

# A Study of Associated Factors on Nutritional status and Academic Performance of Adolescents of Public Schools at Jajarkot District, Nepal

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**Abstract—Introduction:** Undernutrition poses a critical public health challenge for adolescents (10-19 years) in developing countries, according to WHO (1995), impacting growth, brain development, and long-term health. Chronic undernourishment during adolescence can lead to delayed pubertal development and extended growth, affecting learning abilities before and during school. **Methods:** A cross-sectional descriptive study (Sept-Dec 2022) involved 424 adolescents from 14 schools in Jajarkot. A well-designed questionnaire assessed diet diversity, morbidity, academic performance, and anthropometric measurements. Data were analyzed using SPSS version 21 and WHO Anthroplus software. **Results:** Stunting affected 40% of adolescents, with higher prevalence in girls (42.5%) than boys (37.2%). Wasting was more prevalent in boys (11.4%) compared to girls (18.4%), while overweight prevalence was over double in girls (2.2%) compared to boys (1%). Nearly half of adolescents had minimal dietary diversity (45.04%), with variations between girls (43.4%) and boys (47%). Academic performance was distributed among first (29.5%), second (63.9%), and third (6.6%) divisions. Statistical associations were found between morbidity, age groups, stunting, gender, dietary practices, parental education, ethnicity, and academic performance. **Conclusion:** Majority of adolescents with less than five food groups in their diet exhibited poor academic performance. Undernutrition, exacerbated by inadequate dietary practices and morbidity, impacts cognitive achievement. Promoting diet diversity is crucial for improving nutritional status, height for age, and maintaining a normal BMI for adolescents, thereby reducing malnutrition prevalence.

**Keywords—** Adolescents, Academic performance, Nutritional status, Prevalence.

## I. INTRODUCTION

The World Health Organization (WHO) defines adolescents as a person aged from 10-19 years (WHO/UNFPA/UNICEF, 1989). The crucial transition from infancy to adulthood that adolescents go through is marked by significant changes in their physical and psychological makeup as well as in their social interactions. Teenagers have unique dietary needs because of their fast-growing bodies, their erratic eating habits, and their vulnerability to outside factors. As per the United Nations (UN), the period of adolescence can be categorized into two groups as, early and late adolescence characterized differently.

Early adolescence (10-14 years) make up for the key life transition of girls and boys through puberty and into

adulthood. During this stage, children often start to grow more quickly. It is at this stage that brain undergoes a spectacular burst of electrical and physiological development with a consequent impact on emotional, physical and mental ability. Psychologically it is also characterized by low resistance to peer influence, minimal risk perception, often leading to increase in risk taking behavior. Given this, safe and supportive school, family and community environment are critical contexts during this period (George, et al., 2016). Late adolescence (15-19 years) encompasses the latter part of the teenage years, broadly between the ages of 15-19. The major physical changes have usually occurred by now, although body is still developing. The brain's ability to think critically and analytically is much increased, and it is still evolving and learning about itself. It is characterized by pubertal maturation, with self-regulatory skills and an increased ability to use implication of decision (George, et al., 2016).

Growth and sexual development may be delayed in adolescents who have inadequate nourishment. Even while the negative effects take time to manifest, adolescents who receive inadequate nourishment are also at a higher risk of developing chronic diseases. However, because teenagers are typically regarded as a healthy demographic, most health programs ignore them. This is especially a problem in poor nations when nutritional interventions target women and children (Popkin, et al., 2012).

The academic achievement of children and adolescents has a significant impact on their future outcomes and life opportunities, academic achievement is associated with higher educational attainment, which in turn influences health and social outcomes by affecting employment opportunities, socioeconomic status, access to health care, and psychosocial wellbeing (Florence, et al., 2008). The nutritional requirement such as macronutrients like proteins and micronutrients including vitamins and minerals are high during the puberty of adolescents to meet the demand of increased nutritional need as the adolescents gains their weight and skeletal mass during this period (Raghunatha, et al., 2007).

This study aims to assess the associated factors on nutritional status and academic performance of adolescents (10-14 years) of public school in Jajarkot district Nepal.

