Dietary Pattern and Nutritional Status of School Going Adolescents in Public Schools of Kathmandu Valley, Nepal

Isha Shrestha[1], Sajan Nagarkoti[2], Saroj Bhandari[3]

[1]College of Applied Food and Diary Technology, Minbhawan, Kathmandu, Nepal
[2]Nutritional Rehabilitation Home/Nepal Youth Foundation, Sunakothi, Lalitpur, Nepal
[3]Department of Public Health, Nobel College, Sinamangal, Kathmandu, Nepal

Abstract: *Nutritional diet plays important role in survive for all age groups and also helps in promoting and maintaining the health day by day. This study aims to assess dietary pattern and nutritional status of public school going adolescents of Kathmandu. Methods: An analytical cross sectional study was conducted in 391 study participants from seven different randomly chosen public schools of Kathmandu. Semi-structured questionnaire was used as a tool and self-administered technique was applied. Data was collected on variable such as socio-demography, dietary pattern, physical activity, weight and height. Data entry and analysis was done using SPSS version 20.And, descriptive statistics. Chi-square test, univariate analysis binary logistic regression and multinomial logistic regression were used for data analysis. In this study, among 391 study participants more than one third were underweight and 5.88% were overweight. Additionally among total underweight respondents more than half were male. The gender and underweight status of the respondent was found to be significantly associated. The risk of underweight was significantly increased by 1.97 times among the respondents who carried money as Tiffin to school 1-3 times a week (95% CI 1.026-3.784, p-value: 0.042). The risk of underweight was found reduced by 7% among the respondent who are involved in vigorous intensity activity. Age, gender, father´s education level, father´s occupation, was significantly associated with under nutrition status among adolescents. Risk of underweight and overweight was found significantly reduced among the respondents having family meals.*

Keywords: Dietary pattern, Nutritional Status, Public School going Adolescents

1. Background

Nutritional diet plays an important role in survival for all age groups and also helps in promoting and maintaining the health day by day. Health status of all age group depends on food intake practice for every place and time. Low intake or too much intake of food/nutrients results in appearance of malnutrition [1].Malnutrition directly affects per capita income. Malnutrition is main problem everywhere. About 150 million of children are still malnourished in South East Asia Region (SEAR).Nepal also included in SEAR, ranked 140 among 174 countries in the Human Development Index and 0.44 GDP index in 2002 [2].

During adolescence period maximum growth and development of health is seen. That's why school going age groups are very critical age groups because of increased need of nutrients for rapid physical growth and development of the body. Due to inadequate nutrients during child and adolescence period malnutrition, overweight, growth retardation, reduced work capacity can be seen [3]. In developing countries the choices of unhealthy food and junk food/western diet is increasing day by day due to ignorance, lack of knowledge, and wrong perception about healthy foods [4]. In adolescence period, malnutrition problems are seen in rural adolescence due to inadequacy of the quality and quantity of food and over weight problems in urban area due to use of fast foods that arises non-communicable/chronic disease. Adolescences girls are more vulnerable about nutrients intake than boys' because of dieting, social discrimination and pregnancy [5].

More attention needs to be paid to this group because this is the where puberty begins to set in. The need for extra nutrients to support the rapid growth spurts associated with puberty is very crucial in order to prevent complications later in life. Moreover information regarding adolescence about nutritional status and obesity is scarce and the growth references for this age group are inadequate thus when more information is gathered, it will add up to the existing information which could serve as a guide for research works in this area or a similar area and will also help for policy makers. In Nepal, there are limited researches in about adolescents' nutritional status. In light of this; this study aims to assess the dietary pattern and nutritional status of public school going adolescents of Kathmandu. And, also investigate the association between socio demographic variable of the respondents and dietary patterns with nutritional status of adolescent.

