

# Nutritional Status of Adolescents in Semi-urban Community in Dukuchhap Village of Lalitpur, Nepal

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## ABSTRACT

### Introduction

Many Nepali adolescents (10-19 years) are undernourished, which increases the risk of morbidity and mortality. Inadequate nutrition during adolescence can retard physical growth and sexual maturation and increases the risk of adult lifestyle diseases. There is a dearth of research on the socio-demographic factors associated with the nutritional status of adolescents in Nepal.

### Objective

To assess the nutritional status of adolescents (10-19 years) in Dukuchhap Village of Lalitpur, Nepal

### Methodology

A community based descriptive cross-sectional study was carried out by medical students during their field placement for community diagnosis in Dukuchhap Village of Lalitpur from 22<sup>nd</sup> November- 19<sup>th</sup> December 2017. All 10-19 years adolescent population was included in the study. Among the total population (2545) study, 474 were adolescent. The data were collected using semi-structured questionnaire. Physical and anthropometric measurement were done. Data were analyzed using of WHO Z-scores criteria and cut offs points. All the findings were compared with Nepal Demographic and Health Survey, 2011 and other researches published in different journals on related topic. Excel version 2010 and SPSS version 13.0 were used to enter and analyze data.

### Results

The prevalence of stunting was found out to be 36.28%. More males (16.51%) than females (12.60%) were severely stunted and 21.70% of male and 22.14% of female were moderately stunted. Among total respondents, 14.4% were severely stunted and 21.9% were moderately stunted. More numbers of male (38.2%) were stunted than female (34.7%).

### Conclusion

Prevalence of malnutrition among adolescent was more in 10-12 years age group. The prevalence of moderate stunting was slightly high in females than males. Adolescents with extended family type, increasing number of family members & agriculture, labourer and local business as main family occupation are more prone to suffer from malnutrition.

### KEY WORDS

Adolescent, malnutrition, stunting, semi-urban, Nepal

## INTRODUCTION

World Health Organization (WHO) defines adolescence as the age group between 10 and 19 years<sup>1</sup>. Inadequate nutrition during adolescence can retard growth and sexual maturation, and increase the risk of adult lifestyle diseases. The prevalence of malnutrition among adolescents is high in developing countries.<sup>2</sup>

Little less research has been done on adolescent nutritional status in Nepal. Though Indian studies are not directly applicable to Nepali populations, some comparisons might be useful. A study in Karnataka state of India of the 13-19 age group revealed that in rural areas more than one-third (36%) of boys and nearly a half (45.2%) of girls were stunted, while in urban areas about one-fourth (21.7%) of boys and girls (26.5%) were stunted.<sup>3</sup> The same study found that nearly half (48.4% in rural and 43.5% in urban) of adolescent boys and one fifth (19.4% in rural and 21.1% in urban) of adolescent girls were energy deficient, but only a very few (2.3% of rural and 5.4% of urban girl) were considered chronically energy deficient, however, the percentage were little higher (18.8% in rural and 17.4% in urban boys) in case of boys. Energy deficient refers to the BMI for-age Z-score below -2SD i.e., the energy requirement is not sufficient. A study on Nutritional Status of Adolescent Girls from an Urban Slum Area in South India concluded that there is a high prevalence of stunting (47%), of underweight (42.6%) and of thinness (20.6%) among adolescent girls in this slum community.<sup>4</sup>

The study aimed to assess the demographic and health status focusing on nutritional status of the VDC and also to evaluate health resources, services, and systems of care. The specific objectives of the study were: assess nutritional status of adolescents; analyze the distribution of weight-for-age, height-for-age between ethnic groups, and estimate the prevalence of malnutrition in each group.

## METHODOLOGY

From 22<sup>nd</sup> November to 19<sup>th</sup> December, 2015, medical students studying in third year in the Patan Academy of Health Sciences (PAHS), Nepal conducted a survey in Dukuchhap village as a field based curricular activities. The Community Health Sciences (CHS) department oriented 61 medical students about elements of 'Community Diagnosis Survey' focusing on correct use of anthropometric measurements, assessing vital signs and conducting questionnaire. The department played lead roll to develop research protocols and it was approved from academic council of PAHS. The study was thoroughly supervised by eight CHS faculties.