II. MATERIAL AND METHOD

A cross sectional descriptive study was carried out in a population of 17137 adolescent population from grade 6, 7 and 8 in a government school of Jajarkot District. A convenient sample of 424 adolescents were included in the study and calculated using Taro Yamane Method. The study followed a convenience sampling technique for the sample selection. Data were collected using 24- hour dietary recall questionnaire, stadiometer, and weighing scale. Data on academic performance were obtained from student from their previous academic year. Data on diet diversity, academic performance, and nutrition status were analyzed using SPSS version 21 and WHO anthropus software.

III. RESULTS

The study was undertaken among the respondents having specific age groups so that the age of the respondents varied from 10 to 14 years. The population under the study is positively skewed towards the higher age groups, with the highest population at the age of 13 years Fig. 1 and detail valued were shown in Table 1. The mean age of the respondent was found to be 12.56 years with SD 1.061.

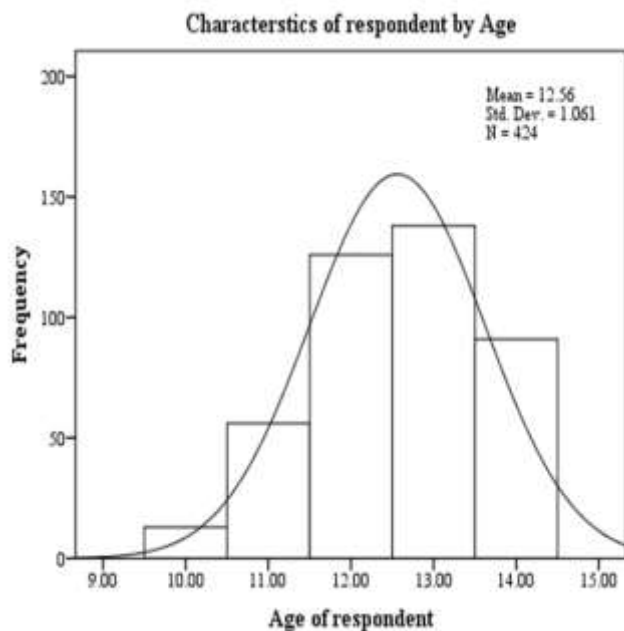


Fig. 1: Distribution of sample population by age

In the study majority of the respondents were girls. There were 53.77 percent girls and 46.2 percent boys in the study population as shown in Fig. 2. The composition of sample population was about equal for girls and boys accounting 50.6% and 49.4% respectively. The higher participation of girls on study was due to availability of girls at home compared to boys who were reported outside the study area for income generation activities.

Fig.3 shows that study population comprised of Brahmin, Chhetri, Hilly Janajati, Hill Dalit, Newar and other unidentified caste and ethnicity. Of all the caste and ethnicity,

the majority were Chhetri (55.42%) followed by Hilly Dalit (29.72%), Brahmin (8.019%), Janajati (6.36%) and Newar (0.472%).

Characteristics of sample population by sex

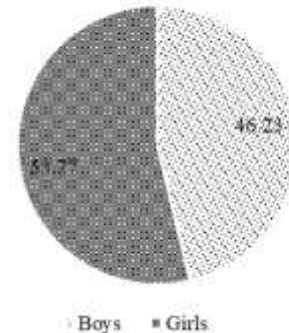


Fig. 2: Characteristics of sample population by sex

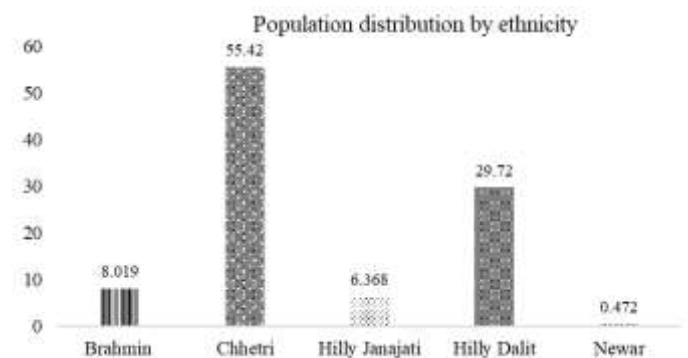


Fig. 3: Population distribution by ethnicity

TABLE 1: Percentage distribution by academic performance of study population

Academic class of respondents	Frequency (n=424)	Percentage
First division	125	29.5
Second division	271	63.9
Third division	28	6.6
<b>Total</b>	<b>424</b>	<b>100.0</b>