2. Materials and Methods

Analytic cross-sectional study was done in 391 respondents in d 7 different randomly selected public schools out of 99 secondary public school of Kathmandu district (Saichhik Manjari, 2070 Magh, District Education Office, Kathmandu), Nepal within the periods of six months from December 2017 to June 2018. Semi structured questionnaire was conducted and it consists five sections. i.e. Section A: Socio-demographic characteristics, Section B: Dietary pattern (Food intake practice at school, eating habit at home, Skipping meal pattern), Section C: Physical activity, Section D: Frequency of food consumption per week and Section E: Anthropometric measurements. For data collection, semi-structured, self-administered questionnaire, weight and

height measurements were used. Weighing machine (UNICEF) and Stadiometer (seca) were used for weight and height measurements. Body mass index [BMI=kg/m2] is used to indicate underweight, overweight and obesity in individuals. BMI ranges are underweight: under 18.5 kg/m^2, normal weight: 18.5 to 24.99, overweight: 25 to 29.9, obese: over 30. For Data analysis SPSS (Statistical Package for Social Science) version 20 was used. Chi-square test, univariate analysis binary logistic regression and multinomial logistic regression were used for data analysis. The sample size was determined by using the formula by Fisher *et al.,* (1991). n = Z^{2}PQ / d^2

Where, n = Sample size required in the study

Z = 1.9 (Standard normal deviate that corresponds to α-level of statistical significance)
P = 50% = 0.5 Expected prevalence of the malnutrition in school going children
Q = 1-P (1-0.5)
d = Margin of error which is the precision of results required (5%)

3. Results

Underweight and Normal

Table 1.1: Nutritional statuses of the respondents

Categories	Frequencies	Percentages
Normal	259	66.24%
Underweight	109	27.87%
Overweight	23	5.89%

This study was done among 391 respondents under study, 259 were found to be normal (116-male and 143-female) with mean age 15.30 years and standard deviation 1.258 years, 109 were found to be underweight (65-male and 44-female) with mean age 14.55 years and standard deviation 1.371 years and 23 was found to be overweight. The association between gender and underweight (P=0.009), age and underweight (P=<0.001) was found to be statistically significant. Due to less percentage of overweight we restricted it and analyzed only underweight and normal respondent. Majority (90%) of underweight respondents were found to follow Hindu religion. The education level, occupation of the respondent's father was found to be significantly associated with underweight status of the respondent with P value 0.006 and 0.0037 respectively. **Table 1.2** shows the details information.

Table 1.2: Distribution of socio-demographic characteristics among underweight and Normal respondents of the study

Characteristics	Underweight		Normal		P-value
	n = 109	29.6	n = 259	70.4	
	n	% %	n	%	
Age	14.55 (1.371)* 11-19 years		15.30 (1.258)* 12-18 years		< 0.001
Gender Male	65	59.6	116	44.8	
Female	44	40.4	143	55.2	0 0.009
Religion					
Hindu	90	82.6	215	83.0	
Buddhist	9	8.3	21	8.1	0 0.198
Christian	6	5.5	21	8.1	
Other	4	3.7	2	0.8	
Father's education Level					
Illiterate	10	9.3	39	15.7	
Literate	22	20.6	72	28.9	
Basic education(1-8)	40	37.4	82	32.9	0.006
Secondary Level (9-12)	32	29.9	39	15.7	
Higher Education	3	2.8	17	6.8	
Father's Occupation					
Homemaker	5	4.7	20	8.1	
Service	35	33	67	27.1	
Business	43	40.6	74	30.0	0 0.037
Manual work	11	10.4	28	11.3	
Other	12	11.3	58	23.5	

Table 1.3 represents the Univariate and Multivariate comparison of food intake at school between underweight and normal respondents of the study. In this study proportion of the respondents who never carried Tiffin box to school was 33.9% among underweight respondents; which was greater than those among normal respondents (23.9%). Additionally, multivariate analysis showed that there was increased risk of being underweight by 1.832 times among the respondents never carrying Tiffin (95% CI = 0.984 – 3.413). Out of total underweight respondents,

23.9% of the respondents and out of total normal respondents 20.5% carried money as Tiffin to school 1-3 times per week. After adjusting for the influence of confounders, it was found that there was significantly increased risk of underweight by 1.970 times among the respondents carrying money as Tiffin to school for one to three times per week (95% CI = 1.026 – 3.784) with the P-value of 0.042.

