

NUTRITIONAL STATUS AND ITS ASSOCIATED FACTORS AMONG GOVERNMENT SCHOOL-GOING ADOLESCENTS OF BIRENDRANAGAR MUNICIPALITY, SURKHET, NEPAL

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ABSTRACT

A recently published WHO report revealed that a large number of adolescents in the Southeast Asian Region, suffer from malnutrition and anemia, which adversely impacts their health and development. If adolescent malnutrition is not treated on time, it leads to major repercussions such as low birth weight and poor health in adulthood. A survey on the nutritional status of adolescents based in 13 districts of Nepal revealed that almost six out of ten male adolescents and seven out of ten (71.0%) of female adolescents were undernourished. The likelihood of undernutrition was high among adolescents residing in Terai (72.0%), followed by Hill (59.0%) and Mountain (54.0%). A cross-sectional descriptive study was carried out among the adolescents of grade 6 studying in the government school of Birendranagar Municipality from May to October 2023. A total of 240 students were selected from five schools constitute the sample size of the study. The selection was based on stratified random sampling, where each school was considered a stratum. Anthropometric measurement assessed nutritional status based on BMI. Attempts were made to determine the associations between the nutritional status and socio-demographic, behavioral hygiene and diet-related variables. Of the total adolescents, 55.8% were normal, 22.3% were thin and 22.9% were very thin. The nutritional status of the adolescents was observed to be significantly associated with their family type, family income, physical activities, and mother's education. Encouraging physical activities and promoting healthy habits can enhance the nutritional status of adolescents in the population of students of grade 6 at governmental schools of Birendranagar Municipality, Surkhet, Nepal.

KEYWORDS

Nutritional status, body mass index, adolescents, WHO Anthro+, associated factor, Nepal

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INTRODUCTION

Adolescents account for about one-fourth of the total world's population, and the majority of them live in developing countries.¹ Adolescence is a period of physical, psychological and social maturation which is one-fifth (22.0%) of the total population of Nepal.² The United Nations (UN) and WHO define adolescence as a segment of a population group aged from 10-19 years old; this is a transition from childhood to adulthood period has intense physical, psychosocial and cognitive development.³

Recent WHO reports indicate that in the Southeast Asian Region a large number of adolescents, who constitute one-fifth (20%) of the population in these countries, suffer from malnutrition and anemia, which adversely impact their health and development, and that anthropometry is a good indicator of nutritional status and health risks in this group.⁴ When it comes to nutrition, adolescence is a crucial period since it is a time of fast development and gives previously undernourished children the chance to put on weight and grow taller, so long as their environment is favorable to better nutrition. On the other hand, if adolescent malnutrition is not treated quickly, it might have major repercussions, including poor health in adulthood and low birth weight.⁵ During this phase, Adolescents reach 50.0% of adult weight, 45.0% of bone mass growth, and 15% of ultimate adult height, along with other body composition and structure changes.⁶

The burden scope of malnutrition is still unacceptably high, and the progress to reduce it is slow.⁷ In many developing countries, stunting, underweight, and micronutrient deficiencies among adolescents frequently result from inadequate nutrition and infections during early childhood combined with a diet insufficient to meet the intense nutritional demands of rapid growth during adolescence.⁸ The WHO has reported that poor nutrition is the single most significant threat to the world's health.⁹

According to the Global School-Based Student Health Survey (GSHS) 2015, 10.9% (male 13.8%, female 8.1%) of adolescent students were underweight, 6.7% (male 7.6%, female 5.8%) were overweight and 0.6% (male 0.8% and female 0.4%) of the school going adolescent were obese.¹⁰ An adolescent nutrition survey from 13 districts representing Nepal's three ecological (Mountain, Hill and the Terai) regions revealed that 59.0% of female and 71.0% of male adolescents were undernourished. The likelihood of undernutrition was high among adolescents residing in the Terai 72.0% has the highest level followed by Hill 59.0% and

Mountain 54.0%. The prevalence was almost similar among adolescents living in urban areas 63.0% and rural areas 65.0%.¹¹

A school-based cross-sectional analytical study was conducted in the public secondary school of Lekhnath Municipality of Kaski District of Nepal showed according to body mass index, half of the respondents (50.6%) were found to be underweight with 38.3% being normal and 11.0% of them overweight.² Similarly, another study conducted in Malangwa Municipality, Sarlahi, Nepal revealed 40.1% of adolescents were malnourished out of which 37.6% were underweight and 2.5% were overweight. The mean BMI was 19.42 ± 2.5 ¹²

Especially, at the provincial level, there is a lack of data available on the nutritional status among adolescents, as most studies focus only on under five-aged children and women. Thus, this study was carried out to assess the nutritional status and its associated factors using WHO AnthroPlus software based on the new WHO Growth Reference 2007¹³ among government school-going adolescents of Birendranagar Municipality, Surkhet District.