Out of total 424 studied populations, 29.5 % of the participants were achieved first division, majority of the respondents achieved second division accounting for 63.9 % and with minimum of respondent achieving third division, i.e. 6.6% as shown in Table 1. The academic class was done according to the Nepal Government ranking system for average annual score marks. The students securing 60% and above were categorized as first division, between 45% and 60% were as second division and less than 45% as third division. The distribution pattern of academic performance as per different characteristics were shown in Table 5.

Morbidity status of adolescent girls and boys

Two weeks preceding the study, 18.4 % of the adolescent's recall experience any type of illness reported with fever, abdominal pain, headache, diarrhea, and other medical condition on which they seek nearby health services. Boys

were found more ill compared to girls (Girls 15.8%, Boys 21.4%) as shown in Table 2.

TABLE 2: Health status of study participants disaggregated by sex preceding the study

Characteristics	N	Ill		Healthy	
		Yes	%	Yes	%
Girls	228	36	15.8	192	84.2
Boys	196	42	21.4	154	79.6

*Dietary diversity of adolescent girls and boys*

47% of adolescent boys and 43.4% of girls consumed at least five food group on day prior the study considered as population with minimum dietary diversity, indicating less than half of adolescent girls and boys are receiving micronutrients through different food sources Table 3.

The observed dietary diversity among adolescent girls and boys in the school under study is notable, with 43.4 percent of girls and 48 percent of boys consuming 5 or more food groups.

TABLE 3: Diet diversity among study population as per age and sex preceding the study

Characteristics	N	More than or equals to 5 food groups(5+)	Less than 5 food groups
<b>Age</b>			
10-12 years	195	91 (46.6%)	104 (53.4%)
13-14 years	229	100 (43.6%)	129(57.3%)
10-14 years	424	191 (45%)	233 (55%)
<b>Sex</b>			
Girls	228	99(43.4%)	129(56.6%)
Boys	196	92(47%)	104(53%)

N: Total number of respondent =424

Study population comprise both adolescents girls and boys aged 10-14 years studying in Jajarkot District

*Nutritional status of adolescent girls and boys*

Figure 4 shows that prevalence of stunting among adolescents attending public schools under the study, with a rate of 42.5% among girls and 37.2% among boys, resulting in an overall prevalence of 40.1% of stunting among adolescents in this specific context.

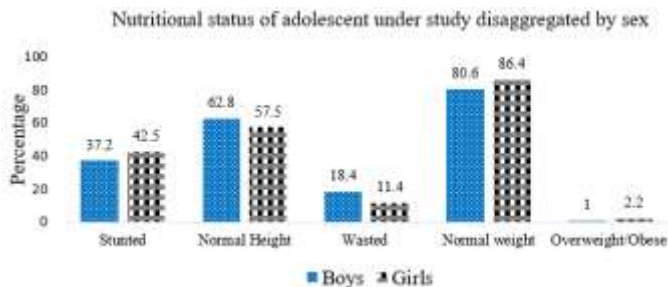


Fig. 4: Nutritional status of adolescent under study disaggregated by sex

The study identified significant rates of malnutrition among adolescents attending public schools in Jajarkot. Stunting prevalence was notably high at over 40%, with wasting affecting 14.6% of adolescents, particularly higher among boys. Overweight and obesity were less prevalent, standing at 1% for boys and 2.2% for girls. Additionally, boys tended to be taller and heavier than girls in the same age group. The mean height for girls fell below the WHO

standard, suggesting a need for better nutritional support to achieve optimal growth. The mean BMI for age was negative overall, indicating lower values, especially pronounced among boys who did not meet the minimum dietary diversity.