Table 1.3: Univariate and Multivariate comparison of food intake at school between underweight and normal respondents of the study

Characteristics	Underweight		Normal		Univariate analysis		P-value	Multivariate analysis		P-value
	n = 109	%	n = 259	%	OR	(95% CI)		AOR	(95% CI)	
Carry Tiffin to school										
Daily	45	41.3	135	52.1	1.00	-	-	1.00	-	-
4-6 times per week	9	8.3	19	7.3	1.421	(0.600-3.364)	0.424	1.547	(0.583-4.102)	0.381
1-3 times per week	18	16.5	43	16.6	1.256	(0.659-2.395)	0.489	1.514	(0.722-3.175)	0.272
Never	37	33.9	62	23.9	1.790	(1.055-3.038)	0.031	1.832	(0.984-3.413)	0.050
Carry money as Tiffin to school										
Daily	59	54.1	153	59.1	1.00	-	-	1.00	-	-
4-6 times per week	12	11.0	36	13.9	0.864	(0.824-4.064)	0.691	0.815	(0.353-1.881)	0.631
1-3 times per week	26	23.9	53	20.5	1.272	(0.729-2.221)	0.397	1.970	(1.026-3.784)	0.042
Never	12	11.0	17	6.6	1.831	(0.421-1.774)	0.137	2.546	(0.969-6.688)	0.050

OR: Odds Ratio, CI: Confidence Interval, AOR: adjusted Odds Ratio AO adjusted for Age, Gender, Fathers education level, Fathers occupation

Table 1.4 showed the proportion of respondents having lunch with mother/father and brother/sister among underweight and normal respondent was found to be 17.4% and 24.7% respectively. The relationship between having lunch with mother/father and brother/sister and underweight status of the respondent was found to be statistically significant with P value 0.049. The proportion of eating dinner with whole family among underweight respondents was 67% and 62.9% among normal respondents. The proportion of the respondents who do not eat in front of television was found to be 32.1% among underweight respondents and 39.8% among normal respondents, sometimes (23 times per week) among underweight and normal respondents was found to be 48.6% and 41.7% respectively. Among underweight respondents, the proportion of respondents consuming breakfast was found to be 67.0% which was more than the percentage of normal respondents consuming breakfast i.e. 62.5%. Similarly 23.9% used to consume breakfast for sometimes (2-3 times per week) which was slightly less than the proportion of normal respondents consuming breakfast sometimes (2-3 times per week) i.e. 27.8%. The proportion of respondents having breakfast before 7 am

was greater among respondents (47.5%) than underweight normal respondents (33.5%).The multivariate analysis showed that there was increased risk of underweight among respondents who consume breakfast before7am by 2.052 times (95% CI 0.183-23.011). The proportion of respondents never skipping dinner was found to be 77.1% among underweight respondent and 74.5% among normal respondent. Similarly, out of total underweight respondents, 21.1% of the respondents and out of total normal respondents 20.8% used to skip dinner 1-3 times per week. In this study less than one fourth of the underweight and normal respondent reported daily consumption of fruits. It was found that the proportion of respondents' never consuming meat and fish among underweight respondents was 11.0 % and 14.3 % among normal respondents. Out of total underweight respondents, 64.2 % of the respondents consumed meat and fish one to three times per week, which was more than normal respondents (56.4%). Again, after adjusting for the influence of confounders, it was found that there was increased risk of underweight by 2.719 times among the respondents consuming meat and fish for one to three times per week (95% CI = 0.308-23.988).

Table 1.4: Univariate and Multivariate comparison of eating habit at home between underweight and normal respondents of the study