The place of the study was chosen to be Dukuchhap Village Developmental Committee (VDC) which is located 12 KM southeast from the capital city (Kathmandu) of Nepal. According to the national census 2011<sup>5</sup>, the VDC had area of 4.96 square kilometer (km<sup>2</sup>) while the total population was 2,669 with high density, 537 inhabitants per square kilometer (Inh/km<sup>2</sup>). It has been declared (along with other two VDCs) as urban area (Karyavinayak Municipality) by government of Nepal in 2015.

The students conducting the survey first compiled household lists. The students visited each and every houses, obtained consent in writing from the household head to serve as respondent. A maximum of three visits were made to each house. Anthropometric measurements of all individuals were recorded. Weight was measured to the nearest 0.1 Kg using a digital weighing scale, which was placed on a horizontal plane surface to minimize the error. Height was measured to the nearest 1 cm. using a portable stick fitted with measuring tape. WHO Z-scores<sup>1</sup> criteria and cut offs points were used to estimate the prevalence of underweight, thinness, stunting and wasting and of different grades of malnutrition amongst adolescents based on gender and different ethnic groups were calculated. All the findings were compared with standard data from Nepal Demographic and Health Survey 2011.<sup>6</sup> Excel version 2010 and SPSS version 13.0 were used to enter and analyze data.

## RESULTS

Among 2545 studied population of Dukuchhap village of Lalitpur district in Nepal, 18.6% of them were adolescents. Out of the adolescents, 55.3% of them were females and 44.7% of them were males. The total number of female and male adolescents of different age group is shown in Table 1.

**Table 1: Age and gender wise distribution of adolescents at Dukuchhap, Lalitpur**

Age (Years)	Female	Male	Total
10	27	23	50
11	21	25	46
12	34	26	60
13	17	24	41
14	29	24	53
15	20	12	32
16	27	16	43
17	28	22	50
18	28	30	58
19	31	10	41
<b>Total</b>	<b>262</b>	<b>212</b>	<b>474</b>

### Weight, Height and BMI of girls and boys of various ethnic groups

The main ethnic group was Danuwar, consisting 31.0% of the total adolescent population and the other ethnic groups were Tamang (30.4%), Chhetri (28.3%), Brahmin (4.4%), Newar (4.4%) and others i.e. Dalit, Magar and Limbu.

Brahmin girls' mean weight, mean height and average body mass index was the highest among all ethnic groups of girls studied with 47.1 kg (SD±7.7), 151.9 cm (SD±5.2) and 22.8 kg/m<sup>2</sup> respectively. Similarly, the lowest mean weight was

39.3kg (SD±8.8) of Chhetri girls, the lowest mean height was 142.9 cm (SD±17.6) of Newari girls and lowest BMI was 18.2 kg/m<sup>2</sup> of Chhetri girls.

Similarly, Chhetris boys' have the highest mean weight and mean height among all ethnic boys studied with 44.7 kg (SD±12.1) and 152.3 cm (SD ±15.9) respectively but their BMI was the second highest with 18.9 kg/m<sup>2</sup>. Similarly, both the lowest mean weight and height was 32.3 kg (SD±7.89) and 132.6cm (SD±12.6) of Newari boys, however, the lowest BMI was 17.7 kg/m<sup>2</sup> of Danuwar boys.

**Table 2: Mean weight, height and BMI according to ethnicity**

Parameters	Ethnic groups					
	Danuwar (n=147)	Tamang (n=144)	Chhetri (n=133)	Brahmin (n=21)	Newar (n=21)	Others (n=8)
<b>Girls weight in Kg (Mean± SD)</b>	40.00±9.84 (n=80)	40.53±10.28 (n=82)	39.26±8.79 (n=72)	47.06±7.71 (n=12)	39.88±11.35 (n=13)	46.37±6.5 (n = 3)
<b>Girls Height in cm (Mean± SD)</b>	145.40±10.03	143.17±11.20	145.81±9.35	151.92±5.20	142.92±17.60	147±5
<b>BMI (kg/m<sup>2</sup>)</b>	18.67	19.48	18.22	22.83	19.24	21.44
<b>Boys weight in Kg (Mean± SD)</b>	38.29±12.28 (n=67)	42.40±13.31 (n=62)	44.73±12.08 (n=61)	37.86±11.36 (n=9)	32.32±7.89 (n=8)	43.36±14.3 (n=5)
<b>Boys Height in cm (Mean± SD)</b>	145.21±14.88	148.90±17.40	152.26±15.93	144.22±13.49	132.63±12.56	147±20.8
<b>BMI (kg/m<sup>2</sup>)</b>	17.67	18.78	18.93	17.91	18.38	19.52

