, 2010). Swine influenza is a highly contagious respiratory disease of pigs caused by one of several swine influenza viruses. Also known as pandemic influenza A/H1N1, it was first reported in 2009, and on 11th June, 2009 WHO officially declared a global pandemic of influenza A (H1N1) and designated the Swine Flu virus as "pandemic influenza A (H1N1) 2009" (WHO, 2011).

The five most affected nations were the United States, Russia, Turkey, China and India. Centre for Disease Control and Prevention (CDC, 2010) estimated 43 million to 89 million Americans were infected from Swine Flu between 2009 to 2010. Globally,

more than 214 countries reported laboratory-confirmed cases of Influenza A/H1N1 and the total number of death reached 18,449 up to August 2010 (WHO, 2011). In the Southeast Asia region, 10 out of 11 member countries had reported 41,513 cases of H1N1virus infection and 573 deaths. The three hardest hit countries in region were Thailand, India and Indonesia (Narain *et al.*, 2009). By January 2011, India had alone accounted for 46,412 cases of swine with 2,728 reported deaths (Malkar *et al.*, 2012**).**

Pandemic influenza A (H1N1) 2009 had posed a serious public health challenge world-wide. So that, Nepal had started laboratory diagnosis of Pandemic influenza A/H1N1 from mid June 2009 through active screening on febrile travelers with respiratory symptoms. The first case in Nepal was detected on June 21, 2009 among three people returning from the USA. Then on 29 June, introduction of the disease to the country was declared. Nepal had reported its first death due to Swine Flu on 28th December 2009 (Adhikari *et al.*, 2011).

In Nepal, a total of 221 people were infected and 4 death occurred between 2009 to 2010 (MOHP, 2011). Now again in 2014, Swine Flu has been detected in Nepal. Since January, six people died while 33 were infected with Influenza A/H1N1 (Gautam, 2014). Even after the declaration of the end of pandemic in 2010, there are still epidemics and sporadic cases reported from many parts of world. This shows that there is still lacunae left in the awareness among the people. Though the prevalence of Swine Flu is low in Nepal, Swine Flu A/H1N1 is highly contagious disease and viruses have the ability to change and mutate to a more virulent form and appear with new strains of influenza viruses which can spreads very quickly.

Nursing students are the key persons to provide care and render health related information to the patient, visitor, family and the community, not only during their study period but also when they work as health professionals in the future. If nursing students have adequate knowledge and positive attitude towards Swine Flu, they not only can give the information on how to prevent and take care if one gets infected with Swine Flu, but also protect themselves from the disease. Therefore, it is necessary to assess the existing level of knowledge and attitude of nursing students regarding Swine Flu prevention.

Methodology

A cross sectional descriptive exploratory research design was adopted to find out the knowledge and attitude on the prevention of Swine Flu among PCL nursing students. The study was conducted from September 2013 to July 2014.

Four private nursing colleges located in Pokhara were selected. They were Manipal College of Medical Science, Charak Academy, Padma Nursing Home School

of Nursing and Fewacity Institute of Medicine Sciences. Probability simple random sampling technique was used to select campuses and non-probability census method was used to select participants. A total of 296 students including PCL 2nd and 3rd year were included in the study.

Before proceeding for data collection, a written permission was obtained from the Institutional Review Board, Institute of Medicine Maharajgunj, Research Committee of Tribhuvan University, Institute of Medicine, Pokhara Campus and respective nursing colleges.

A verbal informed consent was obtained from all the subjects prior to data collection by explaining the purpose of the study. After obtaining the verbal consent, the researcher herself distributed the self-administered questionnaire to the respondents. They were individually asked to complete the questionnaire. Respondents filled up the questionnaire within 15-20 minutes; the researcher collected the questionnaires and checked for completeness. Anonymity was ensured by not requiring the respondents write their names in the questionnaire. The duration of data collection was 4 weeks.

The data was analyzed by using descriptive statistics in terms of frequency, percentage, mean and standard deviation. To identify the association between the knowledge and attitude, knowledge and programme year, a Chi-square test was used at the 0.05 level of significance.

Results

As shown in Table 1, above 82% of the respondents had knowledge of the meaning, mode of transmission, portal of entry and warning signs of the disease Swine Flu. Further, a majority of respondents knew about the causative agents (76.7%), clinical symptoms (77.4%), sample used for diagnosis (63.5%), choice of drugs (74.3%) and people at risk of Swine Flu (61.1%).

However, only 33.8 percent of the respondents knew how long H1N1 virus can survive outside the body; only 34.8% knew that RT-PCR was the most confirming diagnostic test for H1N1 virus; and only 33.1% knew that that the pneumonia could be the possible complication of untreated Swine Flu case.

Table 2 indicates that the mean knowledge score was 11.76 with standard deviation as 2.51. The majority (69.3%) of respondents had average knowledge level on Swine Flu; the knowledge level of 18.6% respondents was low and only 12.2% possessed high level of knowledge.

Table 1. Knowledge of respondents on the meaning, sign and symptoms, diagnosis and treatment of Swine Flu A (H1N1)

		n=296
*Item with Correct Response	**Frequency**	**Percent**
Meaning of Swine Flu as highly contagious respiratory disease.	293	99.0
Cause of Swine Flu is influenza type A.	187	63.2
Organism of Swine Flu is H1N1.	227	76.7
The duration for H1N1 organism to survive outside the body as 2 hour	100	33.8
Most common mode of transmission of Swine Flu is the droplet infection.	252	85.1
The route through which Swine Flu virus easily enter into human body as eye, nose and mouth.	252	85.1
Person have higher risk for Swine Flu as those who interact with infected person.	181	61.1
Major symptoms of Swine Flu are fever, cough and sore throat.	229	77.4
Major warning signs of worsening of Swine Flu are high fever, shortness of breath and persistent vomiting.	244	82.4
The sample commonly used in laboratory test to diagnose Swine Flu is nasopharyngeal swab.	188	63.5
Most confirmative diagnostic test for Swine Flu virus is RT-PCR.	103	34.8
Most common complication of untreated Swine Flu is pneumonia.	98	33.1
The choice of drugs used to treat Swine Flu is Tamiflu.	220	74.3

*Multiple Choices

Table 2. Knowledge level of respondents on Swine Flu

		n=296
Level of Knowledge	**Frequency**	**Percentage**
High > (Mean + SD)	36	12.2
Average (Mean-SD to Mean + SD)	205	69.3
Low < (Mean-SD)	55	18.6

Mean± SD, 11.76±2.51

Table 3. Respondents attitude on prevention of Swine Flu

n=296

Description	Responses		
	Disagree	**Neutral**	**Agree**
	No (%)	**No (%)**	**No (%)**
There is no risk to have Swine Flu infection for those who work in a pig farm+=.	257 (86.8)	14 (4.7)	25 (8.4)
Hand washing and using face mask is one of the most important preventive measures for Swine Flu.	13 (4.3)	6 (2.0)	277 (93.5)
The person infected with Swine Flu should be cared by all the members of the family+=.	43 (14.5)	83 (28.0)	170 (57.4)
Swine Flu in humans can not be cured	222 (75)	53 (17.9)	69 (23.3)
Contaminated things of Swine Flu infected person such as handkerchief, towel and clothing can spread Swine Flu in human.	17 (5.7)	13 (4.4)	266 (89.8)
It is the responsibility of everyone to control the epidemic of Swine Flu in the community.	27 (9.1)	3 (1.0)	266 (89.8)
Soiled material secreted from infected person with Swine Flu should be buried properly.	36 (12.1)	32 10.8)	228 (77.0)
Complication from Swine Flu could be fatal.	48 (16.2)	89 (30)	159 (53.7)
Isolation is not necessary for a patient infected with Swine Flu. +=	262 (88.6)	17 (5.7)	17 (5.7)
Child with Swine Flu infection should not breast feed. +=	170 (57.4)	83 (28)	43 (14.5)
Patient with Swine Flu infection can be treated at home like seasonal influenza such as common cold.	233 (78.7)	25 (8.4)	38 (12.8)
Swine Flu infected person can go any common place without mask. +=	274 (92.5)	8 (2.7)	14 (4.7)

+= Negative items   *The categories "disagree" and "agree" include "strongly" responses

Table 3 shows that the number and percentage of respondents' attitude towards each items. In terms of positive items, majority (93.5%) of respondents agreed with statement that hand washing and using face mask is one of the most important preventive measures for Swine Flu. Only 12.8 percent agreed that patient with Swine Flu infection can be treated at home like of seasonal influenza such as common cold.

Conversely, in terms of negative items, the highest (92.5%) of respondent disagreed with statement that Swine Flu infected person can go any common place without mask. Only, 14.5 percent of respondents disagreed with the statement that the person infected with Swine Flu should be cared by all the members of the family.

Table 4. Respondents level of attitude on prevention of Swine Flu

		n=296
Attitude Level	**Frequency**	**Percentage**
Negative (< Mean-SD)	58	19.6
Neutral (Mean -SD to Mean+ SD)	184	62.2
Positive (>Mean+ SD)	54	18.2

Mean± SD, 41.91±3.91

Table 4 shows that the mean value of attitude score was 41.91 with standard deviation as 3.91. Majority (62.2%) of the respondents had neutral attitude, and only 18.2% had positive attitude toward prevention of the Swine Flu.

This study found that the PCL nursing students in selected colleges in Pokhara have the average knowledge and neutral attitude on the prevention of Swine Flu. It may be due to the prevalence of Swine Flu in Pokhara is very rare. So the study population did not have much exposure with Swine Flu infected patient whatever knowledge they have on Swine Flu, although they were exposed to news.

Discussion

The study showed that the mean score on knowledge on Swine Flu was 11.76 (SD=2.51). The findings from the present study indicated that majority (69.3%) of respondents had an average knowledge level and only 18.6 percent scored low on knowledge score where 20 is the best score. This finding was consistent with findings observed in previous studies Brar (2012) in which, 77.5% had average knowledge and 25% had poor knowledge, Zairina *et al.* (2011), 60.2 percent of respondents attained "adequate knowledge."

As regards to attitude, the mean score on the respondent attitude towards the prevention of Swine Flu was 41.91 (SD=3.91) with score that could range from 12 to 60. It suggests that majority (62.2%) of the respondents had neutral attitude towards the prevention of Swine Flu. In a study it was also found that more than 50 percent of respondent had positive attitude towards the Swine Flu (Singh *et al.*, 2012) which was almost similar with present study.

Conclusion

Knowledge is a significant factor to influence the attitudes and practices during a pandemic. The large portion of PCL nursing students in Pokhara have the average knowledge and neutral attitude on the prevention of Swine Flu. This report also shows that nursing students in Pokhara have average knowledge about the

identification and management of Swine Flu cases, but this is not enough. Since, nurses and nursing students have been identified as the priority group whose preparedness is a critical element in the response to the any pandemic situation, they must possess knowledge to protect themselves as well as others. This finding further supports the importance of conducting educational and awareness campaigns.

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NEPAL'S MILITARY RELATIONS WITH CHINA AND INDIA: DIMENSIONS AND PERSPECTIVES

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Abstract: *Historically, Nepal fought wars with the British East-India Company, Tibet, and China. However, the military relationship, since the conclusion of those wars, has unfolded in a friendly terms. This article explores the contours of two-decade. An analysis of historical relationship reveals that Nepal has always tried to maintain friendly military relationship with China and India. As such, the relationship has been based on Nepal's geo-political position and diplomatic norms. Drawing upon various literatures, this article concludes that given the geo-strategic location of Nepal, it is imperative to further strengthen the mutual relationship and widen the areas of military cooperation, as per the policy objectives envisioned by other instruments of national power. This would help Nepal extract benefits from the economic and military rise of China and India.*

Keywords: *Military relations, security cooperation, training, military aid.*

Introduction

Geo-strategically located between China and India, Nepal has always maintained a balanced relationship with both of them. Though, Nepal fought wars with the British East-India Company, Tibet, and China, the dynamics of military relationship has unfolded in friendly terms. Over the years, the military relationship is facilitated with a range of activities: exchange of military visits, military aid and logistic support, joint exercises, and exchange of training programs with China and India. Moreover, the maintenance of a balanced military relation with there neighbours has remained a key factor in shaping Nepal's foreign policy.

"The successful management of foreign policy requires the conscious integration of force and diplomacy" (Nathan, 2002, p. vii-viii). Nepal's military comprising approximately 96,000 is centrally remains between the two emerging powers of Asia: China with an active military strength of 2.2 million, and India 1.4 million (GFP, 27 March 2014; see also US Department of State, 2010). Besides the strength, and quality of force, standard of diplomatic engagement bears an overarching significance in maintaining friendly military relations and reducing differences with her neighbors. After the conclusion of Anglo-Nepal war, 1814-16 and war with Tibet in 1855, Nepal appears to have no major differences in military relationship with them. In the current political milieu, it is quintessential to strengthen relationship and widen areas of military cooperation as well as to provide a focused attention on how best it can benefit from the military and economic rise of its two powerful immediate neighbours.

Drawing on various literatures, mostly secondary, this paper attempts to provide a descriptive analysis of Nepal's military relations with China and India. This study will appeal to policy-makers, political elites, soldier and scholars, students of international relations and political science, and those interested to dwell upon Nepal's relationship with China and India. Military relationship only after the Anglo-Nepal war and First Nepal-Tibet war is considered under the study, as significant development in Nepal's diplomatic-political front began after these events.

Military relations with China

1788 to 1856: Period of friction

A definite pattern of interaction in military affairs with China appears to have gradually emerged after the series of wars: first Nepal-Tibet war of 1788-89, Nepal-Tibet-China war of 1791-92, and Nepal-Tibet war of 1856. The first Nepal-Tibet war originated mainly due to the worsening of Nepal-Tibet relations over the questions of currency, trans-Himalayan trade, and internal conflict in Tibet vis-à-vis Nepal's drive for outward expansion (Manandhar, 1999). Nepalese forces invaded Tibet in 1788; "advanced from Kuti to Sokhar Jong and from Kerung to Jhungang and reached two strategic towns deep inside Tibet" (Bhattarai, 2010, p. 92). A treaty signed at Kerung on 19 July 1789 ended the war (Bhattarai, 2010). As a result, Nepal started sending a Naikya[1] at Lhasa, and the places occupied by Nepalese forces were vacated.

The Nepal-Tibet-China war, 1791-92, erupted when Nepal invaded Tibet, as some of the agreements of 1789 were violated by Tibet. The Nepalese forces defeated the Tibetan forces at the Tibetan town of Dirgacha, and forced them to retreat (Sharma *et al.*, 1992). Once the Nepalese forces came back to Nepal, the Tibetan Lamas and Chinese residents at Tibet complained to the Chinese Emperor about the Nepalese invasion, and they sought military help from China. Consequently, the Chinese army invaded Nepal, and a war was fought, where Nepalese forces were able to re-capture some of the strategic points occupied by Chinese forces (Nepalese Army, 2008).

Rose and Scholz (1980) posit that "Kathmandu appealed to the British for military assistance" (p. 119). However, no evidence supports such assistance. In a Treaty concluded on 5 October 1792, Nepal and China agreed that, "If Nepal be ever invaded by a foreign power, China would not fail to help her" (Jain, 1981, p. 281). Chinese Army withdrew after the treaty and Nepalese forces helped them for carrying supplies needed on their way back home to the border (Bhattarai, 2010). Both the wars, 1789 and 1791, were largely the result of the Tibetan unwillingness to come to any reasonable settlement with Nepal, unified under King Prithvi Narayan Shah (Sharma, 1986).

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1 Naikya was normally a low-ranking civil or military title of Nepal's Government during that period.

In 1855, Nepal again declared war against Tibet, when Nepal's request to return the territories captured in 1791-92 war, and trade-related issues within the 1792 Treaty framework were ignored by Tibet. With a Treaty signed on 24 March 1856, peace was finally restored, which provided the basis for Nepal-Tibet relations for the next century (Rowland, 1967). The cooperation regarding the hand-over of the captured personnel to each other and withdrawal of troops, upgrading the rank of military or civil mission[2] from Nepal to Lhasa, and extradition were the main features of the Treaty (Jain, 1981).

Framework of relationship since 1857

Between 1857 and 1954, there was neither a military threat perceived from China, nor a significant military relationship was developed, and this might have been due to Nepal's closer relations, through diplomatic and military instrument, with the British Raj[3] and their increased dominance in the Indian sub-continent.

Nepal's relationship with China developed in a new setting mainly brought by the political landscape of China after Mao's rise in 1949 and the political change in Nepal in 1951 as well the end of British Raj and independence of India in 1947. Since 1955, Nepal's military relation with China has been guided by the diplomatic relations, established on 20 September 1955, based on "five principles" (Jain, 1981, p. 287-88). Three principles– mutual respect for each other's territorial integrity and sovereignty, non-aggression, and peaceful co-existence– remained as a common framework to maintain and develop military relations. The Treaty of Peace and Friendship signed in 1960 between Nepal and China provided continuity to those previous principles and strengthened diplomatic ties, which largely contributed to maintaining friendly military relationship since then.

Military relations with India

Period of crisis to normalcy: 1814 to 1950

Though Nepal thwarted the move of British East India Company's forces at the historic Battle of Sindhuli in 1767[4], war broke out and they met again at Nalapani in

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2   Article Five of the Treaty provisioned high-ranking civil or military officers, Bharadar, under the Government of Nepal, to be stationed at Lhasa, instead of Naikya.

3   The meaning of the British Raj is "the British-Indian Empire"–eventually known as the "Raj" (Hindi and Sanskrit for rule, or government). Stephen, P. C. (2001). *India: Emerging Power.* Washington, DC: Brookings Institution Press.

4   Nepal encountered invading British East India Company's force at Pauwa Gadhi of Sindhuli in 1767 during King Prithvi Narayan Shah's unification campaign. A powerful Military Expedition Team under Captain Kinloch along with his 2,400 soldiers started from Patna to Panauti, 307 Kilometers, in order to support King Jaya Prakash Malla of Kathmandu, who requested military assistance from British to contain the Gorkhalis' expansion. Kinloch met with Gorkhali forces at Pauwa Gadhi with a severe blow that made them not to turn their eyes toward Nepal until 1814.

1814 during the Anglo-Nepal War. One of the principal reasons of the outbreak of war was the border tension between Nepal and British East India Company, and Nepal's drive for westward expansion vis-à-vis Company's strong desire to capture territories occupied by Nepal to open up a secure trade link to Tibet. Despite causing significant attrition and damage to Company's forces, impeding their ultimate strategic design, and disrupting immediate plan, Nepalese forces withdrew, mainly due to the lack of extended logistic support and modern weapons systems as compared to the company forces.

Rose and Scholz (1980) assert, "During the war, Nepal sought both material and political assistance from the Chinese government; however, no such assistance has been reported" (p. 119). The war concluded with the Treaty of Sugauli signed on 4 March 1816 (Subedi, 2005). The Treaty appears to have created an obligation, on the part of Nepal, to align with the British Raj. Moreover, it paved the way to open up and strengthen relationship at various fronts. Nepal's extensive interaction with India began after the conclusion of that war.

The recruitment of Nepalese in Gurkha Regiments (GR) was also an outcome of the war. It first started in 1815, and the ownership divided between the British and Indian Army during the partition of India in 1947. Following a Tripartite Agreement signed in November 1947 between the British, India, and Nepal, "GR 2, 6, 7, and 10 went to the British and 1, 3, 4, 5, and 9 to India" (Mehta, 2004, p. 89). This recruitment tradition continues to date and has been considered as a source of attachment in their relationship.

Military relations were strengthened, when Nepal cooperated with the British Raj, as and when requested, by providing troops, in suppressing the Indian Mutiny in 1857, taking part the First World War, suppressing the revolt in Waziristan in 1917, and the Afghan war in 1919 (Nepalese Army, 2008). During the First World War, the government of Nepal assisted in obtaining 55,000 recruits for the Gurkha Regiments of the British Indian Army, and sending some 18,000 of Nepal's own troops to India (Whelpton, 2005). "Including the Nepalese in other units such as the military police in Burma, around 100,000 was involved in the war effort, with at least 10,000 killed and another 14,000 wounded or missing" (Whelpton, 2005, p. 64). Moreover, it is reported that, "almost 200,000 Nepalese troops participated in the First World War, as a part of the British Indian Army" (Nepalese Army, 2008, p. 30).

The 1923 Treaty of Friendship concluded between Nepal and the Great Britain provisioned the sharing of information on mutual security of each other. The Article four of the Treaty states, "…will use all such measures as it may deem practicable to prevent its territories being used for purposes inimical to the security of the other" (Subedi, 2005, p. 189). Yet, one another significant features of the Treaty was that, it

allowed Nepal to procure military hardware from other countries, and such provision was not mentioned in the previous treaties (Subedi, 2005). The reasons to create such arrangement with Nepal might have emerged by realizing the necessity of equipping Nepalese troops to enhance its capabilities and compatibility so that they can work with British troops in future conflicts.

On the outbreak of the Second World War in 1939, Nepal extended support to Britain immediately, as it did during the First World War (Whelpton, 2005). A bilateral Treaty was concluded between Nepal and the Great Britain about the mobilization of Nepalese troops, and during this war, 18 Nepalese Battalions were deployed (Nepalese Army, 2008, p. 33). Whelpton (2005) describes, "Three Nepalese Battalions actually fought as part of the Fourteenth Army in Burma under General Slim and perhaps another 200,000 Nepalese served with British India Gurkha units" (p. 67). The Great Britain, realizing an increasing need of dependable and valiant Gurkha soldiers, might have extended close cooperation with Nepal, and another may be due to the situation created by the political upheaval in China–Mao's posture towards the year 1940s,[5] and its impact on the design of the British Raj.

During the period of Rana Regime, 1846-1950, Nepal and its military worked closely with the British Raj, and it appears to have accommodated itself in the best possible terms in the quest of its survival. Nepal's Prime Minister and Supreme Commander-in-Chief, Padam Shamsher Jung Bahadur Rana, welcomed the proposal of India to maintain the recruitment of Gurkha soldiers in the newly founded Indian Army, after the independence of India in 1947 (Mehta, 2004). The relationship strengthened when Nepal's government provided troops, on request of India, to help maintain law and order in 1949 while Indian forces revolted against the ruler of the former princely state of Hyderabad (Whelpton, 2005).

Relationship entered into a new direction: Since 1950

The end of British Raj and the Independence of India followed by the partition of India in 1947, and end of 104 years of Rana Regime bringing political change in Nepal in 1950 shaped Nepal-India relations into a new direction. The 1950 Treaty of Peace and Friendship between Nepal and India provisioned to work jointly on the mutual security of both the countries (Subedi, 2005). Such a provision itself almost denounced the possibility of evolving into conflict between them.

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5   Mao Tse-tung issued a statement in December 1939, at the time, when his revolution was gaining height; it communique might have threatened the interest of dominant power, British Raj, in the Indian Sub-continent. His states, "In defeating China in war, the imperialist States have taken away many Chinese dependent States and a part of her territories. Japan took away Korea, Taiwan and Ryuku Island, the Pescadores, Port Arthur; England seized Burma, Bhutan, Nepal and Hong Kong; France occupied Annam and even an insignificant country like Portugal took Macao." Jain, R. K. (1981). *China-South Asian Relations 1947-1980*. New Delhi: Radiant Publishers, 284.

Anderson (2013) elaborates:

> Following the deterioration of Sino-Indian relations soon after Indian Independence, the Himalayan border region became extremely tense. Prime Minister Nehru's government viewed Nepal, with Bhutan and Sikkim, as a "buffer region" where India would tolerate no foreign aggression. With the 1950 Chinese annexation of Tibet, Nehru quickly made defence treaties with these states, even offering Indian military assistance in the event of foreign attack. (p. 11)

Subedi (2005) details, "The Treaty cancelled all the arrangements of the previous Treaties, but gave continuity to import military hardware from or through the territories of India" (p. 192). Subedi (2005) further elaborates, "Neither government shall tolerate any threat to the security of the other by a foreign aggressor and to deal with any such threat, the two governments shall consult with each other and devise effective countermeasures" (p. 194).