Among the respondent, adolescent boys under the study were taller and heavier than the adolescent girls. The mean height and mean weight of the adolescent girls aged 10-14 years was 142.52 cm and 34.51 kg whereas the mean height and mean weight of the adolescent boys aged 10-14 years under the study was 144.70 cm and 34.97 kg respectively Table 4.

TABLE 4: Mean height, Mean weight and Mean BMI for age of adolescent as per their characteristics

Characteristics	Adolescents			
	N	Mean Ht (cm)	Mean Wt (kg)	Mean BMI for age z score
<b>Age</b>				
10-12 years	195	139.6	32.06	-0.8
13-14 years	229	146.88	37	-1.05
10-14 years	424	143.53	34.72	-0.93
<b>Gender</b>				
Girls	228	142.52	34.51	-0.85
Boys	196	144.7	34.97	-1.03
<b>Health status</b>				
Ill	78	141.65	34.01	-0.87
Healthy	346	143.95	34.88	-0.95
<b>Dietary practices</b>				
5+ Food groups	191	143.39	35.06	-0.84
<5 Food Group	233	143.64	34.44	-1.01
<b>Ethnicity</b>				
Brahmin	34	144.41	34.67	-1.05
Chhetri	235	143.22	34.4	-0.96
Hilly Janajati	27	142.15	35.78	-0.65
Hilly Dalit	126	144.11	35.06	-0.93
Other/Newar	2	146.75	38.3	-0.42

Overall, the academic performance of the study responds was found higher considering first division rank a comparative factor, it was found higher with female, 10-12 years of age group, with good health condition, Brahmin and with higher level of parental education. (Table 5)

*Factors associated with academic performance*

Furthermore, the factors associated with academic performance among adolescent population in Jajarkot district was shown in the Table 6. The study showed that there was significant association of lower academic performance with stunting (p=0.001), gender (p=0.003), ethnicity (p=0.001), dietary practice (p=0.013) and parental education (p= 0.000) for both maternal and father education status. Different possible factors were analyzed using chi-square to find the association with academic performance. Age group, morbidity status and day meal program, did not showed the association with academic performance in the study area.

IV. DISCUSSION

The finding of this study revealed that 47% of adolescent boys and 43.4% of girls consumed at least five food group on day prior the study which is similar to the NNMSS, (MoHP, 2018), finding representing 48% for boys and 43 % for girls

received minimum dietary diversity the day prior to the survey. Compare with the national level, the diet diversity with 5+ food groups observed comparatively similar i.e. 43.4 percent of girls and 48 percent of boys among the school

under study which is similar to 43 percent girls aged 10-19 years and 48 percent boys aged 10-19 were consuming 5+ food groups at national level (MoHP, 2018).

TABLE 5: Academic performance among adolescence under the study as per their characteristics

Characteristics		N	Adolescents		
			1 <sup>st</sup> division %	2 <sup>nd</sup> division %	3 <sup>rd</sup> division %
Sex	Male	196	21.9	72.4	5.6
	Female	228	36.0	56.6	7.5
Age	10-12 years age	195	32.3	63.1	4.6
	13-14 years age	229	27.1	64.6	8.3
Dietary practice	5+ food groups	191	24.6	71.2	4.2
	<5 food groups	233	33.5	57.9	8.6
Health status	Ill	78	20.5	71.8	7.7
	Healthy	346	31.5	62.1	6.4
Ethnicity	Brahmin	34	38.2	52.9	8.8
	Chhetri	235	34.0	57.9	8.1
	Hilly janajati	27	25.9	66.7	7.4
Father education	Hilly dalit	126	19.8	77.0	3.2
	Newar	(2)	0.0	100.0	0.0
	Illiterate	102	11.8	71.6	16.7
Mother education	Primary level	222	29.3	66.7	4.1
	Secondary level	79	44.3	55.7	0.0
	+2 or above	(21)	61.9	28.6	9.5
Day meal program	Illiterate	216	21.8	69.0	9.3
	Primary level	177	33.9	62.7	3.4
	Secondary level	26	57.7	42.3	0.0
	+2 or above	(5)	60.0	0.0	40.0
	Yes	301	28.6	65.1	6.3
	No	123	31.7	61.0	7.3