### Prevalence of underweight

Out of 474 adolescents, 2.1% of them were found to be underweight. However, the prevalence of underweight was slightly more in male (2.4%) than in female (1.9%). There was

not any single case of severely underweight adolescent. The prevalence of underweight was highest among age group 14 (7.4%), followed by age group 12 (6.3%) and 19 (3.3%) respectively in female. In male, the prevalence was highest among age group 16 (14.3%), followed by age group 18 (7.1%) and 14 (4.4%).

**Table 3: Shows the prevalence of underweight**

Age (years)	Girls (N=262)			Boys (N=212)		
	≤ -2 Z score	-2 to -3 Z score	> -3 Z score	≤ -2 Z score	-2 to -3 Z score	≥ -3 Z score
10	27	0	0	23	0	0
11	21	0	0	25	0	0
12	32	20	2	6	0	0
13	17	0	0	24	0	0
14	27	20	2	3	1	0
15	20	0	0	12	0	0
16	27	0	0	14	2	0
17	28	0	0	22	0	0
18	28	0	0	28	2	0
19	30	1	0	10	0	0

Note: ≤ -2 Z score = Normal, -2 to -3 Z score = Moderate, ≥ -3 Z score = severely Underweight

## Prevalence of Stunting

Out of 474 adolescents, 14.4% of them were severely stunted and 21.9% of them were moderately stunted. However, the prevalence of stunting was slightly more in male (38.2%) than in female (34.7%). The prevalence of moderate stunting was

slightly more in females (22.1%) than males (21.7%) but the prevalence of severe stunting was more in males (16.5%) than females (12.6%). (Table 4)

**Table 4: Prevalence of Stunting by Age and Gender**

Age (years)	Girls (N=262)			Boys (N=212)		
	≤ -2 Z score	-2 to -3 Z score	> -3 Z score	≤ -2 Z score	-2 to -3 Z score	≥ -3 Z score
10	16	8	3	14	4	5
11	13	2	6	16	7	2
12	27	4	3	17	5	4
13	10	6	1	13	5	6
14	20	5	4	18	2	4
15	12	6	2	8	2	2
16	21	4	2	8	5	3
17	17	6	5	16	4	2
18	21	4	3	18	7	5
19	14	13	4	3	5	2
<b>Total</b>	<b>171</b>	<b>58</b>	<b>33</b>	<b>131</b>	<b>46</b>	<b>35</b>

Note: ≤ -2 Z score = Normal, -2 to -3 Z score = Moderate, ≥ -3 Z score = severely Underweight

## Prevalence of stunting by age

The prevalence of stunting was more among age group 19 (54.8%), followed by age groups 13 (41.2%), 10 (40.7%), 15 (40%) and 17 (39.3%) respectively in female. Also in male, the prevalence of stunting was more among age group 19 (70%), 16 (50%), 13 (45.8%), 18 (40%) and 10 (39.1%). Similarly, the prevalence of stunting was least in age group 12 (20%) in female and 14 (25%) in male respectively. (Table 5)

**Table 5: Prevalence of Stunting by Age**

Age	Female	Stunted	%	Male	Stunted	%
10	27	11	40.7	23	9	39.1
11	21	8	38.1	25	9	36
12	34	7	20.6	26	9	34.6
13	17	7	41.2	24	11	45.8
14	29	9	31.0	24	6	25
15	20	8	40	12	4	33.3
16	27	6	22.2	16	8	50
17	28	11	39.3	22	6	27.3
18	28	7	25	30	12	40
19	31	17	54.8	10	7	70
<b>Total</b>	<b>262</b>	<b>91</b>	<b>34.7</b>	<b>212</b>	<b>81</b>	<b>38.2</b>

## Prevalence of malnutrition among different age groups

In the adolescent population (Table 6), 21.9% were severely thin (BMI < 16), 9.3% moderately thin (BMI 16 - <17) and 17.3% were mildly thin (BMI 17-<18.5). A total of 48.5% were suffering from malnutrition, mostly in the 10-12 age group (56.5%), followed by age group 13-15 (27.8%) and then 16-19 (7.6%). A total of 26.6% were suffering from moderate and mild malnutrition. Moderate plus mild malnourishment was also more prevalent in the age group 10-12 (42.9%) followed by age group 13-15 (31.8%) and then 16-19 (25.4%).