Military interaction widened when an Indian military mission was established in Nepal on 27 February 1952, at the request of the Government of Nepal (Malik, 2004). "The task assigned to this mission was to reorganize, train, and equip the Nepal Army (NA) " (Malik, 2004, p. 90). Similarly, Kumar (1980) posits, "The Indian military group, numbering 75 personnel, established 17 check posts along the northern frontiers of Nepal in 1954" (p. 198). Such agreement appears to have materialized keeping in view the growing Chinese threat in the aftermath of the invasion of Tibet by China in 1949.

The military cooperation, in conjunction with Nepal's support to strengthen security in the northern border continued, "When Prime Minister B. P. Koirala, announced a 100 percent increase in defense expenditures to secure the border and agreed to the continued presence of Indian military monitors at points along it" (Whelpton, 2005, p. 96). In the wake of the revolt in Tibet and the Dalai Lama's flight to India in March 1959, tension were growing between India and China, which might have caused Kiorala to announce such military cooperation with India (Whelpton, 2005).

Subedi (2005) details, "Nepal and India concluded an Arms Assistance Agreement in 1965, which provided India as a sole supplier of military hardware to Nepal" (p. 9). Besides, India took the responsibility of training and supplying logistics and equipment for the NA (Subedi, 2005). Similarly, the Joint communiqué signed between Nepal and India in the aftermath of the political change of 1990 provisioned that "Nepal and India shall have a prior consultation with a view to reaching an agreement on defense-related matters which, in the view of either country, could pose a threat to its security" (Subedi, 2005, p. 10).

A distinct tradition, nearly six-decade old practice, has been observed in military relationship. In the words of former Chief of Army Staff of India, General Ved Prakash Malik, "We have an extraordinary situation where the Chief of Army Staff of one country is an Honorary Chief of the Army of the other country: a special privilege that is enjoyed by the Chiefs of both countries" (Malik, 2004, p. 83).

This tradition is much valued and continued until date. Former Chief of Army Staff, General Deepak Kapoor, who received such title from the Nepalese President in 2010 expressed, "We enjoy a 'special military relationship,' and we should try to make it exemplary for the rest of the world, in the days ahead. The Nepal Army and the Indian Army have traditional linkages, and this will not be affected by political changes and whoever heads the government" (*The Times of India*, 21 January 2010).

Security and cooperation

Security and cooperation have remained one of the institutionalizing and significant features in strengthening military relationship. It is underlined in terms of exchange of military courses and training, military aid and logistic support from both India and China to Nepal. The training of NA personnel by the Indian Army date backs to 1952, when an Indian military mission was established in Nepal (Savada, 1993). The extensive security cooperation began, when "India started providing training to NA in the training institutions of India, after the 1965 Arms Agreements" (Subedi, 2005, p. 211).

Security and cooperation gained new height after the political change of 1990 in Nepal as Mehta (2004) points out that in 1990, military aid started in various areas. India continued its assistance throughout the Maoist insurgency, however, in a reduced scale since 2001. India has been one of the major military aid providers in terms of hardware and logistic equipments for NA.

China has been providing military aid to Nepal mainly attributed to their long-standing friendly relations, and in an increased volume in the recent years. In September 2008, China announced military aid in non-lethal and engineering equipment, the first such assistance to Maoist government in Nepal (Bhattacharya, 2009). On 7 December 2008, during a meeting in Kathmandu between the Nepal Defense Minister and the Deputy Commander of China's People Liberation Army, China pledged to provide aid for Nepal's security sector (Bhattacharya, 2009).

On 16 December 2009, China further pledged to provide military aid for the supply of non-lethal military hardware including logistics equipments and training of personnel (Tibet Sun, 16 December 2009). In March 2011, China expanded the volume of military aid to Nepal (Hindustan Times, 24 March 2011). Similarly, in July 2013, People's Liberation Army provided assistance for two mobile hospitals for NA and

the Government of China granted military aid consisting of 50 million RMB to NA (NA Home Page, 2013). Such assistance appears have contributed in enhancing logistics capabilities of NA.

The exchange of military visits, training and courses, seminars, and joint-exercises between the militaries of Nepal and China, and Nepal and India in an extended scale has contributed to the development of mutual understanding and has enhanced the level of military cooperation. Since a long time back, NA had been providing training to foreign officers in a limited number; however, since 2010; it started offering various courses to the officers' of friendly foreign armies, including India and China. Such activity has contributed in deepening the interaction at various levels.

Furthermore, in the globalized world of interconnectedness and interdependencies where multilateralism is taking precedence, an increasing need has been observed to devise common framework through collaborative means and partnership to counter the contemporary challenges. There is a paradigm shift in the notion of security where the military means are not equated only with the traditional notion of state security. A need has been felt to develop mechanism to operate jointly to counter threats of terrorism, trans-border crimes, religious extremism, pandemic, humanitarian assistance and disaster relief, and host of asymmetric challenges.

Nepal's geopolitical position and strategic location between two emerging powers of Asia, China and India, underpins that its military should work closely with the militaries of China and India, and their militaries too should extend cooperation with increased attention to work with Nepal's military. There is much that Nepal can extract from its friendly military relationship with them, and they also need effective cooperation with Nepal's military in order to negotiate many common challenges that contribute in fulfilling their aspiration as a rising players.

From the historical perspective and the extent of current interaction, the dynamics of Nepal's military relations with India and China shows that Nepal has always tried to maintain a friendly military relationship with them defined by national interest and geographical realities. India and China too, have shown credible concern and considerable respect in maintaining two-century long friendly military relationship with Nepal.

Given the scope of relationship that Nepal has maintained, there appear no major differences likely to be emerged out in military relations and such relations appears to have greatly contributed in maintaining relations through other instruments as well as strengthening professional and logistics aspect of Nepal's military. Furthermore, it is quintessential to devise a common and coherent framework and shared responses between friendly militaries while countering the contemporary challenges.

Conclusion

Nepal's military relations with its two next-door neighbours, China and India, has been unfolded in very friendly terms. On the one hand, diplomatic-political instruments assume a wider significance in shaping up military relations; on the other, sound military ties also facilitate, maintain and strengthen diplomatic relations. The continuity and enhancement of such relationship is guided by Nepal's long historic relationship with her neighbours. Furthermore, in the globalized world of interconnectedness and interdependencies, it is crucial to expand military-to-military ties with China and India to devise common and coherent framework, develop comprehensive approach, understanding, and capabilities for shared responses as well as joint-preparedness in order to confront challenges that are increasingly becoming common to all.

Given the geo-strategic location of Nepal, it should continue maintaining a balanced military relation and cooperation with India and China envisioned by other instruments of national power. In the meantime, maintaining a respectful and friendly military interaction could enhance Nepal's capability in extracting maximum benefit from its two powerful immediate neighbours. Furthermore, maintaining friendly relations with China and India staying in the middle path, could help Nepal set conditions to expand and preserve its enduring military relationship with them.

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STATUS OF THE IMPLEMENTATION OF RIGHT TO INFORMATION ACT IN NEPAL

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Abstract: *Right to Information, RTI is a fundamental right of people and it is recognized in international law, as well as the constitutions of at least 100 countries world-wide. Nepal issued RTI Act in July, 2007. It is also regarded as the fundamental right of the people in the existing constitution of Nepal. Journalists and civil society had struggled at least one and half decade to ensure this Act. This article is focused on the implementation of the Act in Nepal. The situation of the implementation of Act and its constraints are analyzed by using the mixed methods of data collection. Qualitative as well as quantitative data are used in this article. The research shows that the implementation of the Act is not satisfactory. Very limited number of people have sought the information and journalists do not use it to dig out the irregularities and corruption cases. Information officers have not been appointed and the government has not established any nodal agency to create pressure for the monitoring of RTI implementation. Political commitment has not been there to implement the Act as the parties are always criticized for not being transparent. No social campaign have been launched in the country to encourage RTI movement. RTI is extremely helpful and effective tool to media to dig out corruption and maintain transparency in the society. The media has a big role in promoting the use of the Act. Civil Society launch campaign to encourage people to seek information throughout the country.*

Keywords: *RTI, rights, public agency, implementation, constraints*.

Introduction

Right to Information also called Freedom of Information is a fundamental human right in modern days. The United Nations, in its very first General Assembly in 1946, adopted a resolution (59.1) stating that "freedom of information is a fundamental human right and . . . the touch-stone of all the freedoms to which the United Nations is consecrated" (UN, 1946).

In 1948, the UN General Assembly adopted the Universal Declaration of Human Rights (UDHR). Its Article 19 guarantees the freedom of opinion and expression as follows:

> Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers (Human Rights, 1948).

The International Covenant on Civil and Political Rights (ICCPR), a legally binding treaty, was adopted by the UN General Assembly in 1966. The corresponding provision in this treaty's Article 19 also guarantees the right to freedom of opinion and expression in similar terms (ICCPR, Article 19).

After that resolution the Right to Information (RTI) underscores the fact that all citizens have the right of access to official documents held by government. After the dimension has been changed, the RTI movement in the world also covers other public bodies to make public their activities and documents. In general, 'right to information' laws define a legal process by which government information is available to the public. Most of the democratic RTI laws have clearly define the public bodies and direct them to provide public information.

The right to information is also a foundational building block for democracy and participation, as well as a key tool for holding government to account and checking corruption. It is recognized in international law, as well as the laws and constitutions of more than eighty five countries world-wide.

Background

Nepal adopted Right to Information Act in July 2007. It was the third country in South Asia, after Pakistan (2002) and India (2005), to adopt such a law. It was, however, the first country in the region to have a formal constitutional recognition of the right to information, as this right was explicitly guaranteed in the Article 16 of the Constitution of 1990. The Interim Constitution also guarantees RTI in the Article 27 (Interim Constitution of Nepal, 2063).

The Nepalese Legislature-Parliament endorsed the Right to Information Act acknowledging several points. The Act's Preamble says that the law was endorsed "giving insight into the spirit and aspiration of the Right to Information legislation,: 'As a legal arrangement is desirable in order that the state functioning (mechanism) is made open and transparent in line with the democratic polity so as to make it accountable and responsible towards the citizen; in order to ease the general public's access to information of public interest; in order to protect the sensitive information that could be damaging to the interests of nation as well as citizens; and in order to protect and implement citizen's right to information.

In fact, the Right to Information movements stress on the principle of "maximum disclosure" which presumes that all information held by public bodies can be accessed by members of the public and that any restrictions should apply in very limited circumstances" (Right to Information Act, 2007).

Research methodology

This study has been conducted based on the descriptive as well as exploratory method. Multi-stage simple random sampling technique has been used to select the

data and respondents. Mixed method (qualitative and quantitative) data is used in this study. Qualitative data have been analyzed by using the quantitative tools. An interview with an experts of right to information campaign in Nepal also has been conducted.

What are the public agencies?

There is a misconception among the people that only the government offices are obliged to give the information or they only are the obligatory bodies to make public their activities. But the definition of public agencies as mentioned below is more wide ranged and covers various offices responsible for providing information. It has provided more rights to the people and all public service delivery agencies are mandated to make public their activities to be more transparent in the society.

Public Agency denotes the agency and institution according to the article 2 of the Act (Right to Information Act, 2007):

- Agencies under the Constitution

- Agencies established by the Act

- Agencies formed by the Nepal Government

- Organizations and Foundations established by the law to provide public services

- Political Party or Organization registered under the prevalent law.

- Organized institution under the full or partial ownership or under control of the Nepal Government; or organized body receiving grants from Nepal Government

- Organizations formed by the agencies established by the Nepal Government or the Law through any agreement

- Non-governmental organization or institution operated obtaining money directly or indirectly from the Nepal government or foreign government or international organizations or institutions;

- Other agencies or institution mentioned as public agency by the Government of Nepal publishing notification in the gazette.

It has provided the broad coverage of the public agencies and it is said that the Nepali Act is more liberal and democratic in the sense of public agencies. The provision of public agency is more democratic compare to other democratic state's RTI law. Here we can see that NGOs, political parties and student unions and other non-governmental offices also are obliged to give information if sought.

Current status of implementation

The media sector, civil society members and others had been continuing their efforts for 15 years towards having a separate RTI Act in Nepal. With much enthusiasm Nepali media workers and democratic forces had been urging the state to produce the Act. But the same enthusiasm and vigorousness cannot be seen in its implementation. The implementation process has been too slow, or little heeded. The current status of the RTI implementation requires proper evaluation and analysis. Those heavily engaged in the struggle for the RTI Act do not appear adequately proactive in its implementation now. Nepali media sector has to review its own role in applying the RTI as per the Act. Shouldn't the media forces play a pro-active role in the implementation of the RTI Act before citizens learn to use their right to seek information? In reality, the current status of the implementation of this Act is not very appreciable because of the following reasons:

- All public agencies have not recruited information officers with or without communication degrees.

- The updating of information or information management in those agencies is weak.

- No culture of proactive disclosure or periodic disclosure has yet been developed in general.

- Training for information officers has not been regular.

- Citizens and institutions have not been encouraged to seek information.

- Government role in this matter is almost nil.

- The National Information Commission has failed to organize nationwide campaigns geared to the implementation of the RTI Act.

- No mechanism to monitor the implementation is available yet.

- Mass media have shown little interest in performing their investigative journalism by utilizing the RTI Act.

- Difficulty has been seen in the implementation of the orders of even the information commission.

It was not possible to record all information provided by public agencies proactively following the enactment of the law but there are records of nearly 300 complaints filed with the NIC following denials, which is an indication that information is not easily available. The following table shows the number of appeals made to the NIC by different citizen groups (Table 1).

Table 1. Information appeals at NIC filed by citizen groups (2008-2012)

Year	Govt. officials	Students	Businessmen	Legal practitioners	Judges	General public	Journalists	Total
2008/09	3	1	-	-	-	6	2	12
2009/10	10	11	-	3	1	11	3	39
2010/11	9	14	6	2	-	13	3	47
2011/12	22	20	4	4	-	57	2	109
2012/13	17	15	7	5	-	25	3	72
Total	61	61	17	14	1	112	13	279

Source: NIC, 2013.

Members of the general public filed the largest number of complaints with the NIC (National Information Commission) while students and government officials actively sought information. The number of journalists making RTI requests was low. The NIC data (Table 1) that is based on complaints does provide an indication of who is seeking information and also shows that there are denials, which is why the complaints reach the NIC.

Most of the appeals reaching the NIC were adjudicated in favor of the applicants. This publication is an attempt to analyze some RTI cases where citizens were able to obtain information. It includes only cases that reached the NIC and from among them only those that were unique either in terms of information sought or the agency involved. The length of time to resolve a case depended on the nature of the information sought, its availability and the willingness of state agencies to cooperate.

All the success stories presented here have their own importance. The stories (cases) were selected after detailed research and observation of the use of RTI as a tool to access strategically important public information, and are successful in demonstrating how public agencies can be held to account.

Success stories

RTI and VAT fraud investigation

In spring 2010, Nepal's Inland Revenue Department (IRD) seized fake Value Added Tax (VAT) invoices that were being sold at local stationeries. Parliament had also raised questions on this issue to which the government did not provided a satisfactory response.

In the meantime, the Ministry of Finance (MOF) and the Department of Revenue Investigation had formed a special task force for the investigation in 2010. It had submitted its report to the Director-General of IRD, who had forwarded it to MOF after which there had been no decision. Taranath Dahal, a senior journalist filed an

RTI application with the MOF seeking information on the tax evaders on 08 May 2011. He wanted to know the names of VAT evaders (both individuals and businesses) and also the amount of revenue lost. He had asked for copies of the 'Investigation Report on Tax Evasions using Fake and Duplicate VAT Invoices (Dahal & Pathak, 2013).

The MOF did not provide the information within 15 days of the application, as required by the law. Neither was the petitioner given a reason for not being provided the requested information. Next, Dahal took his case to the Finance Secretary, the first appellate authority, on 09 June 2011. The Finance Secretary did not respond immediately, and later said he was unable to make the disclosure. Responding to the resulting appeal, on 11 July 2011, the NIC ordered the Finance Ministry to provide, within three days, either the requested information, or an explanation to the Commission. The MOF did not comply with the order. Dahal made another appeal to the NIC on 15 August 2011. Earlier, on 21 June, the Ministry of Finance, through a ministerial decision, had also decided that the information could not be disclosed.

Eventually, the Ministry of Finance disclosed the information on 30th October 2011. This was in response to the NIC's final decision that stated that the requested information was a matter of public concern and, therefore, the petitioner had the right to be informed. The NIC added that it was the public's right to know if the taxes they paid had reached the exchequer, or had been stolen, and that people had the right to know how certain businesses might have taken the money using fake invoices. The order read, "If such scandals are made public, the concerned can be discouraged, and similar crimes are likely to be prevented. Transparency discourages while concealment of public information could encourage it. Therefore, people will be deprived of information if the probe report on tax evasions is kept secret".

The Ministry of Finance disclosure said that a total of 518 companies had been investigated but information on only 437 was disclosed. While the reported loss in taxes was Rs. 10 billion, because information on 81 companies in the probe report was not released, there was reason to suspect that the losses could have been higher.

RTI and municipal transparency

Municipal bodies managing Kathmandu Valley's public parking spaces had never done it transparently. They had not made public calls for quotations for selecting contractors nor prepared rules on the fees. Parking contractors charged different rates for parking in different areas and often, even local organizations, arbitrarily changed the fees while there was no information on where the money went. On 19 July 2012, Sanjeev Ghimire of Freedom Forum filed an information request at the Kathmandu Metropolitan City, and the Lalitpur Sub-Metropolitan City seeking the copies of policies, guidelines, decisions and income on parking spaces.

The municipal bodies failed to provide the information within 15 days of the application. After several reminders, the applicant took a petition addressed to the Chief Executive. He also did not provide information. On 03 October 2012, Ghimire took his appeal to the NIC. Kathmandu municipal officials eventually provided the information but withheld the contractual documents. The information confirmed the arbitrary leasing of parking spaces. Further, since the contractual documents were not provided, there is reason to suspect irregularities. The case also revealed that the municipal bodies—local government organizations – were not aware of RTI and were unwilling to disclose information.

Sushma was passed in examination

In another case, Sushma Subedi of Morang District had failed in Population Studies in her Grade XI examinations in 2012. The results showed that she was absent on the day of the test. She filed an information request to access her mark sheet at the Higher Secondary Education Board (HSEB) in Biratnagar but was denied information. Upon pursuing her case in Kathmandu, she discovered that she had scored 19 out of 20 marks in the examination.

RTI helps reinstatement of a judge

In 2004, the Judicial Council dismissed Chitra Dev Joshi, a judge at the Syangja District Court, for allegedly commenting on politics (Pathak, 2011). He was accused of making defamatory remarks against King Prithivi Narayan Shah, Nepal's founder. Joshi denied making defamatory remarks and challenged the Council for not allowing him to make a statement before dismissal. He was also not provided access to documents that had led to the dismissal.

Joshi sought information on his dismissal from the Information Officer at the Judicial Council, on 11 January 2010. He wanted to examine the documents used by the Council to take the decision. The information officer refused the request and his subsequent appeal to the head of office was also refused. Next Joshi appealed to the NIC seeking its assistance to obtain the documents.

On 01 March 2010, the NIC asked the Council for reasons for not providing the information and the Council responded with several justifications. The NIC then summoned the head of the Council to its office on 16 March 2010, but the letter was ignored. The NIC wrote to the Council again on 15 April 2010, asking its representatives to appear at the Commission within a week.

Eventually, after continuous follow-up by the NIC, the Judicial Council provided the information to the Commission on 09 February 2011. Meanwhile, it had also filed a writ at the Supreme Court challenging the NIC decision saying that it had caused it to breach the law by making the disclosure.

The information revealed that the applicant had not used the words he had been accused of using, and that the recording of the speech did not provide enough grounds for dismissal. He was eventually reinstated to his position after the Supreme Court delivered a verdict ruling that the dismissal was illegal.

Constraints for RTI implementation

Political transition period

Nepal is awaiting for state restructuring. The country as a whole has given top priority to the mission of having a new constitution through the perfection of the ongoing peace process. It may be one of the causes why the state has not been able to pay attention to the RTI Act implementation even after three years of its approval. Like the government, other sectors in the country have not been able to pay sufficient attention to this issue. Since the government mechanism and other stakeholders are more occupied with the peace process issues, it might have become one of the causes for not prioritizing the implementation of the RTI Act.

Non-communicative culture in the state bureaucracy

This appears another constraint regarding the implementation of the RTI Act. It is obviously seen that the Nepali bureaucracy has still been keeping a negative culture of remaining non-communicative on public issues and agenda. They do not appear conscious enough to analyze why communication, information and the mass media matter to the society. They have either ignored or misunderstood the role of information in state restructuring. Moreover, they do not have a culture of updating information with a view to informing the public. This non-communicative culture is a challenge in connection with the lively use of the RTI Act.

Lack of political commitment

The government feels that its duty was fulfilled after the enforcement of the RTI Act. It did not take any further step. Consequently, the bureaucracy, too, was not positively sensitized, nor was it specifically instructed towards the active implementation of the Act. The political leadership of the country does not appear to be fully committed towards its implementation (The Asia Foundation, 2014). The leading role of political forces in implementing the RTI Act could not be seen. This lack of political commitment seems to have affected the bureaucracy too. Politicians are not interested to introduce massively an RTI movement within the parties as they have to be more transparent and open for all the policies and expenditure if an Act is implemented says a political analyst and columnist in the newspaper Pranav Bhattrai (personal conversation/ interview dated October 10, 2014).

Lack of monitoring mechanism

The RTI Act contains a provision for public agencies to update and publicize their information quarterly. However, the concerned public agencies have failed to put this legal provision into practice. Many of them have had no information officers to deal with public information issues. No monitoring mechanism has been set up to make sure public agencies work as per the Act. As a result, it is difficult to obtain the exact information about the status of this Act.

Lack of nodal agency

The first national convention of RTI organized in Nepal in 2011 was focused on the establishment of the nodal agency under the council of ministers to coordinate effectively the RTI activities and to facilitate the implementation of RTI in Nepal. But it has not been established yet. There is a vast lack of monitoring mechanism for the implementation of RTI activities in Nepal. This also is another vital cause for not to be effective of RTI movement in Nepal. There is no agency or department under the government to address or monitor the situation of the implementation of RTI and due to the absence of such a body the RTI campaign of Nepal has not been geared up, says Tara Nath Dahal, one of the drafting committee members of RTI Act, 2007 (personal conversation/interview dated May 3, 2014).

Lack of social campaign

Due to illiteracy and suppressed mentality, the majority of people are not able to look into public issues and demand information as one of their fundamental rights. Majority of them even do not know that the Right to Information is guaranteed in the country's constitution and that its Act as well as regulations are in existence. They mainly depend on their opinion leaders for much information. In this context, the absence of social campaigns has also contributed to the non-implementation of the RTI Act. However, there are many social institutions that can rapidly enhance the social awareness on the importance of utilizing the RTI Act. For promoting people's access to publicly important issues, social campaigns on the implementation of the RTI Act could produce powerful pressures says Dharmendra Jha, a RTI activist and former president of Federations of Nepalese Journalists' Association (personal conversation/interview dated May 10, 2014).