MATERIALS AND METHODS

A cross-sectional descriptive study was carried out among the adolescents of grade 6 studying in the government school of Birendranagar Municipality from May to October 2023.¹⁴ Prevalence for computing sample size of the study was based on a previous study conducted in the Dang District,¹⁵ which has similar demographic characteristics as that of Surkhet District. A total of 240 students were selected from five schools constitute the sample size of the study. The selection was based on stratified random sampling, where each school was considered a stratum. The study included adolescents aged above 10 years. Anthropometric measurement assesses nutritional status based on BMI. Attempts were made to determine the associations between the nutritional status and socio-demographic, behavioral and diet-related variables.

Quantitative data for assessing associated factors were collected through self-administered questionnaires, following clear instructions from the researcher. Initially developed in English, the questionnaire was later translated into Nepali. Anthropometric assessments involved weight and height measurements from adolescents. They were clearly instructed to remove their shoes and step on a digital weighing scale with their hands freely suspended. Height measurements were conducted by a stadiometer, with adolescents

standing shoeless and erect on the plank, back parallel to the meter. The researcher entered the obtained readings into the coded questionnaire for each respondent.

Anthropometric assessments were conducted to calculate BMI, by numerical measure utilizing an individual’s weight and height to estimate body fat, applicable to both males and females irrespective of age.¹⁶ The BMI calculation involves dividing a person’s weight in kilograms by the square of their height in meters, expressed as $BMI = \text{weight (in kg)} / \text{height}^2 \text{ (in m}^2\text{)}$. This index serves as a statistical tool for assessing body composition, commonly used in health and nutrition contexts. The WHO AnthroPlus software categorizes BMI into Underweight (BMI below the 5th percentile), Healthy weight (between the 5th percentile and less than the 85th percentile), and Overweight and Obese (above the 85th percentile).¹⁷ The obtained values from WHO AnthroPlus were analyzed using SPSS-26, and the chi-square test was applied to measure the association between two categorical variables: dependent and independent variables. Ethical considerations were obtained from the Institutional Review Committee of Nobel College (Ref. No.: 80/81/246). Written consent was obtained from schools and parents to conduct the study, ensuring the confidentiality of all information and maintaining the respondent’s privacy.

RESULTS

Table 1 outlines the sociodemographic characteristics of the study adolescents, presenting frequencies and percentages for various variables. The percentage of male (51.7%) and female (48.3%) adolescents were fairly balanced. The age distribution was diverse, with the majority falling into the 11-year-old category (35.0%), followed by 10-year-olds (24.2%), 12-year-olds (29.2%), and 13-year-olds (11.7%), yielding a mean age of 11.28 years with a standard deviation of 0.96. Six out of ten adolescents were *Brahmin-Chhetri* (60.5%) and one out of ten were *Thakuri* (10.0%). The majority of respondents identified as *Hindu* (86.3%), followed by *Christian* (7.5%), *Islam* (3.3%), and *Buddhist* (2.9%). Geographically, more participants resided inside the valley (55.8%) than outside the valley (44.2%). Family structures varied, with 67.6% belonging to nuclear families and 32.5% to joint families. Most adolescents reported having siblings (83.8%), and among those with siblings, the distribution was as follows, 45.3% had one sibling, 42.3% had two, and 12.4% had three. Parental occupations showed diversity, with four out of ten respondent fathers engaged in service (41.3%), and one quartile were foreign employment (25.0%). Respondent mothers

Table 1: Socio-demographic characteristics of adolescent participants (n=240)