## Prevalence of malnutrition by main family occupation

Of the 474 adolescents (Table 6), 236 (49.8%) families were engaged in agriculture, 25 (5.3%) in business, 82 (17.3%) in service works, 67 (14.1%) were laborers, and 64 had "other" occupations. Among adolescents whose families stated agriculture as main family occupation, 22.9% were severely malnourished, 8.9% moderately, and 18.2% mildly malnourished. Among adolescents with local business as the main family occupation 24% were severely malnourished, 8% moderately, 16% mildly malnourished. Among adolescents with service as their main family occupation, 14.6% were severely malnourished, 8.5% moderately and 18.3% mildly malnourished. Among adolescents with laborer as their main family education, 28.4% were severely

malnourished, 11.9% moderately and 14.9% mildly malnourished. Of adolescents with other main family occupations, 20.3 % were severely malnourished, 9.4 % moderately, and 15.6% mildly malnourished.

#### Prevalence of malnutrition by family type

Of the total of 474 adolescents (Table 6), 260 (54.85%) had a nuclear family and 214 (45.15%) had joint/extended family type. Among adolescents belonging to nuclear family, 21.5% were severely malnourished, 10.4% moderately and 19.2% were mildly malnourished. Among the adolescents belonging to joint families, 22.4% were severely malnourished, 7.9% moderately, 15.0% mildly malnourished.

#### Prevalence of malnutrition by Family size

Among the 474 adolescents (Table 6), 35.2% had  $\leq 4$  family members, 51.9% had 5-7 family members, 1% had 8-10

family members and 1.4% had  $\geq 11$  family members. Among those with  $\leq 4$  family members, 20.4% were severely malnourished, 8.4% were moderately and 17.4% were mildly malnourished. Among those with 5-7 family members, 23.2% were severely malnourished, 10.2% were moderately and 17.5% were mildly malnourished. Among those with 8-10 family members, 19.6% were severely, 7.1% were moderately and 16.1 % were mild malnourished. Among  $\geq 11$  members as family size, 40% were severely malnourished, 20% were moderately and 20% were mildly malnourished.

Among the 474 adolescents, 13 (2.74%) of them had BMI more than normal range. Among those 13, 5 (38.46 %) female and 8 (61.54%) of male were overweight/Obese.

Table 6: Prevalence and socio-demographic correlates of BMI amongst adolescents

**Table 6: Prevalence and socio-demographic correlates of BMI amongst adolescents**

Parameters	N	< 16		16 - <17		17 - < 18.5		18.5 - <25		= 25	
		n	%	n	%	n	%	n	%	n	%
		GR-3 Thinner		GR-2 Thinner		GR-1 Thinner		Normal BMI		Overweight Obese	
<b>Age (Years)</b>											
10-12	156	76	48.72	29	18.58	25	16.02	24	15.38	2	1.28
13-15	126	24	19.05	11	8.73	29	23.01	58	46.03	4	3.17
16-19	192	4	2.08	4	2.08	28	14.58	149	77.60	7	3.65
<b>Main Family Occupation</b>											
Agriculture	236	54	22.88	21	8.90	43	18.22	112	47.46	6	2.54
Business	25	6	24	2	8	4	16	12	48	1	4
Service	82	12	14.63	7	8.54	15	18.29	45	54.88	3	3.66
Laborer	67	19	28.36	8	11.94	10	14.92	29	43.28	1	1.49
Other	64	13	20.31	6	9.38	10	15.63	33	51.56	2	3.13
<b>Types of Family</b>											
Nuclear	260	56	21.54	27	10.38	50	19.23	120	46.15	7	2.69
Joint/extended	214	48	22.43	17	7.94	32	14.95	111	51.86	6	2.80
<b>Family Size</b>											
$\leq 4$ members	167	34	20.36	14	8.38	29	17.37	87	52.09	3	1.80
5 - 7 members	246	57	23.17	25	10.16	43	17.48	113	45.93	8	3.25
8 - 10 members	56	11	19.64	4	7.14	9	16.07	30	53.57	2	3.57
$\geq 11$ members	5	2	40	1	20	1	20	1	20		0

## DISCUSSION

### Weight, Height and BMI of girls and boys of various ethnic groups

Income, lifestyle, health, dominant position in society and many other factors vary widely between ethnic groups. So, we tried to assess the differences in nutritional status between ethnic groups. The five main castes in Dukuchhap were Danuwar, Tamang, Chhetri, Brahmin and Newar.