Limitation of the national information commission

The RTI Act has given a judiciary role to the National Information Commission. It has limited resources; however, it can define its subsidiary role to motivate people for the implementation of the Act. It should not confine itself to going through

applications. It could play a proactive role in reaching out to people and media widely. On the other hand it has been confined to the Kathmandu. Without its expansion of throughout the country people are feeling uneasy to register the appeal to the commission. People who are not getting information from the local level public agency then they should come to the appeal and the commission is confined to the Kathmandu valley.

Lack of academic and training programs

Although universities have the right to information as one of their components in the program of mass communication and journalism, it is not enough for in-depth study and specialization. Moreover, non-governmental organizations and public agencies themselves can conduct necessary RTI training programs for all stakeholders, including media workers.

Less involvement of the media

After the RTI Act has been enforced, the media had to take the vanguard role in practically using it. But they have fallen far behind in doing so. There are innumerable public issues still unreported or under-reported. To disseminate publicly valuable information through investigation and persistent follow-up, the media has to use actively the RTI Act. Big scandals could be revealed in a country like Nepal where all-pervasive corruption has been a nationally and internationally known phenomenon.

Conclusion

Nepal had issued RTI act in 2007 after the struggle of journalists and civil society of at least one and half decade. But implementation of the Act is not still satisfactory. Very limited numbers of people have sought the information and journalists do not use it to seek information and dig out the irregularities and corruption cases. Information officers have not been appointed and government has not established any nodal agency to create pressure for the monitoring of RTI implementation. Political commitment has not seen to implement the Act as the parties are always criticized for not being transparent. No social campaign has been launched in the country to encourage the people to seek information as their rights and an effective tool to maintain transparency in local governance. National Information Commission has been limited to the Kathmandu and not aggressive to launch so many programs on RTI throughout the nation. No records of information have been maintained in public agencies and government and non-governmental sectors and it makes difficult to measure the situation of the implementation of the Act. Only appeals are recorded in the NIC and it is not sufficient to analyze the implementation of the Act. There are

certain success stories made by using information during last seven years but it is not sufficient. People should be more active and conscious to seek information with the public agencies and should control the corruption and expose irregularities in society.

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ORGANIZATIONAL JUSTICE, EMPLOYEE TRUST AND COMMITMENT IN NEPALESE FINANCIAL INSTITUTIONS

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Abstract: *The purpose of the study was to establish the relationship between organizational justice, employee trust and employee commitment. A total of 300 survey questionnaires were distributed to the employees working in financial institutions of which 254 usable questionnaires were returned, thereby yielding a response rate of about 84.67 percent. Results revealed a significant positive relationship between organizational justice and employee trust and a significant and positive relationship between organizational justice and employee commitment. The effects of distributive justice, procedural justice and interactional justice on employee trust was found that they all have a positive and significant impact on employee trust and employee commitment. Thus, the employees' positive perception of the fairness and just systems of their organizations makes them more committed to serving their organizations.*

Keywords: *Organizational justice, employee trust, employee commitment, financial institutions, Nepal.*

Introduction

Organizational justice refers to the study of fairness within organizational settings and originates from work in social psychology aimed at understanding fairness in social interactions. The fairness with which employees are treated by their respective organizations is a commonly explored topic. This concept has been the target of a great deal of research, and it has important implications for organizations and their employees (Greenberg, 1990). However, this is a rarely studied issue in the context of Nepal. This study, therefore, focuses on the relationship between organizational justice and employee's trust and commitment in Nepalese financial organizations.

Organizational justice has impact on employee trust and commitment. Trust in an organization and a manager is crucial to mobilize employees' commitment in realizing the organizational vision. According to Blau (1964) trust is built in two ways: (1) performance of duties on a regular basis in response to the benefits received from the other party, and (2) the development of exchanges in accordance with the passage of time. The trust is often expressed as a single concept, but in a social or organizational context, trust has a systemic effect of structure, process, and operational effectiveness (Sjahruddin *et al.*, 2013). Employee trust is essential for the sound inter-relations between employees and organization or managers.

The key to an organizational success depends on the commitment of employees toward the organization. Commitment toward organization is more than just a formal

membership; it encompasses the attitude of the employees towards organization and their willingness to pursue all things for the sake of organization. Organizational commitment is a situation where an employee in line with a particular organization as well as the goals, wishes to maintain membership in the organization (Robbins and Judge, 2007).

In Nepalese context, there are limited studies that have examined how employees' justice perceptions are related to their trust and commitment with organization. Therefore, this study attempts to fill a gap by investigating the relationship between organizational justice and employee trust, on the one hand and the relationship between organizational justice and employee commitment in the Nepalese financial institutions, on the other.

Objectives of the study

Organizational justice has the potential to create significant benefits for the organizations and employees alike including greater trust and commitment. So, the study investigates the relationship between organizational justice, employee trust, employee commitment in financial institutions of Nepal. The major objectives of this study are as follows:

a.   To examine the relationship between organizational justice and employee trust.
b.   To examine the relationship between organizational justice and employee commitment.
c.   To explore the effect of organizational justice on employee trust and employee commitment.

Review of literature

Organizational justice

Organizational justice is the employees' perception of the fairness with which they have been treated by an organization (Moorman, 1991; Campbell *et al.*, 1996; Greenberg & Colquitt, 2006). It can be interpreted as a virtue that allows for mutual consideration and involving both relationships with others and outcomes that affect others' physical, psychological and social welfare (Cropanzano *et al.*, 2001). Organizational justice encompasses social norms and the emergent rules in the decision making and distributing to employees outcomes such as tasks, goods, services, rewards, penalties, pay, organizational positions, opportunities, or roles (Folger and Cropanzano, 1998). Employees will be willing to accept organizational policies and decisions if they are based on fair procedures. It is not just about being treated with dignity and respect but also about being given adequate information

regarding these procedures (Cropanzano & Greenberg, 1997). The way organizational action is taken and how it is carried out matters no less than the actual outcomes (Tyler and Bies, 1990).

In previous organizational justice research, the construct has often been divided into at least three aspects: distributive justice, procedural justice and interactional justice (Leventhal, 1980; Bies & Moag, 1986; Folger and Cropanzano, 1998; Masterson *et al.*, 2000; Cropanzano *et al.*, 2001).

Distributive justice. Distributive justice concerns the fairness of the processes by which a decision is reached. It is "the individuals' perception on whether the gains they earned are distributed fairly. Employees make judgments on justice distribution by comparing their outcome to their previous outcomes or to the outcomes of others (Tyler, 1994). Therefore, distributive justice finally deals with the degree of perceived fairness in distribution and allocation of outcome.

Procedural justice. Procedural justice refers to the fairness of decision making. Folger and Cropanzano (1998) define procedural justice as "fairness issues concerning the methods, mechanisms, and processes employed to determine outcomes". Employees are closely interested in not only the fairness of their own outcomes but also the fairness of decision making and enactment processes in outcome distribution. Procedural justice is most appropriate for reflecting the way employees make judgments concerning the fairness of practices at organizational level.

Interactional justice. It is related to the quality of relationships between individuals within organizations (Folger & Cropanzano, 1998). In interactional justice, decision makers' treatment of those affected by the decisions is crucial because persons identify attitudes as indicators of justice within the organization. It refers to perceptions concerning the way authorities treat their subordinates, and how these subordinates respond to these perceptions (Masterson *et al.*, 2000; Cohen-Charash and Spector, 2001). Employees are sensitive to the communications they receive regarding the implementation of procedures and the explanations of decisions (Aydin & Karaman-Kepenekci, 2007, cited in Mariam, 2011).

Employee trust

Employee trust is one of the dependent constructs in this study. Trust refers to the willingness of a party to be vulnerable to the actions of another party. It is based on the expectation that the other will perform a particular action that is important to the trustor, irrespective of the ability to monitor or control that other party (Mayer *et al.*, 1995).

Trust is part of the norms and values of organization, and is expressed inrelation to goal setting, risk taking, exchanging of information, decision-making, performance management, and collaboration (Sjahruddin *et al.*, 2013). Employees' trust is a critical variable influencing the performance, effectiveness, and efficiency of the organization (Whitney, 1994, cited in Mariam, 2011; Mayer *et al.*, 1995; Kramer & Tyler, 1996; Lewicki *et al.*, 1998; Mayer & Davis, 1999; Dirks & Ferrin, 2002). It is considered to be an essential intangible resource in modern organizations, without which passion for excellence may not prevail (Greenberg & Cropanzano, 1998).

Trust relates to an individual's belief in the honesty, veracity, justice and strength of another individual or an organization (Tzafrir *et al.*, 2004). Gilson *et al.* (2005) suggested that managers may build trust by demonstrating individualised concern and respect for employees. Trust tends to have a strong impact on the relationships between managers and employees (Whetten and Cameron, 2002). This is because in a work place, without some foundation of trust, social relations cannot develop. Trust is a social mechanism that is embodied in the structures of social relations (Schoorman *et al.*, 2007, cited in Mariam, 2011).

Employee commitment

Employee commitment, which is also known as organizational commitment, is another dependent construct in this study. It is the extent to which employees are psychologically connected to their organizations, sustained by continued desires to remain employed in the organization, and it is expressed as emotional feeling, bond, involvement and consideration of alternatives, sacrifices, and costs due to internal and external influences (Ogba, 2007, cited in Mariam, 2011).

According to Jaros (1997), organizational commitment is an important part of an employee's psychological state because employees who experience high organizational commitment are theorized to engage in many behaviours, such as citizenship activities and high job performance that are believed to be beneficial to the organization. Due to its importance, it is often referred to as "the human side of quality" (Hill & Huq, 2004, cited in Mariam, 2011). It focuses on the employees' emotional attachment and involvement in the organization and its goals.

Employee or organizational commitment is considered to be multi-dimensional, which has distinct policy implications for human resource management (Robbins & Judge, 2007). Allen and Meyer (1990) conceptualized and proposed a model of organizational commitment that included three components: affective, normative, and continuance.

Affective commitment. The most prevalent approach to organizational commitment in the literature is the one in which commitment is considered an affective or emotional attachment to the organization such that the strongly committed individual identifies with, is involved, and enjoys membership in the organization (Allen and Meyer, 1990). Employees with strong affective commitment remain because they feel they want to (Meyer *et al.,* 1993). When employees have affective commitment, they will easily absorb the core values which will accelerate the decision-making process (Mowday *et al.,* 1979).

Continuance commitment. Continuance commitment refers to commitment based on the employee's recognition of the costs associated with leaving the organization and they remain because they have to do so (Allen & Meyer, 1996). This commitment, sometimes termed calculative commitment, is commitment based on the costs that employees associate with leaving the organization. Employees with strong continuance commitment remain because they feel they need to (Meyer *et al.,* 1993).

Normative commitment. Normative commitment refers to employee's feelings of obligation to remain with the organization. It focuses on the right or moral thing to do and concentrates on the obligation and/or moral attachment of employees which is produced by the socialization of employees to the organization's goals and values (Allen & Meyer, 1990). Employees with strong normative commitment remain because they feel they ought to (Meyer *et al.,* 1993). Researchers have argued that not all types of commitment may be beneficial for organizations (Konovsky & Cropanzano, 1991).

Organizational justice and employee trust

This study assumes that there is relationship between organizational justice and employee trust. Employee trust develops as employers and employees see that the investments in the relationship are offset by returns. It is based on the norm of reciprocity (Gouldner, 1960). Pillai *et al.* (2001) found out that when distributions of organizational outcomes are considered to be fair, higher levels of employee trust is likely to develop. In a related argument, Brockner and Siegel (1996) found that the interaction between distributive and procedural justice has a significant impact on trust in an organization. Their central argument was that it is not procedural justice per se that is interacting with distributive justice; rather, it is the degree of trust engendered by procedural justice that interacts with distributive justice in order to influence reactions to a resource allocation decision. Additionally, Bakhshi *et al*. (2009) showed that when employees felt that they were treated fairly by their company, they were likely to hold more trust in the management. This is supported in Mariam (2011).

Colquitt (2001) contends that employees who are treated fairly in terms of interpersonal justice have trust for their managers. In relation, Randolph (1995) and Whetten and Cameron (1998) in their studies found out that interactional justice in the form of sharing information raises employees trust in the management. This exchange process leads to an atmosphere of openness and confidence which in turn generates trust. Additionally, Cropanzano and Greenberg (2001) asserted that social interaction like the nature and adequacy of information available and the extent to which employees are treated with fairness leads to trust in management and this in line with the works of Folger and Cropanzano (1998). This is further supported where employees' perception of organizational justice enables employees to feel as members of the organization and thus develop relationships based on trust (Yilmaz & Tasdan, 2008, cited in Mariam, 2011).

Procedural justice reduces fear among employees as there is clear, honest and open communication; this promotes and enhances a culture of trust to the organization (Tzafrir *et al.*, 2004). In agreement to previous research by Mishra (1996) and Tyler and Lind (1992) showed that where employees have voice and participate in the decision making process they are likely to have improved trust in the management. In a similar view, Mayer *et al.* (1995) were of the view that explanations and justification for decisions made by the management culminates into perceived fairness of the interpersonal treatment received by employees which is reciprocated by trust. The resultant trust motivates employees to reciprocate in a positive manner toward the organization (Konovsky & Pugh, 1994, cited in Mariam, 2011). Bareebe (2008) emphasized management integrity in ensuring the fair and consistent application of practices, procedure and processes in order to generate trust. Albrecht and Travaglione (2003) suggest that fairness in organizational policies and procedures is a significant determinant of trust in the management. Likewise, Thornhill and Saunders (2003) contended that distributive justice has become more important, significantly affecting trust in the top management, especially within the context of organizational changes. From the review of previous studies that link organizational justice to trust in an organization, the following hypotheses have emerged:

H1: There is positive relationship between employees' perception of organizational justice and their trust.

H2: Organizational justice positively influences employee trust in the organization.

Organizational justice and employees' commitment

A committed employees' behavior is at the heart of human resources management (Mariam, 2011). Organizational justice has been identified as a critical factor for employees' commitment to the objectives of the organization (Dirks &

Ferrin, 2002). Yilmaz and Tasdan (2009) were of the view that positive perception of organizational justice assists employees to feel as members of the organization which influences their organizational commitment. Suliman and Iles (2000) argued that recognizing employees improves their morale and dedication and makes them emotionally attached to the organization.

Bakhshi *et al.* (2009) were of the view that when employees perceive that the organization is just in terms of fulfilling its side of the contract, they are more likely to be committed. This implies that employees become continuancely committed to serving the organization. In contrast, Folger and Cropanzano (1998) argued that when employees perceive organizational injustice, they will feel negative continuance commitment and seek to leave or engage in behavior that is detrimental to the organization. Cremer *et al.* (2005) supported this notion by saying that if unfair procedures are used trust will be low and employees will most likely to have low commitment.

Pearce *et al.* (2000) in their study found out that procedural justice in the form of fair human resource processes is positively related with organizational commitment. For Bockerman and Ilmakunnas (2006) employees' perception of fairness of pay affects their organizational commitment. Pearce *et al*. (2000) concurred by saying that procedural justice is associated with employee commitment to the organization. In addition, McKenna (2005) viewed that participating, being involved and making suggestions in the organization makes the employees affectively committed to the organization. Paulin *et al*. (2005) argued that when workplace conditions are supportive and equitable, they create affective commitment. This is in line with the previous research conducted Price and Mueller (1986) who argued that treating employees fairly and considering employees' needs increases employee commitment. When the supervisor is seen as following fair procedures and fair interpersonal processes, employees are likely to be committed to the organization (Cropanzano *et al.*, 2001). Similarly Gilson *et al.* (2005), were of the view that when organizations adopt HRM practices that employees perceive as being fair and considerate, it will be reflected in employees attitude towards customer service (Wat & Shaffer 2005, cited in Mariam, 2011; Tzafrir & Gur, 2007; Mishra, 2010). Thus, this leads to the next hypotheses:

H3: There is positive relationship between employees' perception of organizational justice and their commitment.

H4: Organizational justice positively influences employee commitment in the organization.

Method

Research model

The research model was developed on the basis of previous researches. The following equations were tested:

1. $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e_t$

   $ET = \beta_0 + \beta_1 (DJ) + \beta_2 (PJ) + \beta_3 (IJ) + e$

   Where,

   $Y = ET$ = Employees Trust (Dependent variable), "β_0" is constant; "e" is common error or other variable.

   X_1 = Distributive Justice (DJ)

   X_2 = Procedural Justice (PJ)

   X_3 = Interactional Justice (IJ)

2. $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e_t$

   $EC = \beta_0 + \beta_1 (DJ) + \beta_2 (PJ) + \beta_3 (IJ) + e$

   Where,

   $Y = ET$ = Employee Commitment (Dependent variable), "β_0" is constant; "e" is common error or other variable.

   X_1 = Distributive Justice (DJ)

   X_2 = Procedural Justice (PJ)

   X_3 = Interactional Justice (IJ)

Data and sample

Data was collected directly from the respondents. A total of 300 survey questionnaires were distributed to the employees working in financial institutions (4 commercial banks, 4 development banks, and 4 finance companies). A total of 25 questionnaires were distributed in each of the financial institutions. Altogether 254 usable questionnaires were returned, thereby yielding a response rate of about 84.67 percent. Judgmental and convenient sampling technique were followed to gather the views of the respondents.

Variables and measurements

Multi item scales were used to measure the four constructs being investigated in the study. All the items were measured using a 5 Likert scale ranging from 5 to 1 (strongly agreed to strongly disagree).

Organizational justice was measured by adopted items developed by Colquitt (2001). The focus was on distributive, procedural and interactional justice.

Employee trust was measured by adopted items developed and validated by Tzafrir and Dolan (2004) because the study was undertaken in the organizational setting and this scale takes into consideration the employees as well as the exact context where trust happens.

Employee commitment was measured by the eight item scales developed by Allen and Meyer (1990). The three scales (24-items) were used to measure organizational commitment, while each eight-item scale was used to measure one of its three dimensions: affective, continuance, and normative commitment.

Empirical results

Empirical results of the survey and related statistical analyses are discussed in this section.

Correlation analysis

The objectives of the study were based on the relationships between the different variables which were: organizational justice, employee trust, and employee commitment. Table (1) below presents the results correlation analysis.

Table 1. Mean, standard deviation, Pearson correlation results and reliability coefficients

	Mean	SD	OJ	ET	EC	Reliability (Cronbach Alpha)
Organizational Justice (OJ)	3.63	0.61	1			0.83
Employee Trust (ET)	3.67	0.62	0.47**	1		0.91
Employee Commitment (EC)	3.72	0.67	0.58**	0.51**	1	0.89

Correlation is significant at $*p<0.05$, $**p<0.01$ (2-talied).

Correlation between organizational justice and employee trust

The results in Table (1) revealed a significant positive relationship between organizational justice and employee trust ($r = 0.47**$, $p<.01$). Therefore, hypothesis 1 is supported. These results indicate that when the employees perceive the human resource practices of the financial institutions to be fair, their level of trust in the management is improved which will be reflected by their working relations with the management. The exchange process in justice systems in these institutions will lead to openness and confidence of the employees.

Correlation between organizational justice and employee commitment

A significant and positive relationship between organizational justice and employee commitment ($r = 0.58**$) is shown in table (1) above. Thus, hypothesis 3 is also supported. This implies that if employees believe the systems, procedures and

processes in their organizations are reasonably fair in terms of communication, applicability and rationality, they will have a strong willingness to stay, attach and identify with the goals of their organizations.

Regression analysis

The regression model was used to determine the degree to which organizational justice can predict employee's trust and commitment. Table below (2) presents the results of regression analysis.

Organizational justice and employee trust

The table (2) presents the regression results of organizational justice and employee trust.

Table 2. Regression result of organizational justice and employee trust

Organizational Justice	Un standardized Coefficients B	Sig.
Constant	4.411	
Distributive Justice	0.37**	0.00
Procedural Justice	0.51**	0.00
Interactional Justice	0.64**	0.00

$R^2 = 0.338$, Adjusted $R^2 = 0.328$, F-Value = 34.905   Note: *$p<0.05$, **$p<0.01$

The regression analysis was used to find the impact of distributive, procedural and interactional justice and also to identify the more dominant predictor of the employees' trust. The multiple linear regressions were run and the results are presented in Table (2). The un-standardized coefficient of regression for interactional justice (0.64) shows that it is more positively and significantly correlated with dependent variable as compared to distributive justice (0.37, $p<0.00$) and procedural justice (0.51, $p<0.00$) which are also significant. The coefficient of determination ($R^2 = 0.338$) shows that 33.8% variation is explained by these three predictor variables. The F-value shows that the model is significant ($p<0.01$).

The regression line suggests:

ET = 4.411 + 0.37 (DJ) + 0.51 (PJ) + 0.64 (IJ) + e

The results support the conclusion that organizational justice affects employees' trust in the organization. This provided the support to hypothesis 2. Regression results show that interactional justice has a strong impact on employee trust.

Organizational justice and employee's commitment

The table (3) presents the regression results of organizational justice and employee's commitment.

Table 3. Regression result of organizational justice and employee commitment

Organizational Justice	Un standardized Coefficients B	Sig.
Constant	4.21	
Distributive Justice	0.37**	0.00
Procedural Justice	0.47**	0.17
Interactional Justice	0.22**	0.00

R2 = 0.47, Adjusted R2 = 0.44, F-Value = 16.15   Note: *p<0.05, **p<0.01

The effect of distributive justice on employee's commitment was investigated and it was found that distributive justice has a positive and significant impact on employee's commitment (β = 0.37, p<0.01). The effect of procedural justice and interactional justice on employee's commitment was also investigated and it was found that procedural justice has a positive and significant impact on employee's commitment (β = 0.47, p<0.01) and interactional justice has also a positive and significant impact on employee commitment (β = 0.22, p<0.01). The regression model is significant as a whole (F = 16.15, p<0.01) and it explains 47% of the variation in employee's commitment.

The regression line suggests:

EC = 4.21 + 0.37 (DJ) + 0.47 (PJ) + 0.22 (IJ) + e

According to the results, organizational justice positively impacted employee commitment. This provided the support to hypothesis 4. Regression results show that procedural justice has a strong impact on employee commitment.

Discussions and conclusions

This study aimed at assessing the importance of organizational justice on employee's trust and commitment by investigating the interrelationships among variables. The findings of the study demonstrated a strong support for the effect of organizational justice on employee's trust and commitment.

The findings of the study indicate that there is a positive relationship between organizational justice and trust of employees in Nepalese financial institutions. This implies that when employees perceive human resource practices, systems and

procedures to be relatively fair, their level of trust in the management will increase. This is consistent with Pillai *et al.* (2001) who assert that when distributions of organizational outcomes are considered to be fair, higher level of employee trust is likely to develop. Bakhshi *et al.* (2009) affirmed that when employees felt that they were treated fairly by their company, they were likely to hold more trust in the management. Colquitt (2001) contends that employees who are treated fairly in terms of interpersonal justice have trust for their managers. Additionally, Cropanzano and Greenberg (2001) asserted that social interaction like the nature and adequacy of information available and the extent to which employees are treated with fairness leads to trust in management and this in line with the works of Folger and Cropanzano (1998). The results of this study also seem to be consistent with the findings of Mariam (2011). The findings of the study also support the conclusion that organizational justice affects employees' trust in the organization. This is consistent with Sjahruddin *et al.* (2013) who concluded that there was a positive and direct relationship between organizational justice and organizational trust in a manager. Therefore, the Nepalese financial institutions should develop fair and equitable human resource systems, practices and procedures that enhance the truthful environment between the institutions and their employees.