TABLE 6: Factor associated with academic performance of adolescent in Jajarkot

Characteristics		Academic performance status				
		N	1 <sup>st</sup> division	2 <sup>nd</sup> division	3 <sup>rd</sup> division	P- value
Age group	10-12 years	195	62	123	9	0.204
	13-14 years	229	62	148	19	
Sex	Boys	196	43	142	11	0.003*
	Girls	228	82	129	17	
Health status	Ill	78	16	56	6	0.157
	Healthy	346	109	215	22	
Ethnicity	Brahmin/Chhetri	269	93	154	22	0.001*
	Other	155	32	117	6	
Dietary practice	+ 5 food groups	191	47	136	8	0.013*
	<5 food groups	233	78	135	20	
Day meal program	Yes	301	86	196	19	0.719
	No	123	39	75	9	
Father education	Illiterate	102	12	73	17	0.000*
	Literate	322	113	198	11	
Mother education	Illiterate	216	47	149	20	0.000*
	Literate	208	78	122	8	
Stunting	Stunted	170	35	118	17	0.001*
	Normal	254	90	153	11	
Wasting	Wasted	62	11	48	3	0.055°
	Normal	362	114	223	25	
Overweight/ Obesity	Obese/overweight	7	2	4	1	0.454°
	Normal	355	112	219	24	

\* Pearson's Chi-square value, ° Fisher Exact Test

The study showed that there was significant association of lower academic performance with stunting (p=0.001), gender (p=0.003), ethnicity (p=0.001), dietary practice (p=0.013) and parental education (p= 0.000) for both maternal and father education status Age group, morbidity status and day meal program, did not showed the association with academic performance in the study area. Study finding were also supported by study done by Birhanu, et al., (2021) to assess

nutritional status and its association with academic performance of 5-8 grade students among 308 early adolescents in Debremarkos second cycle primary school students.

Another study of Roba, et al., (2016) also supported the study finding the multivariate analyses, sex (female) was significantly associated with the grade eight Ministry exam score. The finding of the study was also supported by Ghosh,

et al., (2013), shows that the tribal students have lower BMI values than their nontribal counterparts which may be due to dietary differences – tribal students have less access to convenience foods and as such may have less consumption of these type of empty calorie containing foods. Also the academic achievements of tribal students were comparatively poor than their nontribal counterparts. Similarly, Jajarkot, a socially marginalized district, population comprised of about half of the marginalized ethnic community who were deprived of education, had less access to nutritious food groups and might consumed less diversified food resulting low academic performance.

As per Uzosike, et al., (2018) study which had a total of 847 public primary school pupils, with a mean DDS of  $3.67 \pm 0.71$ , which shows that dietary diversity was significantly associated with academic performance ( $p=0.001$ ), with higher odds of poor academic performance in both English language and Mathematics reported among pupils with low DDS in comparison to those with normal DDS.

Another study by Ranabhat, et al., (2016) showed, frequencies of illness in the previous year, mother’s education ( $p < 0.05$ ) and father’s education ( $P < 0.001$ ) were significant factors for the IQ score. Typically, the ultra-poor group had much lower BMI and IQ scores. For these adolescents, IQ and BMI are still significantly influenced by parental education and economic standing. A study by Dejene & Amanuel, (2019), to assess predictors of poor academic performance in primary school students among 362 schoolchildren also support study finding that variables like being underweight (AOR): 0.57; 95%, (CI) 0.23–0.82), stunting (AOR: 0.66; 95% CI 0.12–0.93), male (AOR: 2.8; 95% CI 1.79–4.52), participants whom mothers didn’t attend formal education (AOR: 0.62; 95% CI 0.37–0.92) were significantly associated with academic performance. This study cannot be generalized for all the settings.