As per Body weight (Table 2), Chhetri girls were on the lowest average with 39.3 kg and had the lowest Body Mass Index with 18.2 falling in the thinness category whereas remaining other girls from different ethnicity all had normal BMI. However, Brahmin girls were on the highest average body weight with 47.1 kg and correspondingly the highest BMI among all other ethnic girls. Similarly for body weight of

boys, Newar boys had the lowest average with 32.3kg and unlike Chhetri girls, the Chhetri boys had the highest average body weight with 44.7kg.

Likewise when ethnic groups were compared on their heights Newar girls were of the shortest average stature with 142 cm. In contrast, Brahmin girls were on the highest average body height with 151.9cm and have the highest BMI with 22.8 kg/m<sup>2</sup> among all of them. Similarly for height of Boys, Newar boys do have the lowest average height with 132.6 cm. The Newar, Danuwar and Brahmin boys fall under the thinness category but the Danuwar boys have the lowest BMI due to the wider dispersion both in body weight and height.

As per the body mass index, firstly, girls were better compared to their male counterparts except of the Chhetri girls which is opposite of what is expected of the community in Nepal where the society is predominantly dominated by male. Secondly, BMI of both Tamang girls and Tamang boys were better amongst all other ethnic group only because in Tamang community there is no discrimination between male child and female child, however, this ethnic group have the widest variability in their weight and height.

#### Prevalence of underweight

Out of 474 adolescents, 464 (97.9%) of them were found to be in normal weight indicating that this community lies in food secure area in Nepal. However, the prevalence of underweight was slightly more in male (2.4%) than in female (1.9%). There was no case of severely underweight adolescent. However, 21.9% (104/474) of them were in chronic energy deficient condition with BMI <16.

#### Prevalence of Stunting

The prevalence of stunting in the adolescent population was 172 (36.3%) of whom girls were 52.90% and boys 47.1% respectively. The stunting percentage of boys was lowest 25% (6/24) at age 14 which coincide with the growth spurt for boys. Similarly, in case of female the lowest stunting percentage was 21% (7/34) at age 12 which also coincide with the growth spurt for girls. The prevalence of stunting was found to be 36.28% and this is an improvement over similar studies in Nepal, where 47% stunting was reported in 1994<sup>8</sup>. While not comparable, a study done in Darjeeling district, India revealed stunting prevalence to be 46.6%<sup>9</sup>. A 2005 study done in West Bengal, India revealed the prevalence of stunting to be 37.8%.<sup>10</sup> This shows the prevalence of stunting is decreasing in Nepal but it is still a great issue of concern to be solved.

A recent study of 2013 conducted in Chiro town, Ethiopia has revealed the prevalence of stunting was higher in early

adolescence (7.8%) than late adolescence (6.8%), which is very lower than to our findings.<sup>11</sup>

#### Prevalence of Malnutrition Main Family Occupation, Family type and family size

Gender, types of residence, family size, family income, and ethnicity are all contributing factors in malnutrition. This study shows that there is a higher prevalence of malnutrition among adolescents whose families engage in agriculture, general labor, or local business as their main family occupation. This study also discloses the prevalence of malnutrition to be more in extended family type than in nuclear type and increased malnutrition prevalence with increase in family size. This finding is new to Nepal but a recent study in Iran found a similar association between larger family size and malnutrition.<sup>12</sup> This supports our finding on effects of different demographic factors on nutritional status.

#### CONCLUSION

The prevalence of stunting was found to be 36.28% among the study population. Prevalence of stunting shows decreasing trend and was more prevalent in girls than in boys (52.90% vs. 47.1%). Lower stunting percentage at 14 years in boys and in 12 years in girls coincides with the growth spurt for boys & girls.

The prevalence of underweight was slightly more in male (2.36%) than in female (1.91%) and approximately twenty two percent of the adolescents were chronic energy deficient.

Adolescents of families having agriculture, laborer, and local business as their main family occupation are more prone to suffer from malnutrition. The prevalence of malnutrition is higher in extended families, and malnutrition increases in prevalence as the numbers of family member increases.

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#### CONFLICT OF INTEREST

We declare no conflict of interest.



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