The findings of the study further revealed a positive relationship between organizational justice and the commitment of employees in Nepalese financial institutions. This indicates that when the employee perceive fair human resource practices, systems and procedures, their commitments to the institutions increases. This is in agreement with (Pearce *et al.*, 2000; Suliman & Iles, 2000; Robertson *et al.*, 2007; Yilmaz & Tasdan, 2009; Bakhshi *et al.*, 2009) who assert that when employees perceive that the organization is just in terms of fulfilling its side of the contract, they are more likely to be committed. The results of this study also showed that organizational justice positively impacted employee's commitment. This result is consistent with Sjahruddin *et al.* (2013) who concluded that there was a positive and direct relationship between organizational justice and employee commitment. Mariam (2011) argues that when organizations adopt HRM practices that employees perceive as fair and considerate, it will be reflected in employees' attitude demonstrated in the way they serve organization. Therefore, the employees' positive perception of the fairness and just systems of their organizations makes them more committed to serving their organizations.

Limitations and suggestions for future research

This study provides guidelines to help managers better understand the ways to increase employee's trust and commitment and make better decisions about their

outcomes, procedures and fair communication for their employees. However, some limitations of this study must be noted in the interpretation of the results. First, the generalizability is limited because this study did not use random sampling and used a cross-sectional research design. Survey questionnaires were not distributed to randomly selected employees due to situational constraints. Second, all the data came from the survey with self-reported measures. Individual responses can be marked by variations in individual motivation, variations in the knowledge of respondents, memory lapses, and personality. Third, empirical study was limited to only sample financial institutions of Nepal, which may be associated with certain unique features. Thus, the findings obtained may not be generalized to other samples across different industries and other organizations. Therefore, further research can be conducted taking the different organizations and place into consideration.

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PERCEIVED LEADERS' SUPPORTIVE BEHAVIOR AND SUBORDINATES' CREATIVITY: MODERATING EFFECT OF TRUST

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Abstract: *The main goal behind this study was to figure out whether or not the leader's supportive behavior and leader's trust influence subordinate's creativity and whether there is any moderating effect of leader's trusts in the relationship between leader's supportive behaviors and subordinate's creativity in Nepali travel agencies. This study was carried out following a quantitative cross-sectional analysis of perceptual responses from 114 pair of leader-subordinate. This study found out that the leader's supportive behavior and trust were significantly positively correlated with subordinate's creativity relationship between leader's supportive behavior and subordinate's creativity was moderated by the leader's trust of subordinate. Practically, the conclusion can be used to increase subordinate's creativity by increasing leader's supportive behavior and trust. While considering interactive effect practitioners can relatively increase the subordinate's creativity by focusing on increasing trust or support for those who have low level of trust or support or both. Theoretically, this study revealed a new knowledge that the relationship between leader's supportive behavior and subordinate's creativity is relatively more robust under the condition of low level of leader's supportive behavior and leader's trust of subordinate and vice versa.*

Keywords: *Leader's supportive behavior, leader's affect-based trust, leader's cognitive-based trust, subordinate's creativity.*

Introduction

It is necessary for a company to gain competitive advantage by concentrating on the production through creativity (Drucker, 2000; as cited in Carmen *et al.*, 2008), not just to improve the process, quality, technology, or to provide new service and product but also to handle the competitors (Cummings & Oldham, 1997; Andriopoulos & Lowe, 2000). Innovative organizations need creative employees who generate new ideas for product or process innovation. Innovation is the only way to survive and run the organization in the long-term and creativity can lead to innovation in a rapidly changing workplace (Tushman & Reilly, 1997; Dess & Pickens, 2000). If the leader guides them with high support and low control (Oldham & Cummings, 1996) or with democracy and caring leadership (Kanter, 1983), it helps employees to work creatively. Without creativity, no organization can succeed in a competitive market (Harding, 2010). Creativity of subordinates depends on several

factors, among which the perception of their leader's supportive behavior the most important one. In a dynamic environment, the customer's needs are highly changeable and competitions are high; an organization should be able to offer different products or services in different ways to have a competitive advantage. Offering positive differences than competitors is possible whenever their members are creative and innovative.

At the same time, while exploiting the creativity, the subordinate will let himself or herself get into a challenging situation because the new ideas sometimes involve risk, uncertainty and failure (Rubenson & Runco, 1992; Andriopoulos & Lowe, 2000). Not only the subordinate, even the leader has the same degree of chance to get into such a condition, so trust between each other is really important (Smith, 2002). The leader has to trust the ability of employees and employees have to trust the leader's promise for innovation. Without trust, no party can proceed, so interpersonal trust is the most important factor for the creativity of the employees. Having a superior role in the organization, the leader's trust on subordinate is more important than subordinate's trust on the leader.

Business activities of travel agencies are unique and competitive. They deals with people of varied nature; multiple tasks have to be performed by its employees. Most of the travel agencies are small and medium sized. Naturally, employees working in small organization need to be more dynamic and creative to handle multi-nature of the task. So, its employees should be creative and innovative to gain own competitive advantage. But Nepali travel agency leaders lack local knowledge about how their supportive behavior and trust on the subordinate plays role in their subordinate's creativity. In such context, this study provides suggestions based on the analysis of empirical evidences on how travel agencies can enhance their subordinate's creativity.

Most of the studies on the leader's supportive behavior, trust and subordinate's creativity were carried out in Western context. No study has been carried out in Nepali context. Even in the Western countries, such studies hardly focus on travel agencies. We have no sufficient theories about the purposed subject in the context of under-developed countries. Nepali managers mostly practise their leadership behavior on the basis of their intuition as well as theory developed in the context of developed countries. Because of this, they lack latest knowledge based on the study of local business practices, specially on the relationship between the leader's supportive role and the subordinate's creativity. Theories are also based on the review of literatures and studies carried out in the Western context; they also need studies carried out in different context to suggest new ways and techniques to enhance creativity of the employees under different context. That is why this study was carried

out to enhance the knowledge of how creativity of Nepali employees (especially working in travel agencies) can be increased through leader's supportive behavior and trust. In such a context, the study addresses the following issues and questions: How does the perceived leader's supportive behavior impact their subordinate's creativity? How does leader's affect-based trust of subordinate impact subordinate's creativity? How does leader's cognitive-based trust of subordinates impact subordinate's creativity? What will be the impact of leader's cognitive-based and affect-based trust of the subordinates in the relationship between the leader's supportive behavior and their subordinate's creativity?

Review of literature

Leader's supportive behavior

According to Amabile *et al.* (2004), leader's supportive behavior includes task and relations support. The leader's task support involves ensuring the adequacy of resources, which are essential for job execution, whereas relations support focuses on a leader's concern with the socio-emotional needs of his or her employees. In general, supervisory support may include career guidance, performance feedback, challenging work assignments, and work opportunities that promote employee development and visibility (Fields, 2002). George and Zhou (2007) have considered three alternative ways in which supervisors can support creativity: by providing developmental feedback, through displaying interactional justice, and through being trustworthy. Each of these ways that supervisors can support creativity pertain directly to the creative idea generation of subordinates per se, rather than to the more general ways in which supervisors can provide a supportive context.

Creativity

Some researchers (Amabile, 1988; Estrada *et al.*, 1994) suggest that creativity is a process in which employees develop novel and useful solutions to meet challenges and solve work-related problems in the course of goal-directed behavior. Other researchers regard creativity as pertaining to the characteristics of an individual. For example, Evans (1991) reveals that creative individuals have the characteristics of awareness and sensitivity to problems, good memory, and a high degree of adaptability. Isaksen and Lauer (2002) believed creativity is to re-hypothesize, revise or remodel the hypothesis to solve the problem; therefore, the ability of solving unknown problem is called creativity. Ambile (1997) has stated that creativity comes from the interaction between right and left part of brain. Amabile (1997) further states that psychologists are concerned on its motivation, if individual has high passion for

one thing or really love to do one thing, then the creativity will be produced and well performed. People will be most creative when they are primarily intrinsically rather than extrinsically motivated (Amabile, 1997). To increase employees' creativity, their supervisor should be supportive in the organization (Remond *et al.*, 1993). Supervisory encouragement is a controllable and most direct factor for creativity (Amabile *et al.*, 2004). Researchers found that environmental factors have more to do with the creativity (Amabile, 1988; Woodman *et al.*, 1993). Oldham (2002) has stated that the only way is to stay in the creative surrounding is to simulate new ideas for better organizational innovation; so, creativity can be created, and how to stimulate employee's creativity will be an important task. Creativity is the prerequisite for an organization's innovation, effectiveness, and long-term survival, and it facilitates an organization's adjustment to shifting environmental conditions and to take advantage of emerging opportunities (Shalley *et al.*, 2004).

Trust

La Porte and Metlay (1996) have stated that trust is what trustor believes; the trustee will consider trustor's positive advantage even the trustor will not control or interrupt the trustee's negative behavior. Mayer *et al.* (1995) believe that trust is trustor-based on the expectation of others, irrespective of the capability of controlling the trustee; he or she is willing to explore him or herself in a risky situation. From expectative perspective, trust is a kind of situation that relates with positive expectation from others motivation and being involved with unknown or non-controlling risk (Lewicki & Bunker, 1996).

McAllister (1995) has explained the interpersonal trust as cognitive-based trust and affect-based trust, which are widely discussed in the literature on trust. Cognitive-based trust refers to the rational decision to trust or to withhold trust from another employee. Affect-based trust, on the other hand, is more emotional than rational. It evolves over a period of time into a deep workplace relationship with both parties making an emotional investment to each other (Lewis & Weigert, 1985; McAllister, 1995; Costigan *et al.*, 1998). Care and concern for each party in the relationship typify this from of trust. Establishing relationship based on cognition-based judgments, such as competence and reliability, are thought to be more common in the workplace whereas forming a deep, caring relationship based on affect-based trust are probably less common, especially in the typical employees-supervisor relationship.

McAllister (1995) has argued that trust can be vertical (supervisor-subordinate, subordinate-supervisor) as well as horizontal (peers). Most of the previous researches

on hierarchical trust examined the subordinate employee's trust of their immediate supervisor (Costigan *et al.*, 2006). A meta-analysis of 106 studies about trust-in-leader conducted by Dirks and Ferrin's (2002) concluded that both the top-down and bottom-up trust were important factors. "Because trust starts with the supervisor, the top-down perspective to hierarchical trust (i.e. the supervisor's trust of the subordinate) takes on added importance" (Costigan, *et al.*, 2006, P. 764). This study focuses on the supervisor's affect-based trust and cognition-based trust of the subordinate.

Leader's supportive behavior and creativity

Leaders do not necessary to have their own special creativity but they have to know how to manage others' creation and enhance others' potential (Tushman & O'Reilly, 1997). Leaders can affect employees' creativity in three ways: First, defining problem and showing an organizational vision in the long-term over short-term business outcomes more clearly, for example, growth and value rather than profit. Second, by building supportive climate and culture for creativity in the organization. Third, the leader can set up reward system for employees to involve in intrinsic and outer motivational environment (Jung *et al.*, 2008). The supervisor's support will increase the subordinate's creativity, but if the leader controls too much or with many limitations, then the subordinate's creativity will decrease (Deci & Ryan, 1987). Oldham and Cummings (1996) believed that management should support and avoid controlling to enhance creativity in employees. Creativity literature has strongly emphasized the positive effect of supervisory support on creativity (Scott & Bruce, 1994; Oldham & Cummings, 1996; Tierney *et al.*, 1999; Tierney & Farmer, 2002; Shin & Zhou, 2003, as cited in Wang & Cheng, 2009; Gong *et al.* (in press)).

The link between supervisory support and creativity has been relatively well established in the literature. For example, Andrews and Farris (1967) found that employees' creativity was higher when managers listened to their concerns and asked for their input into decisions affecting them. Andrews and Gordon (1970) found that negative feedback from leaders inhibited creativity. Redmond *et al.* (1993) found that the leaders' behavior that contributed to problem construction and feelings of high self-efficacy led to a greater creativity among subordinates. Scott and Bruce (1994) found that the quality of the exchange or relationship between a supervisor and his or her subordinate (i.e., leader-member exchange, LMX) was related to the subordinate's innovativeness. Tierney *et al.* (1999) found that open interactions with supervisors and the receipt of encouragement and support draw them lead to enhanced employees' creativity.

Based on the research findings, the leader should encourage and support their employees as well as develop nurturing relationships. If leaders are supportive, creative activity is more likely to occur. However, the research on supervisor's supportive role consistently finds that contextual factors interact with the individual characteristics to affect creative performance. Therefore, leaders need to understand their employees to provide the right levels of support needed for the creativity to occur. Leadership needs to play an active role in fostering, encouraging, and supporting creativity. Hence, the role of the leader is to ensure that the structure of the work environment, the climate and culture, and the human resource practices (e.g., rewards, resources, goals, and expected evaluations) are such that creative outcomes can and do occur. On the basis of findings from the literature reviewed, the following hypothesis was formulated:

H1: Leader's supportive behavior is positively associated with the subordinate's creativity.

Trust and creativity

George and Zhou (2007) have stated that trust in a supervisor encourages employees to take the risks inherent in creativity. When employees trust their supervisors, they will have confidence that their supervisors will be responsive to creative ideas and will have the competence and knowledge to evaluate their feasibility and the dedication to implement them. The trust in the leader will make employees feel free to have new ideas and engage in innovation (Chandler *et al.*, 2000). Trust accelerates bilateral negotiation, and the quality of cooperation makes personnel more efficient in the organization (Young & Wilkinson, 1989). According to Mayer *et al.* (1995) trust affects employees' degree of risk-taking and influences their willingness to share information. If there is no trust relationship, employees will worry about the negative side of knowledge sharing. Therefore, there should be some influences between the leader and employee's trust relationship to share information and developing creativity. Although trust can be conceptualized differently, what McAllister (1995) and others (Lewis & Wiegert, 1985) have referred as cognition-based trust is key to understand how supervisors can provide a supportive context for creativity. Costigan *et al.* (2006) has found that supervisor's cognitive-based trust and affect-based trust of the employees are associated with the employee's enterprising behavior. The presence of trust also allows the employee to speak openly and candidly with the boss (Mishra, 1996). The supervisor has to have trust in the employee's competence, which then provides an empowered employee a platform from which to take initiative and appropriate risks, and to be accountable and creative (Quinn & Spreitzer, 1997).

Costigan *et al.* (2006) have mentioned that the supervisor's strong affect-based and cognitive based trust of the subordinate will prompt the employee to take more risks, exhibit more creativity, take initiative, speak their mind, and be energized and motivated in the workplace. A subordinate employee would be less likely to take risks or speak out unless trust is present in the relationship with the boss.

Literature on empirical evidence strongly support that both the leader's trust of subordinate and the subordinate's trust of leader positively impact the subordinate's creativity. But in this study, only the leader's trust of the subordinate has been carried out. On the basis of findings of the reviewed literature, the following hypotheses were formulated:

H2-1: Leader's affect-based trust of subordinate and the subordinate's creativity are positively associated.

H2-2: Leader's cognitive-based trust of subordinate and the subordinate's creativity are positively associated.

Supportive behavior, trust and creativity

Wang and Cheng (2009) concluded that creative role identity and job autonomy have significant moderating effects on the relationships between a benevolent leadership and creativity. When each moderator is high, the positive relationship between a benevolent leadership and creativity is stronger; when each moderator is low, this relationship becomes weaker. Subordinates who exhibit a high creative role identity tend to treat benevolent leadership as an important support for their creative process, which suggests a positive moderating effect on the benevolent leadership and creativity relationship (Wang & Cheng, 2009). Like benevolent leaders, supportive supervisors show concern for the subordinate's feelings and needs, provide positive and informative feedback, and help the subordinate develop necessary skills (Deci & Ryan, 1987).

Shin and Zhou (2003) have mentioned that (1) transformational leadership was positively related to the follower's creativity, (2) followers' "conservation," a value, moderated that relationship, and (3) intrinsic motivation mediated the contribution of the interaction of transformational leadership and conservation and partially mediated the contribution of transformational leadership to creativity. Madjar *et al.* (2002) found that the work and non-work support made a significant, independent contribution to creative performance where a positive mood mediated these relations; as a rsult, employees with less creative personalities responded most positively to non-work support. Based on these findings, it can be argued that the leader's cognitive-based trust and affect-based trust of the subordinate moderates the

relationship between the leader's supportive behavior and the subordinate's creativity. On the basis of findings from the literature reviewed following hypotheses were formulated:

H3-1: Affect-based trust moderates the relationship between the leader's supportive behavior and the subordinate's creativity.

H3-2: Cognitive-based trust moderates the relationship between the leader's supportive behavior and the subordinate's creativity.

On the basis of the reviewed empirical evidences regarding relationships between dependent variable (subordinate's creativity), independent variable (leader's supportive behavior) and moderating variables (affect-based trust and cognitive based trust), a theoretical framework has been formulated. Relationship between variables under this study has been framed as shown in the figure 1.

Figure 1. Theoretical framework– Leader's supportive behavior and trust and subordinate's creativity
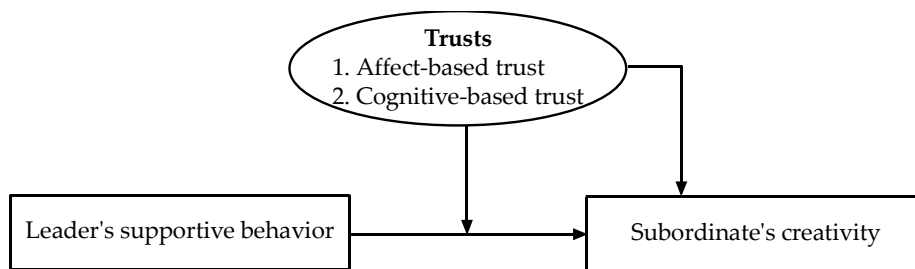
The perceived leader's supportive behavior directly impacts their subordinate's creativity. The leader's affect-based trust as well as cognitive-based trust directly impacts the subordinate's creativity. Therefore, the leader's trust of subordinate cannot be ignored in the relationship between leader's supportive behavior and subordinate's creativity. While the leader's supportive behavior and leader's trust individually and directly impact the subordinate's creativity, the leader's affect-based trust and cognitive-based trust moderate the relationship between the leader's supportive behavior and the subordinate's creativity.

Methods

Sample

Sample of the study was selected from the population of employees involved in white-collar jobs in Nepali travel agencies. A total 16 travel agencies from the

Kathmandu valley were selected. Two sets of questionnaire (Set A for the leader and Set B for the subordinates) were distributed. With the support of contact, questionnaires were distributed to the leader and subordinates in pairs. Both set of questionnaires required to write the names of their subordinates or the leaders. A total 150 pairs of questionnaire had been distributed.

A total 125 pairs of questionnaire were returned, but 11 pairs were not matched with the concerned leader and the subordinate. Only 114 pairs (76%) of questionnaires were usable for the analysis. In the 114 pairs of respondents, 183 individual respondents participated. Out of 183 respondents, a total of 69 respondents were leaders and 114 were subordinates. Among 114 pairs of leaders and subordinates, 6 pairs were composed of 1 leader with 6 subordinates, 10 pairs were composed of 2 leaders with 10 subordinates, 8 pairs were composed of 2 leader with 8 subordinates, 15 pairs were composed of 5 leaders with 15 subordinates, 32 pairs were composed of 16 leaders with 32 subordinates, and 43 pairs were composed of 43 leaders with 43 subordinates.

Among 114 composited leader-subordinate pairs, 50 leaders were executives and 64 were managers, 77 leaders were males and 37 were females, 73 leaders were having working experience more than 10 years and 41 were having 5 to 10 years of experience, 58 leaders had post-graduate, 40 were graduates, and 16 had under-graduated degrees. A total of 89 leaders were below 30 years, and 25 were between 30 to 50 years. Similarly, 92 subordinates held an assistant level post and 22 were officers, 73 subordinates were females and 41 were males, 73 subordinates had working experiences of less than 5 years, 32 had between 5 years to 10 years, and 9 had more than 10 years of experience. A total of 82 subordinates were graduates and 32 were under-graduates, 89 subordinates were less than 30 years old and 25 were between 30 to 50 years.

Measures

Perceived leaders' supportive behavior

The perceived supportive behavior of the leader has been measured by 9 -items measures developed by Greenhaus *et al.* (1990; as cited in Fields, 2002) to assess the subordinate's perceptions of the extent to which they received supervisory support in their job. Its coefficient alpha was .98. Responses had been obtained using 5- points Likert-type scale where 1 = strongly disagree and, 5 = strongly agree. This scale was revised in this study which originally was 1= strongly agree and 5 = strongly disagree, to make same order of agreement with other scale of measure throughout this study. The perceived supportive behavior of the leader was rated by their own subordinates.

Trust

Trust has been measured by using 5 items affect-based trust and 6 items cognitive-based trust test developed by McAllister (1995). These measures have been widely used by scholars to measure interpersonal trust (e.g. Costigan *et al.*, 2006; George & Zhou, 2007). Originally, these were developed to measure both vertical as well as horizontal interpersonal trust. In this study, it has been used to measure the top-down trust, that is, the leader's trust of the subordinates. Response for both affect-based trust and cognitive-based trust has been obtained by using 7-points Likert-type scale where 1 = strongly disagree, and 7 = strongly agree. The leader's cognitive-based trust and affect-based trust of the employees has been rated by leader themselves. Such a self-rated approach to measure the top-down interpersonal trust is consistent with the previous study of Costigan *et al.* (2006). Cronbach's alpha value for the ability-based trust and cognitive-based trust were .93 and .95 respectively.

Creativity

Subordinate's creativity has been measured by using 13-items scale developed by Zhou and George (2001) on a five-point Likert- type scale ranging from 1 = not at all characteristic to 5 = very characteristic. This measure has been used in numbers of studies (e.g. Farmer *et al.*, 2003; Shin & Zhou, 2003; Gumusluoglu, 2009; Wang & Cheng, 2009). The subordinate's creativity has been measured by the leader's perceptual ratings which is consistent with previous research (e.g. Oldham & Cummings, 1996; Tierney *et al.*, 1999; Madjar *et al.*, 2002).

Method of data analysis

Data analysis was carried out by using SPSS program. Frequency distributions were calculated to describe the demographic variables of the leaders and the subordinates. Histogram and normal probability plot were plotted to test the normality of the residual. Pearson correlation was calculated to identify the relationship among variables. Multicollinearity diagnostic was tested to measure the multicollinearity among the independent variables. An explorative factor analysis was carried out to measure the loaded factor in our cultural setting. Simultaneous multiple regression analysis was conducted to measure the significant association of dependent variables and independent variables. Hierarchically moderated regression analyses were conducted to measure the interactive (moderating) effect of the ability-based trust and the cognitive-based trust on the relationship between the leader's supportive behavior and the subordinate's creativity. F-test was conducted to measure the significance of the overall model and t-test was conducted to measure the significance of association of discrete variables. ModGraph, an excel-based application, was used for graphic presentation of the interactive relationship of the variables.

Results

Table 1 depicts the means, standard deviations (SD), zero-order correlation, and reliability coefficients (Cronbach alpha) of all the variables studied. Respondents reported a mean level of subordinate's creativity of 3.10 and the leader's supportive behavior of 3.59 (where 5-point Likert-type scale was used) with standard deviation of.84 and 1.16 respectively.

Table 1. Descriptive statistics, correlation matrix and reliability coefficient of the variables studied

SN		Mean	SD	1	2	3	4
1	Subordinate's Creativity	3.10	.84	(.97)			
2	Leader's Supportive Behavior	3.59	1.16	.89***	(.98)		
3	Ability-based Trust	4.40	.95	.60***	.30***	(.93)	
4	Cognitive-based Trust	4.40	1.01	.59***	.28***	.99***	(.95)

Notes: N = 114, *** Correlation is significant at the.01 level; value of Cronbach alpha are in parenthesis

Both the cognitive-based trust and affect-based trust reported a mean level of 4.40 (where 7-point Likert-type scale was used) with standard deviation of .95 and 1.01 respectively. As expected, all the variables are significantly correlated (p < .01). The value of reliability coefficients of different constructs were between .93 and .98 which indicated that the individual constructs are all consistent in their measurement.