Characteristics	Underweight n =109	%	Normal n = 259	%	OR	Univariate analysis (95% CI)	P-value	AOR	Multivariate analysis (95% CI)	P-value
with whom you eat lunch in family										
Alone	20	18.3	40	15.4	1.00	-	-	1.00	-	-
Whole family	41	37.6	102	39.4	0.804	(0.421 -1.536)	0.509	0.877	(0.397-1.939)	0.746
Mother/father and brother/sister	19	17.4	64	24.7	0.594	(0.283 - 1.247)	0.168	0.439	(0.194-0.995)	0.049
Brother/Sister	29	26.6	53	20.5	1.094	(0.542 - 2.209)	0.801	0.769	(0.371-1.596)	0.481
Person with whom you eat										
Dinner in family Alone	6	5.5	19	7.3	1.00	-	-	1.00	-	-
Whole family	73	67	163	62.9	0.705	(0.270- 1.839)	0.475	1.318	(0.329-5.279)	0.697
Mother/father and brother/sister	19	17.4	53	20.5	0.881	(0.306-2.535)	0.814	0.881	(0.257-3.017)	0.840
Brother/Sister	11	10.1	24	9.3	0.689	(0.215-2.204)	0.530	1.415	(0.460-4.351)	0.544
Eating in front of television										
Yes	21	19.3	48	18.5	1.00	-	-	1.00	-	-
No	35	32.1	103	39.8	0.777	(0.409-1.473)	0.439	1.003	(0.510-1.970)	0.994
Sometimes (2-3 times per week)	53	48.6	108	41.7	1.122	(0.610-2.063)	0.712	1.003	(0.367-1.558)	0.449
Consumption of Breakfast										
No	10	9.2	24	9.3	1.00	-	-	1.00	-	-
Yes	73	67.0	163	62.9	0.930	(0.423- 2.045)	0.85	0.555	(0.207 -1.486)	0.241
Sometimes (2-3 times per week)	26	23.9	72	27.8	1.154	(0.487-2.736)	0.745	0.614	(0.242-1.560)	0.306
Responses on Breakfast Times										
After 9 am	1	1.0	6	2.5	1.00	-	-	1.00	-	-
Before 7 am	48	47.5	80	33.5	3.600	(0.421-30.814)	0.242	2.052	(0.183-23.011)	0.560
Between 7&8 am	41	40.6	127	53.1	1.937	(0.227-16.564)	0.546	1.568	(0.153-16.121)	0.705
Between 8& 9 am	11	10.9	26	10.9	2.538	(0.273-26.638)	0.413	3.444	(0.335-35.379)	0.298
Skipping of Dinner										
>3 times per week	2	1.8	11	4.7	1.00	-	-	1.00	-	-
Never	84	77.1	194	74.5	2.381	(0.517-10.978)	0.266	1.927	(0.355-10.464)	0.448
1-3 times per week	23	21.1	54	20.8	2.343	(0.481-11.415)	0.292	1.671	(0.327-8.538)	0.537
Consumption of Fruits: Daily	18	16.5	39	15	1.00	-	-	1.00	-	-
Never	2	1.8	18	6.9	0.241	(0.050-1.150)	0.074	0.333	(0.065-1.716)	0.189
1-3 times per week	40	36.7	113	43.6	0.767	(0.395-1.491)	0.434	0.878	(0.412-1.868)	0.735
4-6 times per week	49	45.0	89	34.4	1.193	(0.618-2.304)	0.600	0.959	(0.462-1.989)	0.910
Consumption of Meat/Fish										
Daily	1	0.9	10	3.9	1.00	-	-	1.00	-	-
Never	12	11.0	37	14.3	3.243	(0.375-28.018)	0.285	1.488	(0.151-14.698)	0.734
<3 times per week	70	64.2	146	56.4	4.795	(0.602-38.197)	0.139	2.719	(0.308-23.988)	0.368
>= 3 times per week	26	23.9	66	25.5	3.939	(0.480- 32.335)	0.202	1.837	(0.201-16.873)	0.590

OR: Odds Ratio, CI: Confidence Interval, AOR: adjusted Odds Ratio AO adjusted for Age, Gender, Fathers education level, Fathers occupation

Table 1.5 represents the Univariate and multivariate comparison of physical activity between underweight and normal respondents of the study. The proportion of the respondents spending on vigorous intensity activity was found to be 53.2% among underweight respondents and 49.4% among normal respondents. Among underweight respondent, the proportion of the respondents spending on moderate intensity activity was found to be 67.9% among underweight respondents 62.2% among normal respondents. The risk of underweight was found reduced by 7% among the respondent who are involved in vigorous intensity activity.