Variables	n	%
Sex		
Male	124	51.7
Female	116	48.3
Age		
10	58	24.2
11	84	35.0
12	70	29.2
13	28	11.7
Mean ± SD 11.28 (SD ± 0.96)		
Ethnicity		
<i>Brahmin</i>	63	26.3
<i>Chhetri</i>	82	34.2
<i>Thakuri</i>	24	10
<i>Dalit</i>	38	15.8
Others	33	13.8
Religion		
<i>Hindu</i>	207	86.3
<i>Christian</i>	18	7.5
<i>Islam</i>	8	3.3
<i>Buddhist</i>	7	2.9
Permanent address		
Inside valley	134	55.8
Outside valley	106	44.2
Types of family		
Nuclear	162	67.6
Joints	78	32.5
Respondent siblings		
Yes	201	83.8
No	39	16.3
Number of siblings (n= 201)		
1	91	45.3
2	85	42.3
3	25	12.4
Father’s occupation		
Service	99	41.3
Foreign employment	60	25.0
Business	55	22.9
Agriculture	26	10.8
Mother’s occupation		
Household	104	43.3
Agriculture	60	25.0
Service	34	14.2
Business	30	12.5
Foreign employment	12	5.0
Father’s education		
Basic level	75	31.3
Secondary level	90	37.5
Higher secondary level	50	20.8
Bachelor and above	25	10.4
Mother’s education		
Illiterate	48	20.0
Basic level	102	42.5
Secondary level	53	22.1
Higher secondary level	27	11.3
Bachelor and above	10	4.2
Family income		
Below 25,000	101	40.8
25000-50,000	94	39.2
Above 50,000	45	18.8

Table 2: Behavior and hygiene characteristics of adolescent participants (n=240)

Variables	n	%
Respondent's physical activity status		
Yes	150	67.1
No	90	32.9
Duration of physical activity (n=150)		
Less than 30 minutes	35	23.3
30minutes – 1 Hour	63	42.0
More than 1 Hour	52	34.7
Sleep duration (Hours)		
7	45	18.8
8	128	53.3
9	67	27.9
Hand-washing before and after meals		
Yes	134	55.8
No	106	44.2
Types of hand wash (n=134)		
Clean tap water	41	30.6
Life-buoy soap	68	50.7
Dettol soap	25	18.7
Source of drinking water		
Clean tap water	76	31.7
Filtration	140	50
Jar water	44	18.3

were predominantly involved in household activities (43.3%), followed by agriculture (25.0%). The educational level of parents varied, with respondent fathers distributed more across the basic level (31.3%) and secondary level (37.5%). Adolescent mothers exhibited educational levels of illiterate (20.0%), and basic level (42.5%). In terms of family income, a significant proportion of the family's income was below Rs. 25,000.

Table 2 shows the Behavior and hygiene characteristics of the surveyed adolescents. A notable 67.1% of respondents reported engaging in regular physical activity. Among those participating in physical activity (n=150), the duration varied with, 42.0% allocating 30 minutes to 1 hour, and 34.7% engaging for over 1 hour. Sleep patterns were explored, with 53.3% indicating 8 hours, and 27.9% indicating 9 hours of sleep. Hygiene practices, specifically hand-washing before and after meals, were prevalent among 55.8% of respondents. Analysis of hand-wash practices (n=240) revealed 30.6% using clean tap water, 50.7% employing Life-boy soap, and 18.7% opting for Dettol soap. Additionally, the source of drinking water varied, with 31.7% relying on clean tap water, 50.0% using filtration methods, and 18.3% choosing jar water.

Table 3: Dietary-related characteristics of adolescent participants (n=240)

Variables	n	%
Dietary pattern		
Vegetarian	45	18.8
Non-vegetarian	195	81.3
Number of meals in a day		
3	107	44.6
4	98	40.8
5	35	14.6
Consumption of junk food status		
Yes	196	81.7
No	44	18.3
Frequency of junk food consumption (n=196)		
Daily	64	33.0
Alternative	54	27.8
Once a week	16	8.2
Twice a week	60	30.9
Frequency of Fruits consumption		
Daily	42	17.5
Once a week	111	46.3
Alternative	17	7.1
Twice a week	70	29.2
Frequency of green leafy vegetables consumption		
Daily	129	53.8
Alternative	92	38.3
Once a week	19	7.9
Mid-day meal of respondents		
Roti/Paratha and vegetables from Home	62	25.8
Packed food (Noodles/ Biscuits)	30	12.5
Fast-Food from canteen	73	30.4
Noon / Skips	75	31.3