The Pearson correlation coefficient of independent variables of affect-based trust and cognitive-based trust was .99. It was the issue of multicollinearity and VIFs (variance-inflating factor) were calculated. VIF were less than 10 except, in case of interactive variables. Multicollinearity will not be problematic if VIF is less than 10 (Adnan *et al.*, 2006). Even VIFs are more than 10 and are caused by the inclusion of powers or products of other variables, there won't be a problem of multicollinearity (Paul, 2012). Since the measures of variables were used in different cultural setting than its original use, an exploratory factor analysis was conducted and a total of 33 items were loaded within four categories. It implied that the data collected in this study did not mislead due to cultural differences.

Table 2 depicts the 7 different models of regression equation. Regression model 1, measures the direct association of the independent variable (leader's supportive behavior) to predict the dependent variable (subordinate's creativity). Both the regression model 2 and regression model 5 measure the direct association of the moderating variables (affect-based trust, and cognitive based trust) to predict the dependent variable (subordinate's creativity). The regression model 3 and regression model 6 measure the association of moderating variables (affect-based trust and cognitive-based trust) to predict dependent variable (subordinate's creativity) with control of dependent variable (leader's supportive behavior). The regression model 4

and regression model 7 measure the interactive (moderating) association of the independent variable (leader's supportive behavior) and the moderating variables (affect-based trust and cognitive-based trust) to predict the dependent variable (subordinate's creativity). In regression model 1, the leader's supportive behavior is statistically significant ($\beta = .655$, $p = .000$) to predict the subordinate's creativity. In regression model 2, the ability-based trust is statistically significant ($\beta = .533$, $p = .000$) to predict the subordinate's creativity. In model 5, the cognitive-based trust is statistically significant ($\beta = .496$, $p = .000$) to predict the subordinate's creativity. As per the Table 1, the zero-order correlations among all variables were positively statistically significant; coefficients of β in regression model 1, regression model 2, and regression model 5 are positively statistically significant; F value of these three regression models is statistically significant. That is why the hypothesis 1 (H1), hypothesis 2-1 (H2-1) and hypothesis 2-2 (H2-2) of this study were accepted.

Table 2. Hierarchical moderating regression models

Dependent variable	Subordinate's creativity						
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 6 (β)	Model 7 (β)
Independent variable							
1. Leader's supportive behavior	.655***		.575***	1.273***		.579***	1.188***
2. Affect-based trust		.533***	.323***	.939***			
3. Affect-based trust x leader's supportive behavior				-.166***			
4. Cognitive-based trust					.496***	.311***	.832***
5. Cognitive-based trust x Leader's Supportive Behavior							-.144***
R Square	.808	.360	.929	.969	.353	.936	.971
Adjusted R Square	.807	.350	.928	.968	.347	.935	.97
R Square Change			.121***	.040***		.128***	.035***
F value	472.57***	63.51***	726.81***	1142.62***	61.31***	814.70***	1222.69***
P value	.000	.000	.000	.000	.000	.000	.000

***: $p < 0.01$

In regression model 3, the leader's supportive behavior was entered as a control variable in step 1; the affect-based trust was entered as the predictor in step two with of leader's supportive behavior as a control to predict the subordinate's creativity; beta (β) value as well as F value of both predictor was statistically significant. Change in R square (i.e. .929 - .808 = .121) was significant. In regression model 6; leader's supportive behavior was entered as a control variable in step 1; the cognitive based trust was entered as the predictor in step two with leader's supportive behavior as a control to predict the subordinate's creativity. Beta (β) value as well as F value of both predictors was significant at 1% level of significance. Change in R square (i.e. .936 – .808 = .128) was significant. The statistic significance of β value, F value, as well as change in R square in regression model 3 and model 6 indicate that in a hierarchical regression model with leader's supportive behavior as control of independent variable; both ability-based trust and cognitive-based trust individually increase the level of subordinate's creativity. Though, model 3 and model 6 are not directly related to the objectives of this study, they help explain the model 4 and model 7.

In regression model 4, in the first step, leader's supportive behavior was entered; in the second step, affect-based trust was entered; and in third step, interaction of leader's supportive behavior and affect-based trust was entered in the hierarchical regression model. In this regression model, change in R square (.969 –. 929 = .040) was statistically significant at 1% level of significance. In regression model 7, in the first step, leader's supportive behavior was entered; in the second step, cognitive-based trust was entered; and in third step, interaction of leader's supportive behavior and cognitive based trust was entered in the hierarchical regression model. In this model, change in R square (.971 –. 936 = .035) was statistically significant at 1% level of significance. The Beta values of the interactive terms (i.e. beta value of regression model 4 and 7) were not interpreted because the interpretation of beta value of interactive term is wrong (Jose, 2008). However, the moderating (interactive) effect of ability-based trust and cognitive based trust (considering significance of change in R^2 in model 4 and model 7) were statistically significant. So, hypothesis 3-1 (H3-1) and hypothesis 3-2 (H3-2) were supported.

In regression model 4 and regression model 7, the statistical significance of change in R^2 due to the addition of the interactive term is typically used as the criterion of the effect size of the interaction. However, researchers (Champoux & Petter 1987; as cited in Witt *et al.*, 2000) have argued that the change in R^2 does not adequately reflect the magnitude of the impact of the moderator variable. As noted by Witt and Nye (1998; as cited in Witt *et al.*, 2000), a limitation of using the change in R^2 as the only estimate of the effect size of the interaction is that it provides a conservative estimate, as it reflects the average effect of a moderator across the entire

range of values of a predictor. To address this issue, three levels (high, medium, and low) of criterion effect have been identified (Cohen 1988; Aiken & West 1991). In this study, regression model 4 and regression model 7 were introduced in ModGraph, an excel-based application that displays the interaction graphics for an easier interpretation as advocated by Jose (2008). Figures 2 and 3 displays the statistical interaction of dependent, independent and moderating variables. Statistical interactions occur when lines are not parallel (Jose, 2008). Lines displaying interacting effect by both affect-based trust and cognitive based trust were not parallel (figures 2 and 3), so the graphic presentation of statistical interactions confirmed the results reflected by change in R^2 in regression model 4 as well as regression model 7.

Figure 2. Moderation by the affect-based trust in the relationship between leader's support and subordinate's creativity
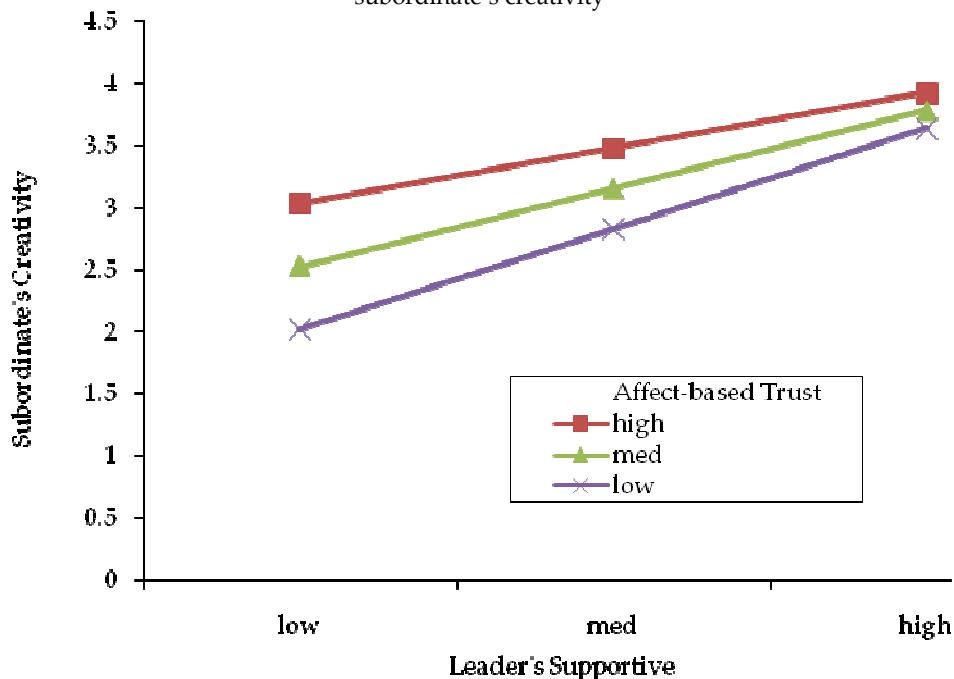
Figure 2, depicts the statistical interactional effect of the affect-based trust and the leader's supportive behavior to predict the subordinate's creativity. The leader's supportive behavior to the subordinate's creativity relationship was relatively strongest in the case of low affect-based trust and weakest in the case of high affect-based trust. Employees of different levels of affect-based trust were relatively less varied in the subordinate's creativity under the condition of leader's higher supportive behavior, but more differences were noted under the condition of leader's lower supportive behavior.

Figure 3. Moderation by affect-based trust in the relationship between leader's support and subordinate's creativity
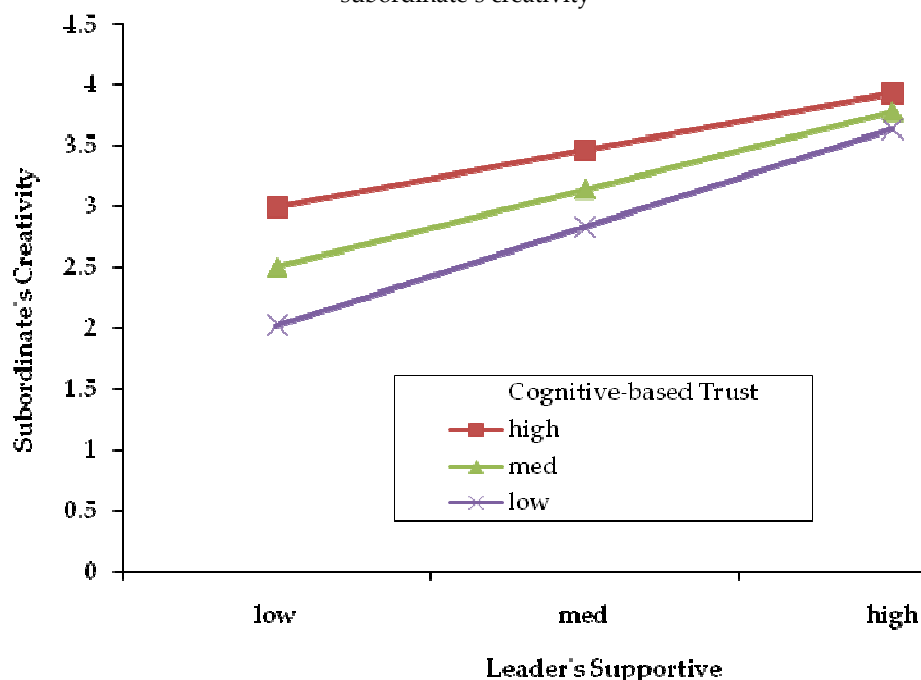

Figure 3, depicts the statistical interactional effect of cognitive-based trust and the leader's supportive behavior to predict the subordinate's creativity. The relationships between the leader's supportive behavior and the subordinate's creativity was relatively strongest in the case of low cognitive-based trust and was weakest in the case of high cognitive-based trust. Employees of different levels of cognitive-based trust were relatively less varied in creativity under the condition of a leader's high supportive behavior, but they were more different under the condition of a leader's low supportive behavior.

Discussion

This study attempted to explain the direct effects of a leader's supportive behavior both ability-based trust and cognitive-based trust on the subordinate's creativity in Nepali travel agencies. Moreover, it attempted to explain the interacting (moderating) effects of a leader's affect-based trust and cognitive-based trust in the relationship between the leader's supportive behavior and the subordinates' creativity. This study confirmed that 1) the leader's supportive behavior positively and significantly impacts the subordinate's creativity, 2) the leader's both ability-based trust as well as cognitive-based trust of the subordinate positively and

significantly impacts the subordinate's creativity, 3) the relationship between the leader's supportive behavior and the subordinate's creativity was statistically significantly moderated by the affect-based and cognitive-based trust.

The perceived supportive behavior of the leader positively impacts the subordinate's creativity; this finding correspond with the previous studies (e.g. Deci & Ryan, 1987; Schein, 1992; Scott & Bruce, 1994; Oldham & Cummings, 1996; Tierney *et al.* 1999; Shin & Zhou, 2003; Tierney & Farmer, 2002). Changes are necessary for success in competitive world; changes require creativity and innovation, so creativity is a must in any organization for its survival, growth and to have a competitive advantage. This study confirms and emphasizes that, even in the Nepali cultural context, creativity of the subordinate can be increased through the leader's supportive behaviour.

In addition, the leader's cognitive based-trust and affect-based trust of subordinates positively impacts the subordinate's creativity; this finding corresponds with the prior studies (e.g. Lewis & Wiegert, 1985). If a leaders trust their subordinates, the subordinate gets more work autonomy, gets opportunities to take increases the confidence which contribute to develop the subordinates as more creative and innovative workers.

The leader's cognitive-based trust and affect-based trust significantly moderate the relationship between the leader's supportive behavior and the subordinate's creativity. There was no difference between the leader's affect-based trust and cognitive-based trust as the moderator in this study. As depicted in figure 2 and figure 3, strength and direction of association of both types of trust were almost the same in the relationship between the leader's supportive behavior and the subordinate's creativity. Even the correlation between these two trusts were so strong (Table 1), that the employees working in Nepali travel agencies have an understanding that makes no difference between these two types of trust. Figures 2 and 3 clearly depict that the relationship between the leader's supportive behavior and the subordinate's creativity was relatively weak under the condition of high i) leader's trusts (i.e. affect-based trust in figure 2 and cognitive-based trust in figure 3) of subordinate, ii) leader's supportive behavior, and iii) both leader's trust as well as subordinate's creativity; and vice versa. It means, when subordinates were highly supported and trusted by their leader, they get spoilt and increase their creativity relatively in small scale than in the condition of low supportive behavior and trust. It does not mean that the leader's support and trust are not necessary for the subordinate's creativity but an excess if a support and trust together spoil the subordinates reducing their creative behavior and actions. Gargiulo & Ertug (2006) have recognized the need for a better understanding of the negative aspects of trust. They claim that excessive trust may

have negative effects for individuals and organizations and this negative effect can occur. Another logic behind the relatively weak moderating effect of the leader's trust in the relationship between leader's supportive behavior and subordinate's creativity at the condition of high trust and supportive behavior can be that the leader's excessive support and trust towards the subordinate enhances more dependency of the subordinate in the leader.

Based on the findings of this study, it was concluded that the subordinate's creativity can be increased by increasing the leader's supportive behavior and trust of subordinate. The leader's trusts of subordinate moderates the relationship between leader's supportive behavior and subordinate's creativity, which means that for a strength of relationship between the leader's supportive behavior and the subordinate's creativity depends on the level of leader's trust on the subordinates.

Implications and direction for future study

On the basis of this study, it can be deduced that the practitioners can explore and increase their subordinate's creativity by increasing supportive behavior and trust. Furthermore, considering the interactive effect the creativity can be increased specially in employees with low level of trust by increasing the support and trust towards them.

However, this study has some limitations to generalize the conclusion; first, the sampling of this study was on the convenience of researcher; therefore, while carrying out survey as the convenience of a single researcher, there may be chances of under-representation of population. Second, Gulser *et al.* (2012) has mentioned that the trusts as trust in manager, trust in subordinate, trust in colleague and trust in organization, but this study has included only trust in the subordinate. Trust in an organization and trust in colleagues may also affect the creativity of the subordinate. Third, the study design of this was cross-sectional without considering the situational factors like the use of technology where direction of causality and situational factor cannot be ascertained. Forth, leader-subordinate pairs were chosen by a referent who also was responsible to administer questionnaire within his/her organization; so accuracy of the data somehow depends on referent person. So, future studies can be more generalizable if they are carried out incorporating the limitations pointed out in this study.

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PREVALENCE OF HEALTH ALTERATION AMONG SENIOR CITIZENS

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Abstract: *A descriptive exploratory research design was used to assess the prevalence of health alteration among senior citizens living in the selected geriatric homes of Kathmandu valley. A total of 100 senior citizens were selected by using census method. Data were collected through structured and semi structured interview schedule and from an observation check list. Data were coded and entered in statistical package for social science (SPSS) program version 16, using descriptive and inferential statistics. Findings of the present study showed the prevalence of health alteration among the respondents, which include; sleep disorder, problem in eating or feeding, Incontinence; urine and stool, confusion, history of fall, risk of fall and skin impairment. Moreover, urinary incontinence was significantly higher in increasing age, likewise, sleep disorder was significantly high among women.*

Introduction

Globally, the population of older persons is growing at the rate of 2.6% per year, considerably faster than the population as a whole, which is increasing at 1.2 per cent annually. At least until 2050 A.D., the older population is expected to continue growing more rapidly than the population in other age groups. The pace of population ageing is faster in developing countries than in developed countries. Consequently, developing countries will have less time to adjust to the consequences of population ageing.

The population of Nepal's senior citizens (above as 60 yrs) has increased from 6.5% in 2001 to 9.1% in 2011. Over the same period, Nepal's population has increased by 15% making the total population 26.6 million from 23 million of 2001 (CBS, 2011). With the aging the seniors have been facing varieties of problems affecting their health. However, their health has not been the focus of care providers. The major problems experienced by older adults include: sleep disorders, problems with eating or feeding, incontinence, confusion, falls, and skin breakdown (Fulmer, 1991).

The increase in the number of senior citizens in a developing economy like Nepal will surely bring challenges needs. Aging problem is an important issue in Nepal.

Rapid and unplanned urbanization and modernization result in socio- economic and cultural change in society that directly affect the situation of senior citizens. Hence, an assessment of the prevalence of sleep disorder, problems with eating or feeding, incontinence, confusion, history and risk of falls and skin break down among senior citizens was done in geriatric homes.

Methodology

Research design

An explorative descriptive study design was used to find out the prevalence of health alteration among senior citizens. The study was done in various geriatric homes of Kathmandu valley having 164 senior citizens. The researcher choose the six geriatric homes for study: Ama Ko Ghar, Mata Tirtha Old Age Home, Nisahaya Sewa Sadan, Siddhi Shaligram Old Age Home, Dev Corner Sewa Samiti and Janak Baba Ashrit Mandir, having 45, 17, 40, 35, 18 and 9 senior citizens, respectively. Census method was used to select the subjects to meet the criteria**.**

The sample size was 100**,** who were suffering from dementia, psychotic disorders, seriously ill or deaf.

Two types of instrument were developed, an interview schedule and an observation check list. The content validity of the instrument was established by consultation with peers, research advisors and experts**.** Pretestation of the instrument was conducted with 17 (10%) sample in Pashupati Bridha Ashram for adequacy and completeness. Instrument was modified following a pretest.

Data analysis procedure

The collected data were checked, organized and coded, and entered in SPSS (Statistical Package for the Social Sciences) 16 versions for analysis. The data were analyzed by using different descriptive statistics like frequency, percentage, mean, standard deviation and inferential statistics; chi-square test was conducted at 5% level of significance.

Results

Majority (56.0%) of the respondents were in the group of more than 75 years. Mean age ±S.D. (74.91±9.603), age range was 60-98 years. Most (84.0%) of the respondents were female. Caste/Ethnic distribution showed that majority (56.0%) belonged to Newar, Gurung, Magar and Tamang castes. Majority (69.0%) followed

Hinduism. Most (90.0%) of the respondents were married (including divorced, widow/widower, seperated), and majority (62.0%) of respondents were illiterate (Table 1).

Table 1. Demographic characteristics of respondents

	n=100
Characteristics	**%**
Age	
60-74 years	44.0
75 years and above	56.0
Sex	
Male	16.0
Female	84.0
Caste/ Ethnicity	
Brahmin/Chhetri	44.0
Others (Newar, Gurung, Magar &Tamang)	56.0
Religion	
Hindu	69.0
Others (Buddhist, Christian)	31.0
Marital Status	
Married	90.0
Unmarried	10.0
Educational Status	
Illiterate	62.0
Literate	38.0

Eighty four percentage of respondents had sleep disorder. Most (94.1%) of them had difficulty in falling asleep, followed by 91.6 percent respondent who had sleeping on and off during night. Similarly, 77.0 percent respondent had problem in eating or feeding. Majority (75.4%) of them suffered from the loss of appetite whereas, 15.6 percent had other problems including watering in mouth, gastric content reflux and abdominal discomfort (Table 2).

Table 2. Health alteration of respondents on sleep disorder and problem in eating or feeding

Descriptions	Number	%
Sleep Disorder (n=100)		
Yes		84.0
No		16.0
If yes, nature of sleep disorder* (n=84)		
Difficulty in falling asleep	79	94.1
Suddenly wake up at middle of night	09	10.8
Wake up early in the morning	17	20.3
Sleeping on and off during night	77	91.6
Problem with eating or feeding (n=100)		
Yes		77.0
No		23.0
If yes, nature of problem in eating or feeding* (n=77)		
Not feeling hungry	58	75.4
No taste in food/ Difficulty in swallowing	35	45.5
Bitterness in mouth	32	41.6
Other (Watering in mouth, Gastric content reflux, Abdominal distension)	12	15.6

* Multiple Responses

Sixty four percent respondents had urinary incontinence, among them, most (85.9%) of them had leakage of urine with feeling of urgency, only 3.1 percent had small amount of leakage continuously. Whereas, least (7.0%) respondents had stool incontinence, on regards to respondents who had stool incontinence, majority (57.1%) had intermittent soiling of cloths with stool (Table 3).

Table 3. Health alteration of respondents on incontinence, urinary and stool

Description	Number	%
Presence of urinary incontinence (100)		
Yes		64.0
No		36.0
If yes, nature of urinary incontinence* (n=64)	55	85.9
Leakage with feeling of urgency		
Leakage with physical activity, i.e. coughing, sneezing	28	43.8
Small amount of leakage continuously	02	3.1
Difficulty in emptying the bladder	09	14.1
Presence of stool incontinence (n=100)		
Yes		7.0
No		93.0
If yes, nature of stool incontinence* (n=7)		
Stool impaction and seepage of liquid feces and feeling frustrated	01	14.3
Prolonged loose stool	03	42.9
Intermittent soiling of cloths with stool	04	57.1

* Multiple Responses

All respondents had presented at least one risk factor for fall. Most (84.0%) of respondents had impaired vision, whereas 66.0 percent had different view about risk of fall (such as difficulty in walking, slippery floor and fear of fall). On regards to history of fall, 65.0 percent respondents had history of fall within the past 1 year. Among them majority (72.3%) had fallen less than 4 times (Table 4).

Table 4. Respondents health alteration on risk of fall and history of fall

Descriptions	%
Presence of risk for fall* (n=100)	
Impaired vision	84.0
Instability gait/balance	76.0
Forgetfulness or disorientation	71.0
Urinary leakage with urgency	64.0
Presence of dizziness or vertigo	65.0
Other (Difficulty in movement, Slippery Floor, Fear of Fall)	66.0
History of fall (within the past 1 year) (n=100)	
Yes	65.0
No	35.0
If yes, number of fall (n=65)	
Less than 4 times	72.3
4 times and more	27.7

*Multiple Responses

Forty percent respondents had confusion, among them majority (62.5%) were suffering from mild confusion. Similarly, on skin impairment, 84.0 percent subject presented skin impairment, among them majority (78.6%) had dry skin (Table 5).