Table 1.5: Univariate and multivariate comparison of physical activity between underweight and normal respondents of the study

Characteristics	Underweight n = 109	%	Normal n = 259	%	OR	Univariate analysis (95% CI)	P-value	AOR	Multivariate analysis (95% CI)	P-value
Vigorous intensity activity										
No	51	46.8	131	50.6	1.00	-	-	1.00	-	-
Yes	58	53.2	128	49.4	1.163	(0.743-1.822)	0.507	0.930	(0.552-1.567)	0.786
No. of Days Spent for Vigorous Intensity Exercise										
Never	51	46.8	130	50.2	1.00	-	-	1.00	-	-
1 to 3 days	35	32.1	74	28.6	0.829	(0.495-1.390)	0.478	1.043	(0.578-1.885)	0.888
4 to 6 days	15	13.8	30	11.6	0.785	(0.390-1.579)	0.497	0.819	(0.372-1.800)	0.619
All days	8	7.3	25	9.7	1.226	(0.519-	0.642	0.652	(0.252-1.682)	0.376

						2.896)				
Moderate intensity activity No Yes	35 74	32.1 67.9	98 161	37.8 62.2	1.00 1.287	- (0.801-2.067)	- 0.297	1.00 1.213	- (0.713-2.064)	- 0.477

OR: Odds Ratio, CI: Confidence Interval, AOR: adjusted Odds Ratio AO adjusted for Age, Gender, Father's education level, Father's occupation.

4. Discussion

The study showed, among 391 study participants, 109 (27.87%) were underweight, 23 (5.89%) were overweight and 259 (66.24%) were normal. Additionally, among total underweight 59.6% were male and 40.4% were female. The gender and underweight status of the respondent was found to be significantly associated with each other with P value of 0.009. Likewise study conducted by Dambhare DG et al., [6] in peri urban area of Wardha, that showed the prevalence of underweight was comparatively more among boys (75%) than girls (25%) as same result as hospital based cross sectional study conducted by Singh JP et al.,[7]The findings of the cross sectional study conducted by Wang Y et al., in 1991 and 1993 also carry similar findings of the study which showed more boys than girls were under-nourished in both years (P<0.05)[8].

This study revealed that majority of respondents both reported "yes" on consumption of breakfast i.e. underweight (67.0%) and 62.5% of normal respondent. Similar result was found in the cross sectional study conducted by Kigaru DMD et al., [4]in Nairobi City, Kenya, Majority of the respondents (92.1%) reported "Yes" on consumption of breakfast. This study showed among underweight respondent, nearly half of the underweight respondents took their breakfast before 7 am. Followed by between 7and 8 am (40.6%) and normal respondent more than of the respondents had breakfast between 7& 8 am, followed by having breakfast before7am. It is supported by study conducted by Abiba A et al.,[1] in Tamale metropolis showed most of the respondent (80%) took their breakfast 7 am followed by between 7& 8 am (16%).

This study showed that majority of the both respondents group took lunch every day; underweight (78.0%) and normal respondents (72.6%), most of them took dinner every day; underweight (77.1%) and normal (74.9%). Among underweight respondents, 21% skipped dinner 1-3 times per week and only 1.8% skipped dinner more than 3 times a week. Similarly in the

Study conducted by Abiba et al., (2012) majority of the study population (76.8%) took lunch every day. Most of the respondents (91.9%) took dinner every day, 6.1% skipped 1-3 times per week and the rest 2% skipped >3 times per week.

In the study conducted by both Soyer MT et al., [9] and Onyiriuka AN et al.,[10] most of the respondents eat with members of household. Our study revealed that more than half of the respondents ate dinner with whole family. The risk of underweight was significantly reduced by 56.1% among the respondent who ate lunch with mother or father and brother or sister. This may due to the fact that eating with family have healthy choice of food and thus could improve diet quality. The findings of this study presented that on watching television while eating, nearly half of the respondents among underweight and normal respondent reported "sometimes (2-3 times a week)"and followed by "No" and least reporting "Yes". Conversely, in the study conducted by Kigaru DMD et al.,[4] showed that on viewing of television while eating, more than half of them reported "Yes", followed by "No" and "Sometimes (2-3 times a week).