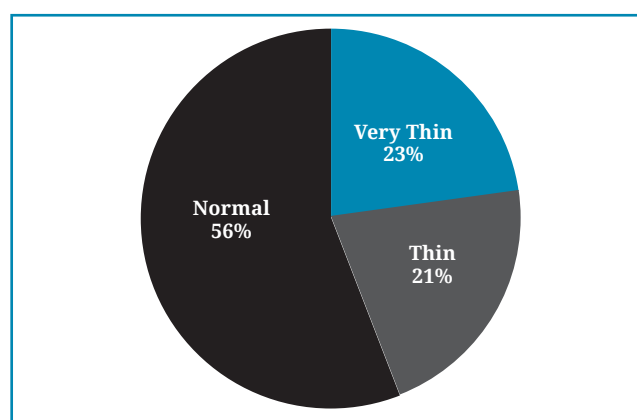
**Fig 1: Nutritional status of respondents (n=240) by using BMI for age (Percentile – WHO Anthro+)**

Table 4: Association between demographic, family, behavior, lifestyle variables and nutritional status of adolescent participants

Variables	Nutritional Status		Chi-sq. value	P-value
	Under-weight (Very thin + Thin)	Normal Weight		
Age				
10	21 (36.2%)	37 (63.8%)	3.442	0.332
11	43 (51.2%)	41 (48.8%)		
12	29 (41.4%)	41 (58.6%)		
13	13 (46.4%)	15 (53.6%)		
Sex				
Male	59 (47.6%)	65 (52.5%)	1.213	0.271
Female	47 (40.5%)	69 (59.5%)		
Ethnicity				
<i>Brahmin</i>	38 (60.3 %)	25 (39.7%)	10.086	0.39
<i>Chhetri</i>	34 (41.5%)	48 (58.5%)		
<i>Thakuri</i>	9 (37.5%)	15 (62.5%)		
<i>Dalit</i>	12 (31.6%)	26 (68.4%)		
Others	13 (39.4%)	20 (60.6%)		
Religion				
<i>Hindu</i>	92 (44.4%)	115 (55.6%)	0.47	0.828
<i>Non-Hindu</i>	14 (42.4%)	19 (57.9%)		
Permanent address				
Inside valley	49 (36.6%)	85 (63.4%)	7.105	0.008*
Outside valley	57 (53.8%)	49 (46.2)		
Family type				
Nuclear	60 (37%)	102 (63%)	10.27	0.001*
Joint	46 (59%)	32 (41%)		
Siblings				
Yes	95 (47.3%)	106 (52.7%)	4.81	0.028*
No	11 (28.2%)	28 (71.8%)		
Education status of father				
Basic Level	39 (52%)	36 (48%)	2.978	0.395
Secondary Level	37 (41.1%)	53 (58.9%)		
Higher Secondary	21 (42%)	29 (58%)		
Bachelor and above	9 (36%)	16 (64%)		
Education status of mother				
Illiterate	33 (68.8%)	15 (31.3%)	15.719	0.003*
Basic level	42 (41.2%)	60 (58.8%)		
Secondary level	19 (35.8%)	43 (64.2%)		
Higher secondary level	9 (33.3%)	18 (66.7%)		
Bachelor and above	3 (30%)	7 (70%)		
Monthly income of family				
Below 25,000	72 (73.5%)	26 (26.5%)	62.717	0.001*
25,000-50,000	29 (30.5%)	66 (69.5%)		
Above 50,000	5 (10.6%)	42 (89.4%)		
Physical activity				
Yes	51 (21.3%)	99 (41.3%)	16.766	0.001*
No	55 (22.9%)	35 (14.6%)		
Junk food status				
Yes	94 (48%)	102 (52%)	6.236	0.013*
No	12 (27.3%)	32 (72.7%)		
Break-time tiffin				
Roti/Paratha and vegetables from home	21 (33.9%)	41 (61.1%)	15.085	0.002*
Packed food (Noodles/Biscuits)	16 (53.3%)	14 (46.7%)		
Fast-food from canteen	24 (32.9%)	49 (67.1%)		
Noon / Skips	45 (60%)	30 (40%)		

*Percentage values are based on column totals.

Table 3 is a comprehensive examination of respondents' dietary patterns and lifestyle choices. The data reveals that a significant majority of adolescents identified as non-vegetarian (81.3%). The frequency of meals per day varied, with 44.6% opting for three meals, and 40.8% for four meals a day. Notably, 81.7% of respondents reported consuming junk food, among whom 33.0% did so daily, and 27.8% on alternate days. Fruits consumption frequency varied, with 17.5% consuming them daily, and 46.3% weekly. Green leafy vegetables were more prominently included in daily diets, with 53.8% consuming them daily, 38.3% alternately, and 7.9% weekly. Mid-day meal preferences indicated that 30.4% preferred fast food from canteens, while 31.3% either skipped or had no specific mid-day meals.