Table 5. Respondents health alteration on confusion and skin impairment

Description	Number	%
Presence of confusion (n=100)		
Present		40.0
Not Present		60.0
If present, level of confusion (n=40)		
Mild	25	62.5
Moderate	15	37.5
Presence of skin impairment (n=100)		
Present		84.0
Not present		16.0
If present, skin condition (n=84)		
Dry skin	66	78.6
Dry skin +Redness over bony prominence	18	21.5

There is significant relationship between the age and urinary incontinence (chi square = 6.684 with 1 *df* and *p* = 0.010). Whereas, the relationship of age with sleep disorder, problem with eating or feeding, confusion, history of fall and skin impairment seemed insignificant (Table 6).

Table 6. Relationship of respondents age with health alteration

n=100

Health alteration	Age		χ2	*p*-value
	60-74 years	75 years & above		
Sleep Disorder				
Yes	37	47	0.000	0.982
No	07	09		
Problem with eating or feeding				
Yes	32	45	0.810	0.368
No	12	11		
Incontinence (Urine)				
Yes	22	42	6.684	0.010*
No	22	14		
Confusion				
Present	17	23	0.061	0.805
Not present	27	33		
History of fall				
Yes	25	40	2.312	0.128
No	19	16		
Skin Impairment				
Present	36	48	0.278	0.598
Not present	08	08		

Chi Square test * Significant at *P*<0.05 with 1 *df*

There is significant relationship of sex with sleep disorder (chi square =10.914 with 1 *df* and *p*= 0.003). But the relationship of sex with problem in eating or feeding, urinary incontinence, confusion, history of fall and skin impairment is not significantly related to each other (Table 7).

Table 7. Relationship of respondents sex with health alteration

n=100

Health alterations	Sex		χ2	*p*-value
	Male	**Female**		
Sleep disorder				
Yes	09	75	8.800	0.003*
No	07	09		
Problem with eating or feeding				
Yes	10	67	2.066	0.151
No	06	17		
Incontinence (Urine)				
Yes	09	55	0.497	0.481
No	07	29		
Confusion				
Present	05	35	0.608	0.436
Not present	11	49		
History of fall				
Yes	10	55	0.052	0.819
No	06	29		
Skin impairment				
Present	11	73	2.843	0.092
Not present	05	11		

Chi Square test * Significant at *P*<0.05 with 1 *df*

Discussion

The socio-demographic information revealed that majority (56.0%) of respondents were of 75 years and above, mean age ± S.D (74.91±9.603), age range 60-98 years. Most (84.0%) of the respondents were female. Caste/Ethnic distribution showed majority (56.0%) belong to other (Newar, Gurung, Magar and Tamang) group. While 69.0 percent respondents were Hindus. Similarly, most (90.0%) of the respondents were married (including divorced, separated, widow/widower). Moreover, 62.0 percent of respondents were illiterate.

Study findings revealed the prevalence of sleep disorder among respondents (84.0 percent), who had at least one symptom of sleep disorder. The most common symptoms of sleep problems was difficulty in falling asleep (94.1%), followed by 91.6 percent sleeping on and off during night, as well as waking up early in the morning 20.3 percent and sudden wake up at middle of night 10.8 percent. The finding is similar with the study result by Lindstrom *et al.* (2012), who found that 70% of the respondents had sleeping problem. According to Pando-Moreno *et al.* (2001), 58

percent of men and 76 percent of women had at least one symptom of sleep problem. In line with the findings of similar study conducted at Sweden, the most common symptom of sleep problem was interrupted sleep during the night (82%) with a greater percentage of women, than men (Lindstrom *et al.*, 2012). In contrast to Costa *et al.* (2011), 44.6 percent respondents had sleep problems, among them, 32.5 percent reported waking up during the night and not being able to sleep again. Similarly, for 27.9 percent it took too long to fall asleep and 29.3 percent slept poorly at night.

The present study result reveled that females have significantly higher (75%) sleep problem than males (9%), (X^2 =10.914, and *p*= 0.003). Similar findings were reported by Lindstrom *et al.* (2012) that 73% of women suffered from sleep problems (*p*=0.004) than men (66%). Likewise, the findings by Rocha *et al.* (2002), reported that the prevalence of insomnia was only (38.9%) in them and (45.3%) in women (*p* value < 0.001). The study result showed that age is not significantly related with sleep disorder. Instead, sleep problems tended to be more common with the increas of age (p<0.001), which revealed that, sleep problem was (59%) among 60 years, which increasingly (76%) seemed among the ages 90, 93, & 96 years (Lindstrom *et al.*, 2012).

Similarly, the prevalence of problem in eating or feeding among senior citizens was 77.0 percent. Majority (75.4%) did not feel hunger, 45.5 percent of respondents had no test in food and difficulty in swallowing; likewise 41.6 percent had bitterness in mouth; whereas, 15.6 percent had other problems such as watering in mouth, gastric content reflux and abdominal discomfort. No significant relationship between age and sex was recorded with regard to the problem in eating or feeding. The higher problem of eating or feeding might be due to various factors associated with aging i.e., difficulty in swallowing, gastric content reflux (loosening of the gastric spincture), change in taste, difficulty in transferring the food to their mouths. This was also identified by Weetch (2001), who statined that loss of teeth and ill-fitting dentures can make chewing uncomfortable. Reduced smell and taste may tend to render food bland and unappetizing. In some people, reduced or thicker saliva may make the mouth dry, increasing swallowing difficulty. Incomplete relaxation of the gastro-esophageal sphincter can make swallowing difficult, while weakening of the sphincter can allow reflux of food and gastric acid. Another reason for problem in eating may be the lack of money to buy the food according to their interest and favor.

The prevalence of urinary incontinence (UI) was 64.0 percent among the respondents in the present study. Most (85.9%) of respondents had leakage of urine with feeling of urgency. Similar type of study showed that an urge incontinence had a higher prevalence rate, with 36. 6% to 41. 6% of the elderly having at least an occasional problem (with 7. 5% to 9. 6% having problems often) (Chaojie & Andrews, 2002). The present study revealed that the urinary incontinence is significantly higher

with increasing age (X^2=6.684 and *p*= 0.010). In contrast to Sidik (2010), the prevalence of urinary incontinence was only (9.9%) among the elderly in Malaysia but it was significantly associated with age (*p* < 0.05). The present study raveled there was no significant relationship of sex with urinary incontinence. Instead, the finding by Teunissen *et al.* (2004) stated that prevalence rate of UI was two-times higher in women than in men; women are more at risk of developing UI than men because of their different anatomy, especially the weaker structure of their proximal urethra and the hypermobility of the bladder outlet.

Seven percent respondents had stool incontinence, among them 57.1% had intermittent soiling of cloths with stool, followed by prolonged loose stool (42.9%). In contrast a similar study conducted by Chassagne *et al.* (1999) among institutionalized elderly, 20 percent had fecal incontinence and was usually associated with acute diarrhea or fecal impaction.

The prevalence of confusion was 40.0 percent among the respondents, among which, majority (62.5%) had the presence of mild and 37.5 percent had a moderate confusion. The study showed that the relationship of age and sex with confusion is not significant. Similar type of study on different setting showed an acute confusion (delirium) among hospitalized elder with the prevalence range from four percent to 53.3 percent in medical inpatients (Milisen *et al.*, 1998; Bruce *et al.*, 2007; as cited in Sendelbach & Guthrie, 2009). While in long-term care, the prevalence ranged between 1.4% and 70%, there was significant increase of the risk of delirium with age (Lange *et al.*, 2013).

Moreover, all the respondents had at least one common risk factor of fall. Most (84.0%) of them had impaired vision, whereas 66.0 percent had different view about the risk of fall (such as difficulty in walking, slippery floor and fear of fall). Findings about the history of fall within 1 year showed 65.0 percent. Among them majority (72.3%) fell less than 4 times, followed by 27.7 percent have fallen more than 4 times. The study findings correspond with the findings by Fleming *et al.* (2008), who found that 58 percent respondent had fallen at least once in the previous year. In contrast, a study showed that only 25.6 percent reported falling in one year, but of those, 61.2 percent fell once, 21.4 percent fell twice, 7.8 percent fell three times, and 9.5 percent fell four or more times in the last year (Milat *et al.*, 2011). The present study showed age and sex are not significantly related with the history of fall. To the contrary of present study. Yu *et al.* (2009) reported the prevalence of falls was only (18.0%), higher (20.1%) in women than in men (14.9%), (*p* value=0.006), and increased with age ($\chi2$=10.37, *P*=0.001). The related factors of falls in the elderly included age >60-70 years, femininity, less physical activities, fear of future falls, living alone, severely impaired vision, health problems, chronic diseases (diabetes, hypertension, postural

hypotension, stroke sequela, cataract, arthritis, dementia and depression), medications (psychoactive, anti-diabetic), gait imbalance, high bed and faintly-lighted stairway.

Furthermore, the prevalence of skin impairment was 84.0 percent; of that majority's (78.6%) skin condition was dry. But no evidence of the skin breaks or pressure sore was found. There was no significant relationship between the age and sex with regard to skin impairment. In a report by Paul *et al.* (2011), 55.6 percent elderly people had xerosis (dry skin), but was significantly associated with older age (OR: 1.48, 95% CI: 1.16-1.89) and female sex (OR: 1.80, 95 CI%: 1.29-2.53). According to Finch (2003) the ageing process can adversely affect skin functioning.

The present study findings concerning senior citizen's health alteration should be considered to improve the quality of life of the seniors. There has been a predominance of women who were having all the problems. It might be due to the proportion of male respondents was lower only (16 person) than female (84 person) in the study.

Conclusion

It can be concluded that the senior citizens living in six selected geriatric homes of Kathmandu valley have high prevalence of health alterations including sleep disorder, problem in eating or feeding, incontinence (Urinary) history and risk of fall and skin impairment. Some respondents had the presence of confusion, and the least of the respondents had stool incontinence.

Acknowledgements

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COMMUNITY RESPONSE TO CLIMATE CHANGE AND FOOD SECURITY IN RUPA LAKE BASIN AREA, KASKI DISTRICT OF THE WESTERN NEPAL

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Abstract: *An assessment of food security was carried out on Rupa lake of Kaski district in the context of climate change. The lake is used to provide agriculture and animal husbandry facilities to over 85% of human population of the basin area. Based on total households sampled (n: 70), there was a year-round food security for 50% of HHs with >20% of them having food surplus, about 20% HHs have food security for more than six months and about 5% of HHs faced food insecurity for 9 months in a year. 90% of respondents observed that the impacts of climate change have been noticed in this period in the form of rise in temperature (>70% HHs); unpredictable rainfall (>75% HHs); rain shift (>60% HHs); phonological changes (>50%) and so on over the last 30 years. As result, about 75% HHs started adapting strategies against impacts that declined agro-production. Over 70% HHs applied chemical fertilizers and energy inputs; improved seeds (>20%), change in farming practice (about 20%) and so on to enhance agriculture production. Communities engaged in forest management for quality fodder to additional hybrid livestock and for the indirect income from NTFPs (10% HHs from 49 types of NTFPs). As a result, an abundance of fodder and fuelwood from forestry significantly increased which contributed directly to the livelihood whereas wild edible fruits, vegetables and fishery have augmented nutritional supplement.*

Keywords: *NTFPs, livelihood, climate change, climate impact, food security, adoption, food security, wetland.*

Introduction

Nepal is a food deficit and least developed country, having a population of more than 27 million people. Around 31 percent people in the country live below the poverty line. Around 49 percent of under-five children are chronically malnourished (NCCSP, 2014). Globally, Nepal ranks 109th out of 187 countries in terms of its Human Development Index (UNDP, 2013). Annual population growth rate of the country is 2.2 percent. It is estimated that the country's population in 2025 will reach 40.5 million and will have difficulty to meet the food requirements (Nutrition Country Profile, 1998; FAO, 2008). Taking this scenario into consideration Nepal will face serious food insecurity in future too. However, Nepal is rich in natural resource with

high biological value of wetlands that include high biodiversity of plants and genetic diversity of animals. Similarly, fresh water originating from the Himalayas creates many wetlands with beautiful natural environment. These facts indicate that Nepal has a good prospect in diversifying and increasing agricultural production through wetland management and conservation to alleviate poverty and attain sustainable livelihood. They are important resources in term of biological, hydrological, social, economic, religious and cultural values.

Nepal consists of more than 6000 rivers and rivulets, 3252 glaciers, 2323 glacial lakes covering 5,323 km^2. There is an enumeration of 163 wetlands covering 724,257 ha in the Tarai (IUCN, 1998). NLCDC has spotted 5358 lakes in Nepal. Lakes, both natural and artificial (reservoirs) are major resources for livelihood. Because of this, they are also highly vulnerable to human activities (development activities, human waste disposal, industrial pollution and other activities) if they are not properly preserved and used in a sustainable manner. Similarly, lakes are heavily influenced by natural causes such as earthquake, landslides, soil erosion, excessive rainfall and natural calamity and geographical limitation of Lake Ecosystem and neighbouring ecosystems.

Recently, in an international conference held in Kathmandu (April, 2014), climate change experts, researchers and academics pointed out that by 2050 the snow fed rivers of the Himalaya will dry and it will have adverse effect on climate change. To meet the challenges a scientific approach is being chalked out.

Climate change has raised many issues. Among them global warming is one of them. The Himalayan region has more vulnerability to global warming and climate change. Melting of ice, glacier, glacial lake outburst and floods have impact in eco-system. The effect is more serious in poor developing counties like Nepal. The annual increase in temperature per decade by 0.41°C is much higher than global average (Dahal, 2008). Climate change is relatively new challenge of global scale but have strong local effects.

Climate change has threatened the present and future food security of low income countries like Nepal. It is stated that agriculture, forestry and fisheries are highly sensitive to climate. It is very likely to have a serious impact on the productive functions. As a consequence, the production of food, feed, fiber, energy, or industrial crops, livestock, poultry, fish and forest products may decrease (FAO, 2008). It will worsen the living conditions of especially poor farmers, fisheries and forest-dependent people who are already vulnerable and food insecures. Therefore, people

are adopting community approach to face the adverse effect of climate change for food security and livelihood.

Rupa Lake is the third biggest lake of Pokhara valley. It supports a number of flora and fauna. The lake is under pressure from diverse anthropogenic factors. Water birds of Rupa Lake face a number of threats including trapping/hunting, fish farming using nets, habitat destruction by soil erosion, sedimentation and agricultural conversion, human disturbance, water pollution and eutrophication. However, the major focus of the study is to address the issues related to food security and adaptation strategies for livelihood in the context of climate change in Rupa lake area of Kaski district. Pokhara valley has heavy annual rainfall. If alternative measures were taken for conservation of rain water for augmentation reservoir, it will have positive effect in local climate change. This article is based on the research "Role of Wetlands in Food Security and Livelihoods of Local People in Rupa Lake Area in the Context of Climate Change" conducted in 2012 and funded by University Grant Commission. This article reflects a part of the study.

Materials and methods

This study was carried out in Gandaki zone of Kaski district at Rupa lake areas. It covers an area of 115 ha with marshes and paddy field shores in its basin of 30 km^2 surrounded by sub-urban structures, scattered hamlets and forests. Rupa is a small advancing eutrophic Lake that falls in 4 VDCs and wards 10 & 11 of Lekhnath Municipality in Kaski district of Nepal (28^0 08' 39.72'' N and 84^0 06' 29.29'' E). The study was limited to a small area within the lake basin of Rupa and had short time frame.

The lake area represents humid upper tropical and lower subtropical climate with mean annual temperature 19.3°C and precipitation 3157 mm. A total of 49749 (CBS, 2001) people resides in the basin areas with its 47 percent comprising of males and 53 percent to females. By ethnicity, 28.8 percent are Janajati, 53.5 percent Brahmin-Chhetri, 14.5 percent occupational caste and 3.2 percent others. The major occupation is subsistence agriculture. A very low percent of population is engaged in small business and hotel operation. The major occupation is subsistence agriculture (Oli, 1996).

Initially, the lake area was bigger than what it looks like these days. Over 60 percent of Lake area has been lost (IUCN, 1998) which is also evident from an elderly response of local people. The lake was 215 ha in 1964 which by 2000 has been reduced to 115 ha. At present, it is only about 90 ha (Field data, 2013).

Study site

The study was based on stratified random sampling technique for the questionnaire-based HH survey. Settlements were selected with heterogeneous ethnic groups. In addition to this, gender, caste, educational status and dependency of the

people on wetland were the criteria used for sampling. Samples were taken within the impacted areas of wetland (2 km radius of core Rupa Lake area and dependency area to the Lake areas). All together 20 percentage of HHs was surveyed in impacted area. *Sisteni, Upper Talbesi, Chaur, Devisthan, Stream Side (Khola Chau), Sundari Dada, Lower Talbesi, Jamankuna, Bhangara, Simaldada* settlements were sampled as research site. Out of 532 HH of the research site 70 HHs were selected for the direct HH survey method.

Food Security assessment was done using HFIAS method by asking nine questions (Coates *et al.*, 2006).

1. Did you worry that HH would not have enough food?

2. Were you or any HH member not able to eat the kinds of food you preferred because of lack of resources?

3. Did you or any HH member eat just a few kinds of food day after day due to lack of resources?

4. Did you or any HH member eat food that you preferred not to eat because a lack of resources to obtain other types of food?

5. Did you or any HH member eat a lesser amount of food than you felt you needed because there was not enough food?

6. Was there ever no food at all in your HH because there were not resources to get more?

7. Did you or any other HH member eat fewer meals in a day because there was not enough food?

8. Did you or any HH member go to sleep at night hungry because there was not enough food?

9. Did you or any HH member go a whole day without eating anything because there was not enough food?

The study was conducted by collecting both primary and secondary data. The primary data were collected through field observation/transect walk, group meeting, focus group meeting, semi-structured interview, stakeholder consultation (VDC leaders, villager elders, different stakeholders and communities), and laboratory analysis of water quality. Meteorological data are taken from the Department of Hydrology and Metrology, Nepal (2013). Wetland Inventory, Assessment and Monitoring Tool (WIAM) are used for overall assessment of lake (WIAM, 2011). The collected data was entered in the computer using SPSS statistical package and Microsoft Excel for process and analysis of data. Both qualitative and quantitative methods were used for the analysis.

Results and discussion

Food security in the context of climate change

The study was based in context to community response; above 65 percent of the respondents stated that as an impact of climate change, there has been a decline in crop production. However, the national agricultural statistics MoAD (as cited by Rajbhandari & Bhatta, 2008) does not agree with this community statement. The figure 1 shows the impacts of climate change in food security as per the community response during last 30 years. However, people could not respond adequately on increased vulnerability.

Figure 1. Impact of climate change in food security (%)
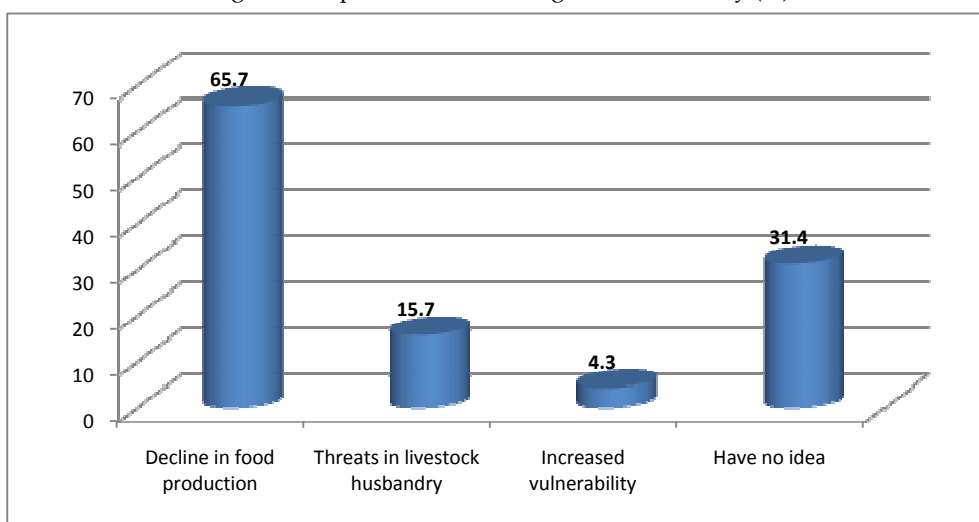
Source: Field data

It was found that 50 percent of the households produced food to meet their annual requirement from their own land that fulfilled their food requirement for the whole year, while the rest of the households did not have enough food production (Figure 2). There were 5 percent households that met their food requirement only for less than 3 months. The average production of paddy in the study area was 2451 kg/ha which is lower than that of the national average production for mid hills of 2706 kg/ha (MoAC, 2008).

Figure 2. Food security status in study area (%)
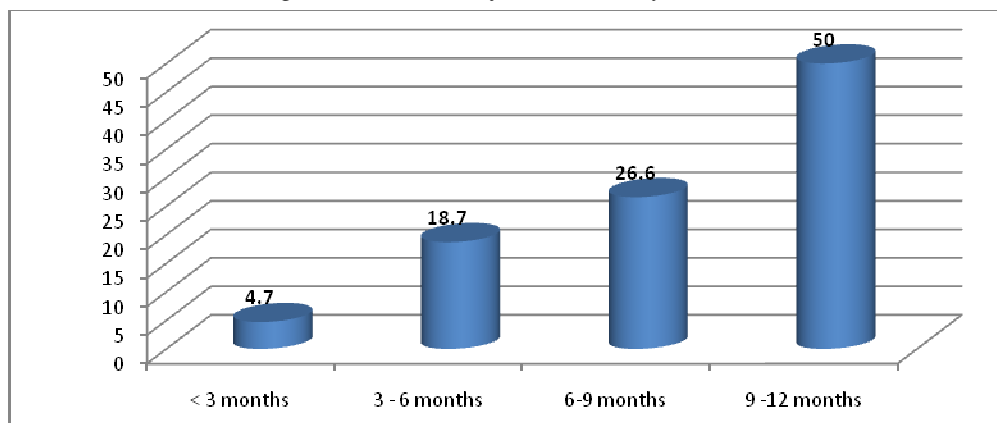
Food security assessment

Food security assessment was done by using Household Food Insecurity Access Scale (HFIAS) tool to measure Food Security (Coates *et al.*, 2006). A set of nine questions was used as a research tool and the data analysis was done as per that tool. The HFIAS indicator categorizes households into four levels of household food insecurity: excess food security, and mild, moderate and severe food insecurity. Table 1 illustrates this categorization. The categorization scheme is designed to ensure that a household's set of responses will place them in single, unique category.

Table 1. Categories of food insecurity (Access)

Question No	Never % (No of Sample)	Rarely (Once of twice in past 30 days)	Sometimes three to ten in the past 30 days	Often (More than ten times in the past 30 days)	Percentage of sample (in bracket is no of sample HH)
1.	57.1 (40)	15.7 (11)	17.1 (12)	10 (7)	100 (70)
2.	14.3 (10)	22.9 (16)	34.3 (24)	28.6 (20)	100 (70)
3.	15.7 (11)	27.1 (19)	38.6 (27)	18.6 (13)	100 (70)
4.	20.0 (14)	32.9 (23)	31.4 (22)	15.7 (11)	100 (70)
5.	87.1 (61)	4.3 (3)	4.3 (3)	4.3 (3)	100 (70)
6.	92.9 (65)	5.7 (4)	1.4 (1)	-	100 (70)
7.	94.3 (66)	5.7 (4)	-	-	100 (70)
8.	95.7 (67)	4.3 (3)	-	-	100 (70)
9.	97.1 (68)	2.9 (2)	-	-	100 (70)

Note: *Food secure: green, mildly food insure: light red, moderately food insure: yellow, severely food insure: red*

Food secure household

It was found that 57 percent of the HHs never worried about food quality and quantity. Those HH were food secure households.