In this study less than one fourth of the underweight and normal respondent reported daily consumption of fruits. Conversely, in the study conducted by Rao DR et al., [11] more than half of the study participants reported daily fruit consumption. In our study, more than half of the respondents from each group consumed meat and fish 1-3 times a week and least respondents of each group consumed it. This findings was supported by the findings of the study conducted by Onyiriuka AN et al.,[10] 49.2% of the respondents ate meat 1-3 times /week and the least (19.1%) of daily and also showed meal skipping was associated with an increased prevalence of overweight and obesity. This may be due to binge eating and often people who skip meals throughout the day make up for lost calories by eating larger meals in one sitting which gives an uneven distribution of calories throughout the day and may lead to weight gain.

5. Conclusion

Among 391 study participants, more than one -fourth were underweight, minority of the respondent were overweight. Additionally among total underweight more than half were male. The gender and underweight status of the respondent was found to be significantly associated. The risk of underweight was significantly increased by nearly two times among the respondents who carried money as Tiffin to school 1-3 times a week. The risk of underweight was significantly reduced by 56.1% among the respondent who ate lunch with mother or father and brother or sister. The risk of underweight was found reduced by 7% among the respondent who are involved in vigorous intensity activity.

Study Limitation

The study was limited to only Kathmandu valley and that sample size might not be the exact representatives of whole case so as to generalize the findings of the study.

Ethical consideration

From different seven public school of Kathmandu valley granted permission for the study conducted. Informed consent of the students was also taken before including

them in the study. Official letter from the CAFODAT College, Institutional Review committee was taken before conducting the research.

Acknowledgement

Funding

References

[1]. Abiba A, Grace A N K and Kubreziga KC. Effects of Dietary Patterns on the Nutritional Status of Upper Primary School Children in Tamale Metropolis Pakistan Journal of Nutrition 2012;11 (7): 689-707

[2]. Joshi HS, Gupta R, Joshi M C, Mahajan V. Determinants of Nutritional Status of School Children - A Cross Sectional Study in the Western Region of Nepal Natl J Integr Res Med2011; 2(1): 10-15

[3]. Haider R, Bhatia S *et al.,* Adolescent Nutrition: A Review of the Situation in Selected Southeast Asian Countries 2006

[4]. Kigaru DMD, Loechl C, Moleah T *et al.,* Nutrition knowledge, attitude and practices among urban primary school children in Nairobi City, Kenya: a KAP study Kigaru BMC Nutrition 2015; 1:44

[5]. Adesina FA *et al.,* Weight status of adolescents in secondary schools in port Harcourt using Body Mass Index (BMI) Italian Journal of Pediatrics 2012; 38:31

[6]. Dambhare DG, Bharambe MS, Mehendale AM *et al.,* Nutritional Status and Morbidity among School going Adolescents in Wardha, a Peri-Urban area Online Journal of Health and Allied Sciences Apr-Jun 2010 ;Volume 9, Issue 2

[7]. Singh JP, Kariwal P, Gupta SB *et al.,* Nutritional status and morbidity among school going children: A scenario from a rural India Sch. J. App. Med. Sci 2014; 2(1D): 379-383

[8]. Wang Y, Popkin B and Zhai F The nutritional status and dietary pattern of Chinese adolescents, 1991 and 1993 European Journal of Clinical Nutrition 1998; 52, 908-916

[9]. Soyer MT, Ergin I and Gursoy ST. Effects of social determinants on food choices and skipping meals among Turkish adolescents. Asia Pac J ClinNutr 2008; 17 (2):208-215

[10]. Onyiriuka AN, Umoru DD, Ibeawuchi AN Weight status and eating habit of adolescent Nigerian urban secondary school girls. South African Journal of Child Health 2013; 7 (3):108112

[11]. Rao DR, Vijayapushpam T, Rao GMS ,Sarma KVR. Dietary habits and effect of two different educational tools on nutrition knowledge of school going adolescents girls in Hyderabad, India, European Journal of Clinical Nutrition 2007; 61,1081-1085