Fig. 1 shows the nutritional status of the respondents according to the WHO AnthroPlus software, BMI for age. Regarding nutritional status, 56.0% of the participants had normal weight, whereas 23.0% were very thin and 21.0% were thin. Altogether 44.0% of the participants were underweight.

An attempt was made to examine the association between the dependent variable (nutritional status) and the explanatory variables in table 4 where the chi-square test was applied. A highly significant association between family type ($p = 0.001$), physical activity ($p = 0.001$), and family income ($p = 0.001$) with nutritional status was observed. Furthermore, a statistically significant association was found between junk food status and break-time tiffin [Roti/Paratha and vegetables from home, packed food (Noodles/Biscuits), Fast-food from canteen] and Noon/Skips and nutritional status ($p = 0.045$ and 0.004 , respectively). This study also found a significant association between the mother's education status and nutritional status ($p = 0.003$).

DISCUSSION

In the study conducted in 2023 AD in rural Ghana, 137 young adolescents were enrolled, WHO AnthroPlus software was used to measure the BMI. A large proportion 88.4% had a normal BMI status while 5.8% each were overweight and underweight but differed in this study, more than fifty percent 55.8% were normal and 44.2% were underweight. Likewise, the meal frequency of adolescents was three times in more than 70.0% of adolescents followed by 4 times the meal frequency (15.32%) of respondents but in this study, the majority of the respondents (44.6%) had meal frequency three times followed by four times a day (40.8%).¹⁸ Likewise, as compared to the prevalence of underweight was higher in males (24.5%) than

in females (19.58%) which shows consistency in this study as the prevalence of underweight was higher in males (32.4%) than in females (10.4%).³

In the present study among adolescents, 57.2% of adolescents were normal weight followed by underweight (42.2%). The findings in this study were a different to the study conducted in the Dang District as 74.3% of adolescents were normal weight, followed by underweight (21.8%), overweight (3.1%) and obesity (0.8%).¹⁵ Similarly, a study conducted in the Kaski District showed 50.6% of adolescents were underweight followed by normal weight (38.3%) and overweight (11.0%) which was different from this study where more than fifty percent 55.8% were normal and 44.2% were underweight. In the same study conducted in Kaski District showed that there is a significant association between nutrition status and ethnicity, type of family which is similar to this study as there is a significant association between nutrition status and ethnicity ($p = 0.039$) and type of family ($p = 0.039$).²

The present study showed the prevalence of underweight (42.2%), and (57.8%) normal weight is consistent to the study conducted in the Western Region of Nepal, more than half of the respondents (69.64%) were normal weight, and (30.45%) were underweight.¹⁸ The Cross-sectional study conducted on the Government School of Solukhumbu District, Nepal showed that the prevalence of underweight was 40.0% followed by normal weight (40.0%) and overweight (6.36%) but in this study, the prevalence of underweight was slightly higher (44.2%) whereas more than fifty percent (55.8%) were of normal weight.⁵

Adolescent Nutrition Survey in Nepal 2014 showed 79.5% of adolescents were underweight followed by 20.1% were normal weight and 0.9% were overweight which showed contrast in the study as prevalence of underweight is 42.2% and normal weight is 57.8%.¹⁰ The study was conducted in the Dang district, where the majority of the respondents (51.4%) were male. The majority of the respondents (42.7%) belonged to the *Brahman-Chhetri* ethnicity. Likewise, the majority of the respondents belonged to a nuclear family (64.3%) which showed consistent to the study as the majority of the respondents were males (51.7%) where as the majority of the respondents (60.5%) were *Brahmin-Chhetri*. Likewise, the majority of the respondents belonged to the nuclear family (73.8%).¹⁵

Furthermore, the study showed nutritional status of adolescents was significantly associated with family monthly income ($p = 0.001$), permanent address ($p = 0.008$), mother education ($p = 0.003$), physical activity

($p = 0.001$), number of siblings ($p = 0.004$), junk food status ($p = 0.001$) and break-time tiffin ($p = 0.002$). These findings highlight the multifaceted nature of factors influencing the nutritional status of adolescents. Addressing these factors, such as promoting healthy eating habits, encouraging physical activity, and considering socioeconomic factors, could improve adolescents' overall health and well-being.

Limitations of the study: As the study is based on food consumption of the past, recall bias might affect the precision of findings. However, efforts were made to minimize such bias.

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