Food insecure household

Mildly food insecure: From the study, it was found that 32 percent of the households were mildly food insecure. They rarely worried about not having enough food or were rarely unable to eat preferred foods, and/or rarely ate monotonous diets or less preferred foods.

Moderately food insecure: It was found that 6 percent of the HHs was moderately food insecure. These households sacrificed quality of food more frequently by eating monotonous diet or undesirable foods sometimes. They had started to cut back on quantity by deducting the size or number of meals sometimes.

Severely food insecure: It was found that 4.3 percent population was severely food insecure, i.e. they often cut on the meal size or number of meals, or experienced any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating) even as infrequently and rarely in the last 30 days.

Figure 3. Food Security by HFIAS score Method
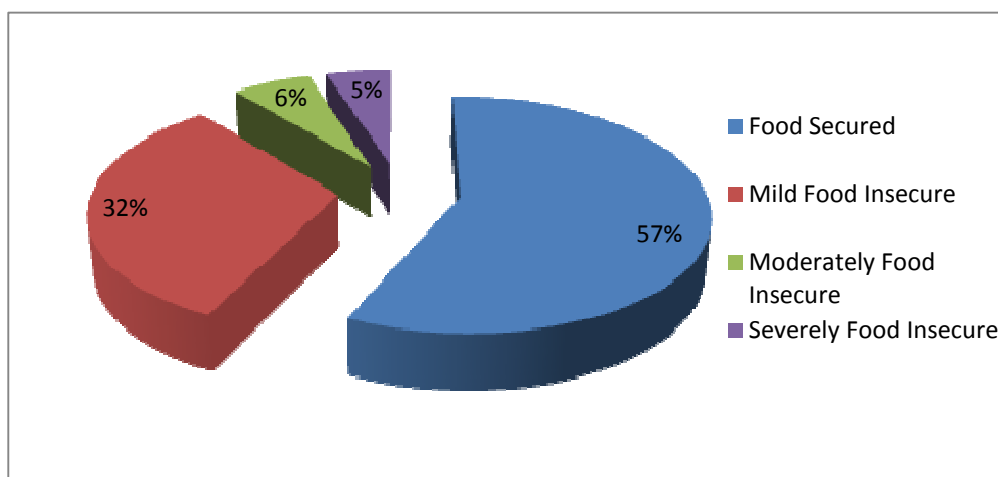
Adaptation strategies to climate change for food security

In relation to agriculture production, more than 54 percent respondents informed that agriculture production was in the decreasing trend. It means that climate change

had negative impact on food production, which is directly related to food security. Therefore, subsistence farmers have adopted various strategies to cope with climate change because of the decline in food production. About 74 percent of households were aware about the effect of climate change and had adopted different strategies to resist against the effect of climate change. Most common strategies included the use of chemical fertilizer/pesticide, hybrid seeds, use of bio-gas and change in agriculture farming system. About 77 percent, 52 and 50 percent have adopted chemical fertilizer/ pesticides, bio-gas and increased agriculture input (compost & bio manure) respectively as coping strategies against climate change. Most of the people were adopting mixed cropping and short duration crops. Almost all of the respondents reported that they were using organic manure / compost and bio-pesticides for high agricultural production. Figure 4 showed the adoption strategies to improve agriculture production.

Figure 4. Adoption st¡rategies of climate change for food security (%)
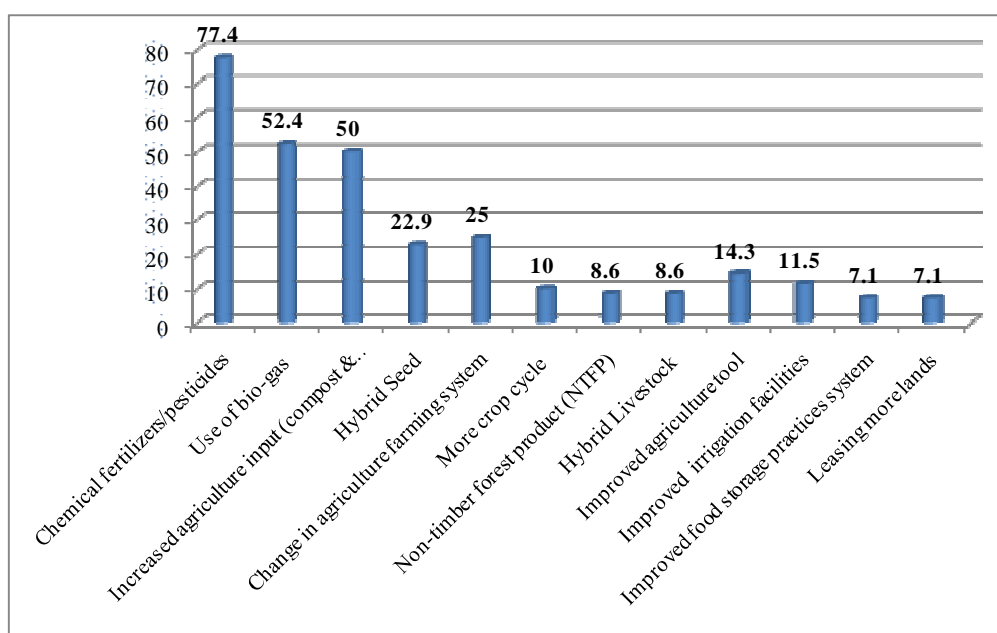
Livestock is one of the major components of Nepalese agriculture production and food security. Poultry, cattle, buffalo, goat and pig are common livestock. Ninety percent livestock contributed in the household food security indirectly. People were also relying upon the nearby watershed and wetland area to meet the demand of food security. They were also relying upon various wetland and forest resources to escape from food insecurity.

Alternative source of income for food security

The coping strategies for food security are growth in agricultural production in the study area. The use of organic fertilizer for sustainable development is suggested for agricultural development. Besides agriculture, people are involved in different alternative sources of income generation for the livelihood. Households vulnerable to food insecurity often responded by skipping meals, reducing food intake, selling assets like livestock; temporary migration for employment, cross boarder migration and day labor are some other strategies adopted to reduce the food insecurity (Figure 5).

Figure 5. Alternative source of income for food Security (%)
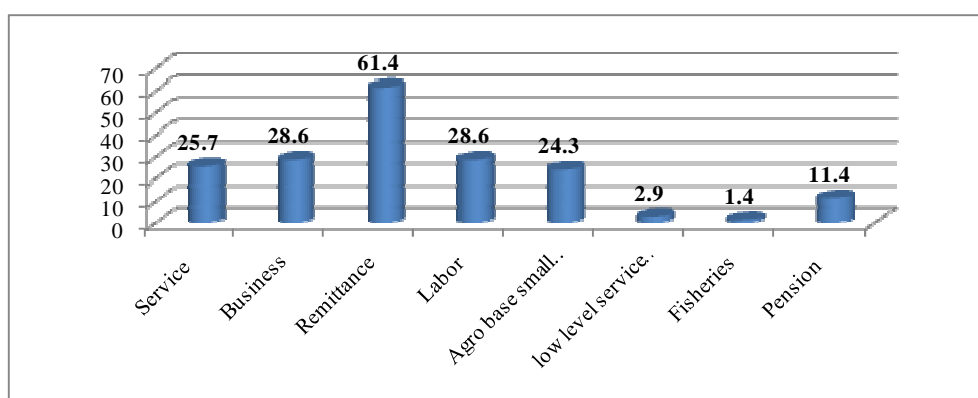
Remittance has received highest priority as an alternative source of income in the respondents' households. Above 61 percent of the households informed that at least one household member is abroad to earn money to secure food and livelihood. People are willing to do bee keeping, coffee farming and fish farming, poultry, and herbal farming as the alternative source of income for livelihood. Proper storage of food also helps in food security. All cereals storage techniques are traditional. As a result, 10-30% food is lost due to rodents and pests. However, more than 80% practice vegetable drying when they have adequate vegetable. About 60% make pickles, *Mashura* (value added vegetable drying) and fermentation.

**Impact of climate change on wetland resources**

Wetland also plays an important role for the regulation of climate change and the life style of people residing nearby the wetland areas. However, the long term climate change may affect the wetland areas and the resources food for those who are dependent on such resources.

Wetland in the study area provides different resources such as drinking, irrigation and domestic water supply, fish supply, timber, fiber, fuel wood and fodder

supply. It also provides some wild foods, medicinal plants and handicraft materials and so on. However, the impacts of climate change have affected the production system of the wetland. As per the respondents only fish supply is increasing and the remaining resources such as aquatic flora and fauna are in declining stage. Figure 6 shows the rating scale of resources availability.

Siltation is major threat to the wetlands, due to human encroachment on the wetland land. The main cause of siltation are deforestation in upstream, development work, soil erosion and cultivation practices in erosion prone-areas in upstream. It also affects the downstream areas. These practices have pushed Nepalese wetlands at the verge of extinction. Similar situation is found in Rupa Lake. It is major threat to the wetlands in Rupa Lake. Ten years ago the depth of the Lake was 10 meter whereas now the depth is only 4-6 meters (Rupa Lake Co-operative, 2012). But its height (volume of water) of the Lake is severely reduced. So the Lake has faced two problem of siltation. If the conservation activities are not carried out by Rupa Lake Cooperative the Lake is going to disappear. The Lake area was 135 hectare 30 years ago but now it is about 90 hectare.

Figure 6. Impact of climate change in Rupa Lake
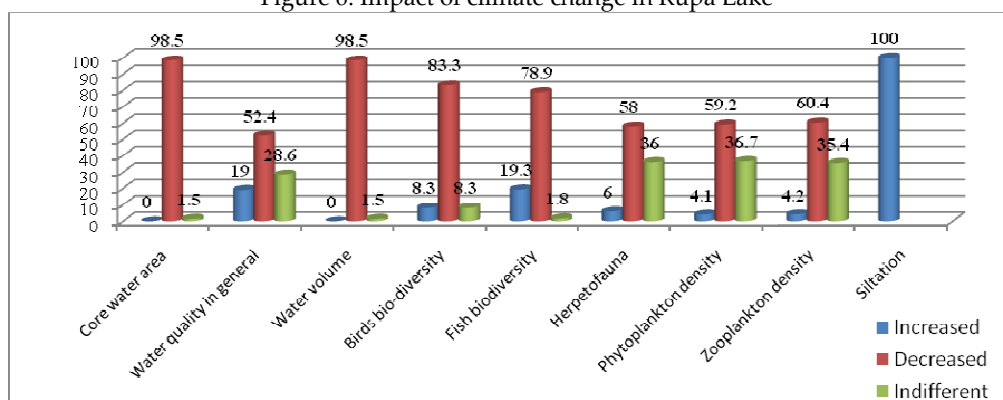
Similarly, climate change is another factor in draining resources for the last 30 years. No doubt climate change is slow process to cause resource draining. In case of Rupa Lake, the core water body and water volume has sharply decreased because of the siltation and deposition of soil and debris in and around the Lake area which are carried out by the feeder streams in the wetland area. This decrease in water body and its quality has affected the biodiversity and around Lake.

Observed impact of climate change

Of the total households, 92% of the respondents showed their positive response towards the climate change and its impacts on agriculture. Rise in temperature,

unpredictable rainfall, shifting in rainfall pattern and phonological changes are major indicator of climate change. They were directly observed by more than 50% of the respondents. However, although people are less aware about climate change, they are applying strategies for climate change. Figure 7 showed the climate change in last 30 years.

Figure 7. Observed Impact climate change in the last 30 years (%)
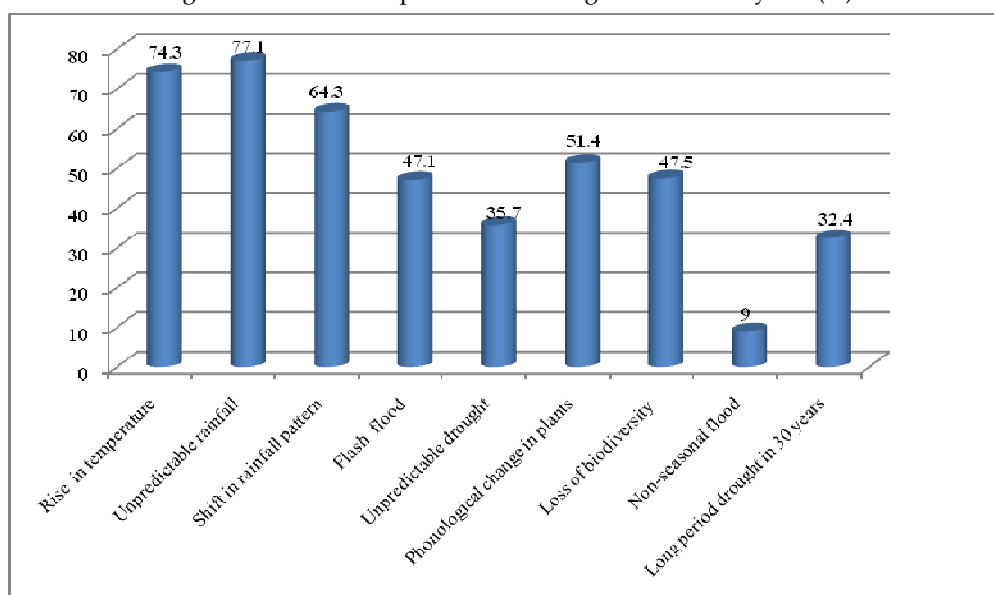
The impact of climate change in agriculture is very crucial. In relation to agriculture production, more than 54% responded that agriculture production was in decreasing trend and 12% responded that production was as it is.

Climate change in the context of meteorological data

Meteorological data was taken from Pokhara Airport station for the analysis of climate change. Major two parameters– temperature (average) and rainfall were taken from Pokhara Airport which is the nearest station from Rupa Lake. Thirty years meteorological data was analysed to measure climate change. It shows that the average, maximum and minimum temperature have increased by 2 degree in 30 years. Figure 8 shows trend of average, maximum and minimum temperature in 30 years. However, rainfall pattern is oscillating (Figure 9). It is evidenced that the metrological data and people's perception are similar in the context of climate change.

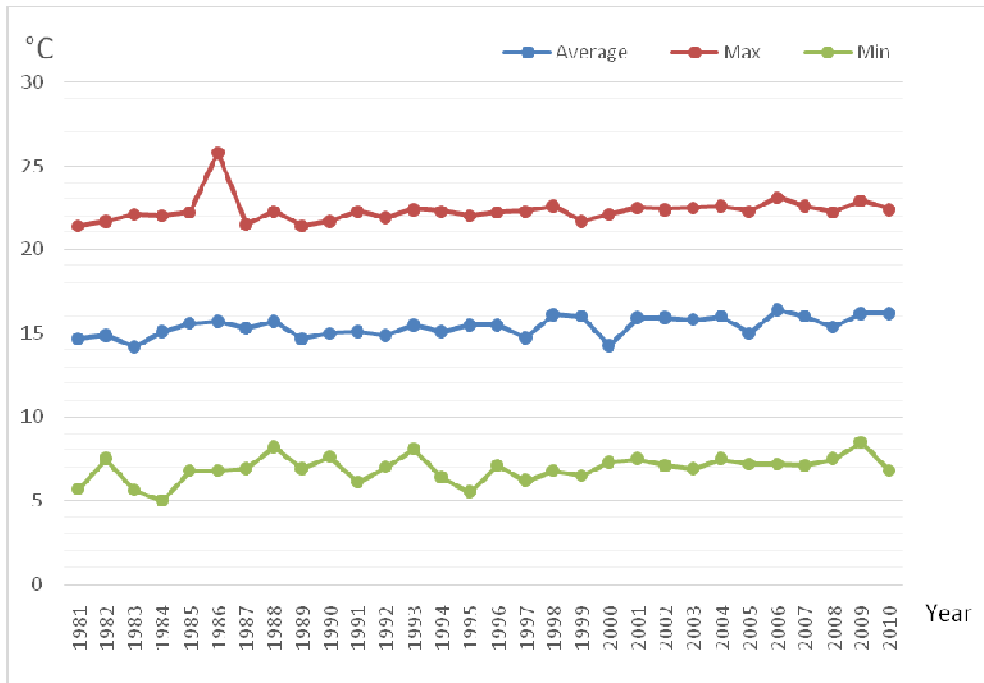Figure 8. Trend of maximum, minimum and average temperature pattern in 30 years
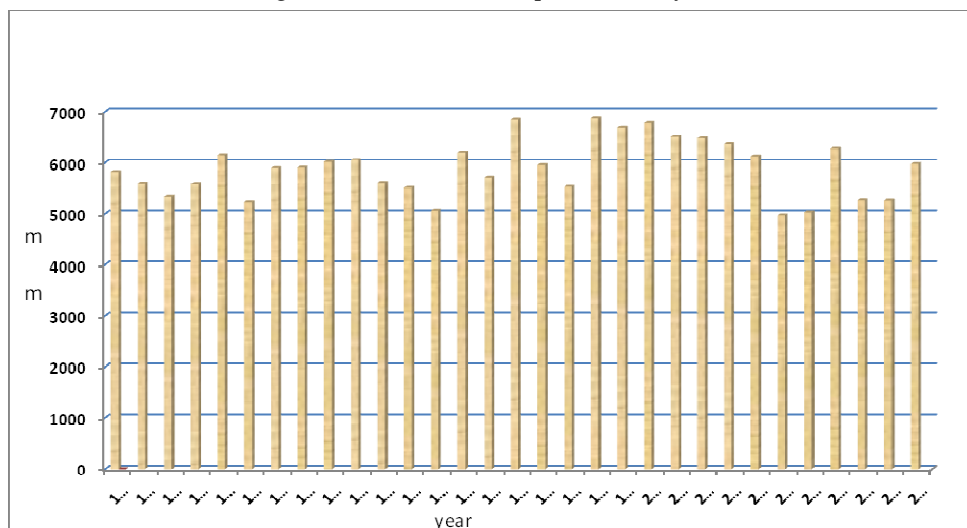

Figure 9. Trend of rainfall pattern in 30 years

Coping strategies adopted to mitigate the impact of climate change

People have focused on the conservation of the community forest surrounding the wetland. The study shows that people are engaged in afforestation and

conservation of the forest. About 10% HH collected 49 types of NTFP. The conservation of forest improved the condition of the forest. In comparison to 30 years data, the condition of forest is deteriorating. There are 12 community forests surrounding the Lake. They help protect the beauty of Lake and control the climate. As of now RLRFC is organizing activities related to conservation, NTFP collection, and awareness-raising programmes in the area.

Conclusion

About half of the world population (3 billion) live in $ 2.5 per day and one billion people go to bed hungry and many more are malnourished (www.UN/ISDR). Climate change worsens situation. Climate change is becoming the real threat to the lives in the world. It largely affects water resources, agriculture, coastal regions, freshwater habitats, vegetation and forests and snow cover. It leads to landslide, desertification and floods, and has long-term effects on food security as well as in human health. Changing climate impacts the poor people more because of land degradation, competition of resources and volatile market. It is an important issue in the present day society.

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NEPALESE MUSIC INSTRUMENTS AND MOURNING RITUALS: FROM PERMISSION TO PROSCRIPTION

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Abstract: *Life of people of Nepal is profoundly associated with music and music instruments. From birth to death, religious rites to festivals, music pervades the big and small events of Nepalese life. Whether it is happy or unhappy moment, every phase of our life passes through music. In this context, this article briefly highlights some of the interesting facts of music instruments particularly, those instruments forbidden to play on certain occasions and those that are required to be played during funeral rituals.*

Keywords: *Baaja, kahabaaja, jhyamta, mourning, funeral.*

Introduction

Nepali feel proud of their music instruments. The instruments played in different regions of the country have their unique characters and distinct features. In a country blessed with diverse folk cultures, music functions as means of communication as well as an expression of human feelings. Be it home, religious places, field, festivals, happy and sad occasions, music instruments are invariably played (Regmi, 2014).

The blowing of *sankha* (conch) at dawn and the ringing of *ghanta* (bell) indicate the daybreak and herald a good beginning. The *panchebaaja* and *naumatibaaja* mark the auspicious occasions like marriage, *bratabandha* (sacred thread wearing ceremony) and *pasni* (rice feeding ceremony). Similarly, *chhusya, musya, dha, khin, bayan, paschima, dhime* instruments among others remind one of quintessential Nepalese festivals or the *jatra*s. Likewise, the band *baaja*, concert band and *badsaahibaaja* are associated with military exercises and national festivals. There are other instruments like *kahabaaja*, droning of *sankh, ghariganta, dhyangro* etc. which are played explicitly during funeral procession and mourning (Regmi, 2003).

We will briefly discuss some of the instruments forbidden to play on certain occasions as well as some of those which are played during the funeral rituals.

Instruments forbidden to play on certain occasions: Despite music and music instruments influencing every activity of Nepalese society, it is equally interesting to note that several instruments were forbidden on certain occasions and those flouting the law were deemed punishable. Usually at the time of mourning or death, particularly on the demise of head of the state or kings, the playing of music instruments were restricted. Since, the document does not speak any specific name of

the instruments that was restricted to play, we can easily guess that none of the instruments were allowed to be played in the public places. Some inscriptions of the Shah period has it that instruments were banned for four months and speak of punishment to those defying the prohibitions. An analysis of such documents brings forth two reasons for banning the playing certain music instruments: first, to mourn the death while refraining from recreations during such time, and second, to discourage people other than those assigned from playing instruments.

There existed a tradition of conducting *jatra* (festival) without instruments at the death of royal family members. However, in some *jatras* instrument playing was indispensable to ward off disasters. As for example, in 1662 A.D, playing instruments was banned in a *Matsyendranath jatra* of Patan due to the death of certain member of the royal family. That year a roaring inferno engulfed the city of Patan. Therefore, according to the vernacular genealogy, the people had to expiate their guilt for not playing the instruments in *jatra*.

Nepalese music has a tradition of strict adherence to certain rules in singing and instrument playing. In Newari tradition, instruments of the *khin* category made from *khari* (*Celtis australis*) wood like *dapakhin*, *paschima* and *kwachakhin* namely *dholki* and *dhime* were forbidden from playing in between *Bhal Bhal Astami* (Asar Krishna Astami) and *Gathemangal* (a Newari festival). They were allowed only after *Gathemangal*. (Royal Palace, 1975). It is said that during this time the farmers of the Kathmandu Valley are busy in farming as it happens to be the farming season. Considering that their involvement in musical activities would hamper cultivation thereby leading to hardships, they made a rule to keep them away from musical activities (Ranjitkar, no date). This may be the reason why still they have no tradition of playing instruments while singing the *sinhajya*, the plantation song in the rice field (Hridaya, 1995). One of the interesting aspects of *sinhajya* song is that the prohibition was subjected to the conventional instruments, not the modern instruments. Hence, in some places they are seen playing *tabla* and *paschima* (Hridaya, 1995).

Among Rai people, the popular instrument is *jhyamta* which is played in a distinct way on special occasions. They hold on to the belief that the *jhyamta* should not be played at the house of the chief priest performing crematory rites, particularly after the gifts and presents are offered are brought to his house. Doing so would bring curse on him and he would die. The Rais believe that the soul of the deceased is ever present in *jhyamta* and playing the instrument haphazardly means inviting one's death (Rai, 1999). Interestingly, we can also find similar kind of prohibition in some religious scriptures which forbid playing *jhyali* in Shiva temple, *sankh* blowing in Surya temple, and *bansuri* (bamboo flute) in Durga temple (Mishra, 1979) (*Shivagare Jhallakam cha Suryagare cha Sankhakam. Durgagare Bansabadhyam Madhuri cha Nabadayet.*).