## V. CONCLUSION

From this study, the associating factor on nutritional status and academic performance of adolescent were assessed. Stunting and wasting were the most common undernutrition problems among adolescents attending public schools at Jajarkot. Very high prevalence of stunting and wasting was a serious public health significance among the study population while the prevalence of obesity and overweight was comparatively low. Majority of the adolescent were not meeting the minimum dietary diversity, day prior preceding the study. Minimum dietary diversity was significantly associated with academic performance. Morbidity status, age of the respondents, gender are the contributing factors for poor nutritional status among adolescent which were also considered a major predictor of malnutrition. Dietary diversity, sex, ethnicity, parental education, stunting was found significantly associated with academic performance. On comparison of both sexes, female was more stunted and obese than males whereas prevalence of wasting in boys were higher than girls. Adolescent under the age group 13-14 for boys and

girls were more likely to get stunted as compared to 10-12 years.

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### Conflict of Interest

None

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To all the participants

## REFERENCES

- [1]. Birhanu, T., Zewdie, A., Wubetu, W., Gizew, D., & Sintayehu, A. (2021). Nutritional status and its association with academic performance among 5-8 grade students in Debreworkos second cycle primary school, Amhara Regional State, Ethiopia. *Ethiopia Journal of Public Health and Nutrition*, 4(2).
- [2]. Burrows, T., Goldman, S., Pursey, K., & Lim, R. (2016). Is there an association between dietary intake and academic achievement: A systematic review. *Journal of human nutrition and diet*.
- [3]. Dejene, S. R., & Amanuel, T. (2019). Undernutrition as a predictor of poor academic performance: the case of Nekemte primary schools student, western ethiopia.
- [4]. Florence, M., Asbridge, M., & Veuglers, P. J. (2008). Diet quality and academic performance. [(D) Y Cross sectional]. . . *Journal of School Health*, 78(4), 209-215; quiz 239-241. doi:10.1111/j.1746-1561.2008.00288.x
- [5]. George, C. P., Sawyer, S. M., Santelli, J. S., Ross, D. A., Afifi, R., Allen, N. B., & Viner, .. R. (2016). Our Future: a Lancet Commission on adolescent health and wellbeing. 387: 2427.
- [6]. Ghosh, S. (2013). The Role of Adequate Nutrition on Academic Performance of College Students in North Tripura. *International Journal of Health Sciences and Research*, 56-63.
- [7]. Ghosh, S., Rakshit, S., & Bhattacharya, M. (2013). Academic Performance and Nutritional Status- A case study on college Students in North Tripura. *IOSR Journal of Research and Method in Education*, 1(4), 2320-7388. Retrieved from www.iosrjournals.org
- [8]. MoHP, N. (2016). *Nepal Demographic Health Survey*. Ministry of Health.
- [9]. Popkin, B. M., Adair, L. S., & Ng, S. W. (2012). Global nutrition transition and the pandemic of obesity in developing countries. *Nutr. Rev.*, 70, 3–21.
- [10]. Ranabhat, C., Kim, C.-B., Park, M. B., Kim, C. S., & Friedoony, L. (2016). Determinants of Body Mass Index and Intelligence quotient of elementary school children in mountain area of Nepal , , 3010003: p.1, A. 1.
- [11]. Roba, K., Abdo, M., & Wakayo, T. (2016). Nutritional Status and Its Associated Factors among School Adolescent. *Journal of Nutrition and Food Sciences*, 6(3). doi: 10.4172/2155-9600.1000493
- [12]. UNICEF. (2018). *UNICEF Program Guidance for the second decade: Programming with and for the adolescents*. New York: UNICEF Programme Division.
- [13]. Uzosike, T., Okefor, I., & Mezie-Okkoye, M. (2018). Dietary Diversity, Nutritional status and academic performance of pupils in public primary schools in Port Harcourt Metropolis. *Journal of Community Medicine and Primary Health Care*, 32(2), 42-56.
- [14]. Raghunatha, D. R., Vijayapushpam, T., Subba, R., G.M., & Sarma, K. (2007). Dietary habits and effect of two different educational tools on nutrition knowledge of school going adolescent girls in Hyderabad, India. *European Journal of Clinical Nutrition* 61(9), 1081-1085. Retrieved from https://doi.org/10.1038.sj.ejcn.1602622
- [15]. WHO/UNFPA/UNICEF. (1989). *The reproductive health of adolescence: a strategy for action*.

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