Similar belief is also held by the Brahmins and Kshatriyas. According to their belief, one should not ring the *ghanta* (bell) while worshipping the gods during the *Sorah Shraddha* (memorial rites of the deceased). Disobeying of which would bring curse on people from the *pitris* (deceased father/mother). Among the Buddhists, they have the tradition of blowing *nekufugi* (horn instrument) which they blow in the name of the deceased from *Shrawan Sukla Paksha* to *Bhadra Krishna Paksha* for one month. They refrain from playing the instrument after that (Manandhar, 2001).

Instruments played in funeral music: In Nepal, music is not only associated with happy moments but also with sorrowful events which is evidenced by the tradition of playing funeral music and mourning tunes. Though the mourning tune is not commonplace among all the groups and classes, their presence, however, in one or the other form is found in almost every group. There is the tradition of army band playing mourning tunes in the funeral procession of distinguished citizens, senior army or police officials.

The tradition of playing *Deepak* raga in the funeral procession and the rites of Royal family members and *kahabaaja* (Indra Baja) playing on such occasion for commoners and other castes is learnt to have been started during the reign of King Jayasthiti Malla (Wrights, 1966). The lower class people were barred from playing mourning instruments (Khanal and Bhandari, 1992). However, legends have it that a member of *Teli* (a low caste) appeased King Amar Malla by killing one monster known as Bala Daitya and the King impressed by his subject's heroic feat awarded the clan the rights to play mourning instruments in the funeral processions (Lamsal, 1966).

The edict of Jayasthiti Malla has mentioned different castes like *Kasai, Tepoch, Khusal* and *Pulupulu*, that were eked out living by playing music in funeral processions (Khanal and Bhandari, 1992). The *Kasai* were assigned to play *Kahaabaaja* and *Pulupulu* were assigned to pla*y Manjira* during the funeral procession and *Sati* (formerly: a widow cremating herself in her husband's pyre) rites (Khanal and Bhandari, 1992). As per Historian Gyan Mani Nepal, *Kasai* is also associated with one more instrument called *Nayunkhi Baaja* (*Jhyali) which* is also interpreted as '*Nayar Baaja*' that is said to have entered the Kathmandu valley from Nayar country of Southern India (Nepal, 1988).

In Nepal, even today, there is a tradition to blow *sankha* and ghanta in the funeral procession of Brahmin and Kshatriya. The Gurungs of Tamu ethnic group also follow the same tradition (Bhandari, 1999). Similarly, in Kathmandu Valley, there is the tradition of composing musical *Ramayana* in memory of the deceased at *Gaijatra* festival and going around the city singing it.

The playing of mourning instruments in the funeral procession is still popular particularly among the *Jyapus* of Kathmandu. Among the Shresthas (a higher caste in Newars), the tradition is waning whereas, the *Jyapus,* and the *Kasais* play *kahabaaja* to mark the funeral processions (Nepali, 1965). Similarly, the Bajrayani community sing a *Charya Geet* called *Mayajaal* during the death prayer held every three month, six month and one year (Bajracharya, 1998). Among the Buddhist community, they have a tradition of blowing horns which they believe bring peace to the departed soul (Manadhar, 2001). The table below shows some of the instruments used during the death rituals:

Table 1. The instruments used in death rituals

No.	Name of the instruments	Place / Tribe
1.	Gyaling (religious Sehanai)	Tamang / Kavre
2.	Dhyangro	Tamang / Kavre
3.	Jhyamta	Tamang / Gurung / Tanahu
4.	Sankha	Tamang / Tamu
5.	Ghanta / Ghanti	Bramhin / Kshetris / Tamang
6.	Ohganjro	Gurung / Dolakha / Tanahu
7.	Damaru	Jirel / Dolakha
8.	Kaha (Indrabaja)	Newar / Kathmandu
9.	Dhol	Maithali / Mithila
10.	GhariGhanta	Maithali / Mithila
11.	Dha: Baja (Tinchhu, Bhusya, Neku)	Newar / Bajracharya

Source: Regmi, 2003

Different ethnic groups in Nepal use different musical activities to perform funeral rites. The Tamang community plays instruments like *gyaling, sanai, ghyangi, jhyamta,sankh* and *ghanti* in funeral processions. Similarly, they traditionally perform *dora nritya* (dance) in funeral rites. Likewise, an event known as *ghewa* is held in memory of the deceased at the end of the year in which the Karma Lamas follow numerous rituals amid musical activities. In funeral rites of the Jirels (local tribes) inhabiting in Dolakha district, the Lamas play *damaru* and the *jhankris* (witch doctors) play *dhyangro* in funeral procession. They dance the whole night in the house of the deceased as well as in the tomb yard playing *damaru* and *dhyangro.* (Royal Palace, 1975) ·

Similarly, the Hayu people of Sindhuli district play *dhyangro* while performing crematory rites (Royal Palace, 1975). The Gurungs of Tanahu conclude the crematory rites by carrying an effigy and consigning it to the river amid colourful musical activities in which they dance playing *dhyangro* and *jhyali* (Royal Palace, 1975). In

Darchula district, they perform rites in memory of the departed soul by placing the *astu* (the bodily remains gathered from ashes of funeral pyre) on *chauri-gai* (the high-land cattle) and taking out procession to the jungle amid musical fanfares to dispose the ashes (Royal Palace, 1975). Similalry, in Nepal's terai, in Mithila culture, the instruments played in funeral procession are *dhol* and *gharighanta* (Rakesh, 1977).

Methodology

The objective of this article is to highlight the importance of different music instruments in different stages of Nepalese life. To meet the objective, the materials of this article have been mostly gathered from the secondary sources such as National Archives, libraries and personal record of eminent Nepalese scholars that include published and unpublished historical documents. The researcher has attempted to collect the archaic resource materials, which fed Nepal's historiographers and harboured information on music and make some analytical discourses.

Summary

Varieties of music and instruments in vogue are predominantly influenced by Nepal's indigenous cultural and religious traditions that owe their origin to mythology and legends associated with them. Hence, the music and dances besides carrying folk traditions are embedded in rich mystic traditions. In order to understand the undercurrents of Nepalese music shaped and developed under influence of an array of cultural and religious traditions, one needs to understand the legendary and mystical traditions that evolved in Nepal at different junctures of history. Besides having immense classical influence, they carry a blend of ethnic, folk and indigenous traditions.

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STRESS AND THE COPING MECHANISM AMONG ADOLESCENTS, POKHARA

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Abstract: *The study was conducted to findout the prevalence of stress and the coping mechanism among adolescents. The design of the study was descriptive in nature which was carried out purposively in two schools (government and private) of Pokhara of Kaski district. A total of 200 samples of class 8, 9 and 10 were selected by using non- probability purposive sampling method. A semi-structured, self administrative questionnairs were used for data collection. Results revealed the prevalence of different types of stress among adolescents in government and private schools. As per the physical factors, headache was the common problem found in adolescents of both government and private schools, accounting for 67.7%, 52.0%, respectively. Similarly, they feel family stress (parental stress) while their family members (parents) become ill and if the parental expectation is very high (66.7%, & 55%.). About 49.5% adolescents in government school and 48.0% adolescents in private school experienced stress when their peers teased them. In relation to socio-cultural factor, most of the government and privlate school adolescents (43.4% and 40.6%) felt stress because there was no specific right for self determination available to them. Therefore, the adolescents of both government (60.8%) and private schools (45.5%) had felt the need of some modification. Among them 80.8% adolescents of government school &. 72.3% of private school experience irritation and anger at the time of stress. Similarly 50.5% adolescents in government school and 34.7% adolescents in private school had felt stress when they could not spend money as their peers did. IN relation to the support system, peer support was found higher in adolescents of both types of school (government 86.7% & Private 77.1%). The above finding also showed that older age adolescents have adopted more positive coping method (mean 8.2 SD 1.68) than younger ones (mean 7.9, SD 1.79). Similarly female adolescents are more positive (mean 8.17, SD 1.71) in comparision to males (mean 8.0, SD 1.7). And adolescents of the government school are more positive (mean 8.48, SD 1.57) than adolescents of the private school (mean 7.6, SD 1.77). Based on empirical results, it can be concluded that the parents and the entire community of people as well as the government including NGOs and INGOs should initiate program on adolescents' behaviors to minimise their stress and prmote their positive coping abilities.*

Keywords: *Stress, coping, adolescents.*

Introduction

Nepal is a developing country with the high prevalence of poverty. The country has several issues related to health, society and environment. Adolescents comprise

22% of the total population of Nepal and they are expected to grow in the years to come (Anonymous, 2000/2001). High-risk behavior due to anxiety and stress is emerging as a significant problem among adolescents in our community. It is known that most of the high-risk behavior acquired during adolescence can also affect their adult life and have long-term adverse effects on the individual, family and community.

Stress can be linked to all aspects of health: mental, physical, emotional, intellectual and spiritual. Adolescents have many stressors. Physically their bodies are growing and thus their hormones are changing. And their physical appearance is becoming more important. Intellectually, they are dealing with comprehensing the physical changes. There are also mental and emotional changes in addition to new experiences both good and bad and meeting expectations of their parents (Terri, 2008). Emotionally, they develop new relations with friends and the social environment of the school. Learning to become individuals under their parents' rule may play a key role in developing stress. Spiritually their belief systems are being challenged due to the increased knowledge of the world (Louise, 1990a).

The high risk behavior of adolescents can be end-result of many associated factors like education/information-gap in relation to reproductive health changes at adolescent stage, and/or a poor access to health services, social conflict, traditional/cultural norms and unequal treatment such as domination of female adolescents, or exploitation, abuse, and or unsupportive environment from family, school, and society (Kelly, 2000). When adolescent are unable to adapt to the transitional stage of physical and psychological changes, they develop an enormous amount of anxiety, and stress. Since adolescents are more vulnerable to physical, mental, social and spiritual stresses, an increasing level of stress, anxiety and mental tension in addition to the academic pressure, can result in teenage depression and also result in negative personal traits leading to acute attention problem (Louise, 1990b). However the type of stresses experienced and individual ability to comprehend the situation determines the coping ability. It is believed that internalized distresses may be converted into somatic (physical) symptoms leading to various psychological problems (Whaley & Wong, 1995).

The study aimed to find out the prevalence the stress among adolescents and identify the types of stresses experienced by them. It also aimed to assess the coping mechanism adopted by the adolescents in a stressful situation with respect to their socio-demographic characteristics.

Method

I had selected descriptive exploratory research design. Sample population of this study was adolescents of age 12 to 18 years of both sexes of class 8, 9 and 10 of a

private and a government schools of Pokhara, Kaski District. A non-probability purposive sampling technique was used to collect the data. A semi-structured multiple response type of questionnaire was used to obtain the information based on the objectives. Presumptive Stressful Life Events Scale (PSLES) developed by Singh *et al.* (1984) in Indian setting was followed and PSLES was developed according to Nepali socio-cultural setting to measure the different type of stresses among adolescents in Nepalese context. Similarly, the coping check list of Rao *et al.* (1989) was adapted and modified to suit the Nepali socio-cultural setting.

Results

Socio-demographic characteristics of the respondents

Adolescents of 12 to 18 years of age were the respondents of class 8,9 and 10. Among them 50.8% respondents were above 15 years, 54.6% of them were female and 63.9% of them were from Janajatis, 70.9% were Hindus, 50.5%, students studied in class 9. The finding shows that the majority of the parents of the respondents were literate (father: 86.4%, mother: 76.6%) with secondary level of education (father: 46.5%, female: 49.6%). The majority of them were from nutral families (77.8%). Majority of fathers' were engaged in service (42%) and most of the mothers were housewives (74.9%). The economic status of the majority of respondents was middle class (54.5%).

Table 1. Respondents' stresses due to physical factors

n=199

Physical factors	Government school students		Private school students	
	Number	Percent	Number	Percent
Headache	67	67.7	52	52.0
Body pain	60	61.2	43	43.0
Body injury	55	56.7	15	15.0
Illness	55	56.6	27	27.0
Physical Weakness	50	53.2	13	13.0
Body defect	47	47.5	11	11.0
Over weight	45	45.9	13	12.9
Very short height	44	44.9	17	17.0
Loss of appetite	40	40.8	16	16.0
Under weight	32	33.0	19	19.0
Very tall height	23	23.2	13	13.0

*Multiple response

Physical factors show that headache is the common problem of adolescents attending both government and private schools (67.7% and 52.0%) followed by body pain (61.2% and 43.0%), illness (56.6% and 27.0%) and body injury (56.7% and 150%), respectively (Table 1).

Table 2. Family factors responsible for stresses of adolescents

n=200

Family factors	Government school students		Private school students	
	Number	Percent	Number	Percent
Illness of family member	66	66.7	43	42.6
High parental academic expectation	62	63.3	55	55.0
Lack of parental time	59	59.6	41	40.6
Death of close family member	59	59.6	39	38.6
Unfavorable comparison with other	58	58.6	25	24.8
Unfavorable home environment for learning	56	56.6	44	43.6
Family conflict (misunderstanding)	55	55.6	33	32.7
Lack of parental love and care	55	55.6	36	35.6
Ignore the personal needs by the parents	53	53.5	22	22.0
Less chance for personal entertainment	53	53.5	41	40.6
No right for making decision	51	51.5	37	37.4
More discourage than encourage	50	50.5	25	25.0
Poor interpersonal relationship within the family members	49	49.5	43	43.4
Extramarital relations of parents	44	44.4	7	6.9
Getting marriage or engagements	43	43.4	22	22.0
Hard family discipline	41	41.8	38	37.6
Preference in female and male child in family	41	41.4	14	13.9

* Multiple response

More than half of the adolescents attending the government school felt more stressed when their family member became ill (66.7%) whereas the adolescents of private school felt more stressed due to their parents' high academic expectation (55.0%). The adolescents of government school gave the second highest priority to high parental academic expectation (63.3%); 43.6% of adolescents of private school rated an unfavourable environment for learning of the second fastens (Table 2).

Table 3. Peer (friends) pressure responsible for stresses of adolescents

n=199

Peer (friends) Pressure	Government school students		Private school students	
	Number	Percent	Number	Percent
Tease you	49	49.5	48	48.0
Breakup with close friends	44	44.4	37	36.6
Unable to compete academic performance as their colleagues	37	37.4	54	53.5
Jealous to you	30	30.6	32	31.7
Unable to compete with the colleagues in playing	30	30.6	30	29.7
Peers do not involve in group activities	30	30.3	34	33.7
Cannot perform group activities	27	27.6	33	32.7
Poor body figure in	19	19.2	16	15.8
Friends do not care you	17	17.2	24	23.8
No well dress up in comparison to colleagues	15	15.3	21	20.8

* Multiple response

Majority of the respondents of both government and private schools felt stress when their friends teased them (49.5% and 48.0%). Majority of them had also experienced stress after the break up with their close friends (44.4% and 36.6%), followed by 37.4% and 53.5% respectively when they were unable to compete with their peers. (Table 3).

Table 4. Socio-cultural factors responsible for stresses of adolescents

n=200

Socio-cultural factors	Government school students		Private school students	
	Number	Percent	Number	Percent
Need some modification/change	59	60.8	46	45.5
No right of self determination	43	43.4	41	40.6
Caste discrimination	39	39.4	9	8.9
More commanding in nature	39	39.4	17	16.8
Not useful and unreasonable	38	38.4	19	18.8
Hard to follow	30	30.3	23	22.8
Harm to follow	21	21.2	14	13.9
Sex/gender discrimination	17	17.2	4	4.0

* Multiple response

The students of both government and private schools had felt need of socio cultural modification (60.8% and 45.5%). This is because they felt that they had no right of self determination (43.4% and 40.6%). Majority of respondents of government school had also expressed stress due to caste discrimination (39.4%) whereas respondents of private school felt it more commanding in nature (16.8%) (Table 4).

Table 5. Psychological factors responsible for stresses of adolescents regarding school

n=200

Psychological factors	Government school students		Private school students	
	Number	Percent	Number	Percent
Getting irritated and angry	80	80.8	73	72.3
Feeling of sadness	72	72.7	53	52.5
Seeking of love and belonging	70	70.7	71	70.3
Feeling of frustration	63	64.9	51	50.6
Feeling of fear and anxiety	61	61.6	54	53.5
Loss of interest in doing things	59	59.6	23	22.8
Feeling of guilt	52	52.5	28	27.7
Loss of sleep	47	48.0	14	14.0
Feeling of jealousy	47	48.0	14	14.0
Feeling of death	20	20.6	22	21.8

* Multiple response

Getting irritated and angry are the main psychological factors associated with stress for respondents of both government and private schools (80.8% and 72.3%), respectively. They had also expressed sadness (72.7% and 72.3%) and also sought love and longed belonging during the time of stress (70.7% and 70.3%), respectively (Table 5).

Most of the respondents of both government and private schools felt stress while they could not spend money in comparison to their peers (50.5% and 34.7%),) whereas students of private school also felt stress when they could not buy things as they like (37.6%). Similarly, majority of respondents of government school had also expressed stress when they have family financial problem (43.4%) (Table 6).

Table 6. Socio-economic factors responsible for stresses of adolescents

n=198

Socio-economic factors	Government school students		Private school students	
	Number	Percent	Number	Percent
Difficult to spend money in comparison to colleagues	50	50.5	35	34.7
Family financial problems	43	43.4	31	30.7
Difficult to pay for school bill	40	40.4	17	16.8
Difficult to buy the necessary things	38	38.4	24	23.8
Retirement from job of the parents	34	34.7	16	16.0
Unemployment of the parents	32	32.7	16	16.0
Difficult to buy the things you like	30	30.3	38	37.6
Insufficient food in the house	26	26.3	7	6.9
Difficult to buy for essential stationary materials/dress	22	22.2	18	17.8
Feel bad because there is no vehicle (motor cycle)	18	18.2	17	17.0

 * Multiple response

Table 7 indicates that the peer is the first significant person from whom the respondents of both government and private schools seek support (86.7% and 77.1%) followed by parents (82.7% and 69.0%), brother (33.7% and 56.0%). But only few of them seek support from professional persons (25.5% and 33.7%).

Table 7. Support system of respondents in stressful situations

Source of Support	Government school students		Private school students	
	Number	Percent	Number	Percent
Peer/friends	85	86.7	64	77.1
Parents	81	82.7	58	69.0
Brothers/sisters	59	33.7	47	56.0
Relatives	55	56.1	38	45.8
Teacher	50	51.0	33	39.8
Elders	42	42.9	35	42.2
Grand parents	37	38.9	19	22.9
Professional persons (specialists)	25	25.5	28	33.7
Neighbors	22	22.4	9	10.7

* Multiple response

Table 8. Comparative table of positive and negative coping mechanism

n=200

Positive coping	n (%)	Negative coping	n (%)
Try to understand the problem	187 (93.5)	Pray to god and perform special pujas to solve the problem	121 (60.5)
Try to solve the problem	186 (93.0)	Hope on luck (miracle will happen)	79 (39.5)
Analyze the problem to find out the cause of stress	163 (81.5)	Postponed the decision	72 (36.0)
Try to control my feelings and emotion	158 (79.0.0)	Act violent	72 (36.0)
Listen to music	151 (75.5)	Avoid/ reject the problem	70 (35.0)
Seek emotional support	150 (75.0)	Blame others for occurring problem	59 (29.5)
Think of alternative solutions of the problem	139 (69.5)	Go away from home without any notice to family members	52 (26.0)
Engage in games (indoor or outdoor)	125 (62.5)	Consult an astrologer or horoscope	52 (26.0)
Consult with health personnel's	107 (53.5)	Think to commit suicide	31 (15.5)
Think of past experience of similar situations	103 (51.5)	Drive fast in a vehicle/motor cycle/cycle	22 (11.0)
Do meditation	89 (44.5)	Drinks excessive alcohol	11 (5.5)

As the Table 8 shows, the highest positive score is 93.5% and the highest negative score is only 60.5%. The total sum in positive mechanism excessed that of negative coping mechanisms. Majority of the respondents have adapted positive response rather than negative ones.

Table 9. Coping mechanisms of respondents by age

n=913

Age in years	Coping mean/SD	
	Positive	Negative
<15 Mean	7.9	3.86
SD	1.79	2.18
>15 Mean	8.2	3.34
SD	1.68	2.01

Adolescents of above fifteen years of age had used more positive coping method (mean 8.2, SD 1.68) in comparision to those below fifteen year of age (mean 7.9, SD 1.79). Similarly, more negative coping method had been used by adolescents below fifteen years (mean 3.86, SD 2.18) in comparision to those who were above fifteen years (mean 3.34, SD 2.01) (Table 9).

Table 10. Coping mechanisms of respondents by sex

n=194

Sex of the respondents	Coping mean/DS	
	Positive	Negative
Male		
Mean	8.0	3.36
SD	1.7	2.02
Female		
Mean	8.17	3.84
SD	1.71	2.23

Female respondents used more positive coping method (mean 8.17, SD 1.7) compared to male respondents (mean 8.0, SD1.7). The negative coping mechanism is also higher among females (mean 3.84, SD 2.23) in comparison to male respondents (mean 3.36, SD 2.02) (Table 10).

Table 11. Coping mechanism of respondents by school

n=200

Types of school	Coping mean/SD	
	Positive	Negative
Government		
Mean	8.48	2.86
SD	1.57	2.0
Private		
Mean	7.6	4.95
SD	1.77	2.01

The adolescents attending goverment school had adapted more positive coping mechanism (mean 8.48, SD 1.57) and less negative coping mechanism (mean 2.86, SD 2.0) in comparison to those attending private school (Table 11).

Discussion

In this study, majority of the respondents felt different kinds of stresses. If the parents and the authorized person do not try to understant and solve their problems in time they may develop severe cases of anxiety and stress. Since adolescents were

more vulnerable to physical, mental, social and spritual stresses, an increasing level of stress can result in teenage depression and negative personal trait leading to attention problem. It was believed that internalized distress may be converted into somatic symptoms leading to various psychological problems.

Most of the adolescents feel headache and bodily pain when they cannot overcome the stress. Similarly, adolescents become very stressful when their family members become ill and also while their parents do unfavorable comparision with others. This is the period of gaining peer identity and they feel great stress when they can not overcome the peer pressure. Majority of adolescents in this study had also experienced stress while their peers teased them and were unable to compete with their peers. Furthermore, the adolescents felt stress due to sociocultural factors because they felt that they had no right of self determination in sociocultural practice. So they had realized the need of some modification or change in the condition. Psychological factors play greater part during the time of stress, generally expressed by irritation and anger.

Socio-economic factors also play a vital role in increasing the stress. Most of the adolescents attending government school had expressed their stress while they could not spend adequate money in comparison to their peers whereas students of private school felt stressed when they could not buy things as they like. These findings are consistent with those of earlier studies (Montgomery *et al.*, 1996; Ford *et al.*, 1999).

The study reveals that when stress is increased and positive coping is decreased with age, increased support from society is needed to overcome the stress. Study showed that majority of the adolescents seek social support from their peers for sharing and relieving discomfort instead of seeking professional help. Similarly, they had also availed support from their parents. They feel that their parents are their vital supporter for reducing stress.

This study also reveals that the positive coping skill increases as they mature. Adolescents of above fifteen years had demonstrated higher positive coping skills in comparision to those below fifteen years. Similarly, the negative coping skill is higher among those who are below fifteen years of age.

Female adolescents had higher positive coping skills in comparision to males. This might be because females do not have easy outlet of their stress in a traditional society. Moreover, the adolescents of government school had indicated higher positive skills in comparision to adolescents attending private schools.

Conclusions

Adolescents are affected by various types of stress factors and the individual capacities to cope the stresses are different according to their age, sex and type of the school they attend. Each adolescent tries to overcome it by positive coping skill as

they grow up. If the stress is very severe and not attended by a professional, it may result in depression, or negative personal traits. Therefore, it is necessary to promote awareness to take initiative on adolescents' health and behaviors to minimize the effect of stress and promote their coping abilities.

Acknowledgements

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