



# Household Food Security Access and Nutritional Status among Early Adolescents in a Poor Neighborhood of Sinamangal, Nepal

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## ABSTRACT

**Background:** Early adolescence is an important period of the life cycle wherein the food system plays a critical role in protecting food security as well as the nutritional needs essential for a healthy transition from childhood to adulthood. Despite the surging concerns regarding the food and nutrition security of adolescents throughout the nation, people in a poor neighborhood are often neglected and considered the most vulnerable.

**Objectives:** This research aims to assess the status of household food security and nutritional status among early adolescents living in a poor neighborhood of Kathmandu, Nepal.

**Methods:** Using a cross-sectional study design, data was collected with the Household Food Insecurity Access Scale (HFIAS) tool. Nutritional status was measured using the WHO Child Growth Standard Reference 2007 Statistical Software for Social Science (SPSS) macro package based on BMI-for-age z-score, height-for-age z-score, and weight-for-age z-score, respectively. Data were entered in a predetermined format of SPSS version 20.0 and imported into STATA version 13.1 for univariate and bivariate analyses. Ethical approval was sought from the Ethical Review Board of Nepal Health Research Council (NHRC) prior to the study.

**Results:** More than one-fifth (21%) of the households were food insecure. Based on BMI-for-age, 5.5% of the adolescents were found to be moderately undernourished and 2.6% were severely undernourished. The percentage of moderately and severely stunted adolescents were 8.4% and 5.8%, respectively, based on height-for-age. Based on weight-for-age, moderately and severely underweight adolescents accounted for 13.0% and 1.3% of the total.

**Conclusion:** The prevalence of underweight, stunting, and wasting among early adolescents was high. The households in a poor neighborhood were also experiencing some form of food insecurity. This calls for targeted efforts to address malnutrition and improve the nutritional status of early adolescents, particularly in poor neighborhoods. *Curr Dev Nutr* 2021;5:nzab127.

**Keywords:** food security, nutritional status, adolescents, poor neighborhood, Nepal

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Abbreviations used: NHRC, Nepal Health Research Council; SDG, Sustainable Development Goal; SPSS, Statistical Package for the Social Sciences.

## Introduction

Proper nutrition is essential for all individuals to achieve a full level of physical and mental health. On the contrary, malnutrition is affecting and killing people of all age groups worldwide, especially the poor and vulnerable. In developing nations, it continues to play a major role in causing morbidity and disability in children, contributing to half of the 10.4 million annual child deaths (1, 2). Considering the existing burden of malnutrition and its consequences, the Sustainable Development Goals (SDGs), particularly SDG-2, recognized food security and nutrition as essential components and aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture by 2030 (3). However, evidence suggests that 1 in every 9 people in the world are suf-

fering from hunger and malnutrition (4). Despite the availability of effective health interventions, over 10 million children under the age of 5 y die annually from preventable and treatable illnesses. Of those deaths, over one-third are accountable to malnutrition (5). Furthermore, in developing countries, 146 million children under the age of 5 y suffer from undernutrition which is one of the main factors causing malnutrition (6). In developing countries, ~66 million primary-level school children attend classes hungry (7).

Early adolescence is an important period of life, typically occurring between the ages of 10–14 y, in which youths undergo a varied and rapid physical, cognitive, and social transformation (8). Inadequate nutrition during adolescence may have a detrimental effect on growth and sexual maturation and place them at high risk of long-term disease, although

the effects appear after an extended period. (9). Adolescents comprise one-fifth of the population in Southeast Asia. In this region, a larger number of adolescents suffer from chronic malnutrition and anemia which impact their health and well-being. Most of the nutrition initiatives in the developing world are mainly focused on women and children, neglecting adolescents (10).

Nutrition and food security have been identified as crucial for national development and accorded as a top priority by the government of Nepal. Despite improvements in the food security status of the Nepalese population, data from the Nepal Demographic and Health Survey (NDHS) 2016 suggests 20% and 22% of households are still mildly and moderately food insecure, respectively, with 10% being severely food insecure, which accounts for 4.6 million of the population being food insecure (11). An adolescent nutrition survey conducted in 2014 in Nepal also revealed that 71% of male and 59% of female adolescents were undernourished (12). The factors influencing malnutrition are multifaceted. Food insecurity is a key risk factor for malnutrition (13). Household food insecurity often leads resource-constrained households to establish eating patterns based on low nutritional quality food which in turn contributes to childhood obesity and may socialize children to adopt similar behavioral patterns in adulthood (5). The other effects of food insecurity, in addition to undernutrition, involve mental health, which was shown to be common among adolescents of food-insecure South African households (6).

In Nepal, nearly half (49%) of the total urban proportion live in slums (14). Kathmandu valley has the highest number of people living in slums and informal settlements, reporting the highest rate of unemployment (15). Slums in the Kathmandu valley are characterized by overcrowding, poor housing and sanitation, inadequate access to safe drinking water, and poor sewage and drainage systems making them vulnerable to poor health and malnutrition (16). Studies have reported adolescents in slums are more prone to nutritional deficiencies due to physical and social vulnerability (17, 18). A study conducted in 6 urban slums of the Kathmandu valley concluded a higher prevalence of stunting (38%), wasting (9%), and underweight (30%) among preschool children and a high rate of chronic energy deficiency (9%) among their mothers (16). However, the extent of malnutrition and food insecurity in the early adolescent group in urban areas is not well documented. Early adolescence is an important period of the life cycle; the food system can play a critical role in protecting food security and nutritional needs of early adolescents, which are essential for a healthy transition from childhood to adulthood.

Hence, this study targeted assessing the status of adolescents' household food security level and its associated nutritional outcomes, which in turn could be evidenced in effective policy and planning of nutrition-specific as well as nutrition-sensitive programs for the government of Nepal, and all other concerned stakeholders, in the near future for the betterment of such disadvantaged communities.

## Methods

### Study area and period

For this study, the Sinamangal slum/squatter area located along the riverbank of Bagmati in Kathmandu Metropolitan City was purposively selected. This study was conducted from December 2019 to May

2020. This area comprises mostly disadvantaged Janajatis (43.3%), two-fifths of residents do not have any formal education, more than two-thirds are self-employed with one-third having a monthly income of <5000 Nepalese Rupees. A map of the Sinamangal slum area is provided in [Figure 1](#) (19).

### Sample size determination and sampling procedure

A proportion-based sample size was used with the level of significance at 0.05 and 5% margin of error, assuming a 50% malnutrition rate in a poor neighborhood, as there were no studies available on the nutritional status among adolescent groups in these age groups in Nepal. The calculation resulted in 384 participants being included in the study. A nonprobability convenient sampling technique was used to enroll participants in the study due to the unavailability of a sampling frame and challenges of developing a new one. In the case of >1 respondent in the selected household, the oldest adolescent was considered for the study. Inclusion criteria for the participants were: living in a poor neighborhood for the last 6 mo and the presence of either of the parents or adult guardian at the time of the interview. Participants who were physically and mentally not able and those refusing to participate in the study were excluded from the study.

### Data collection tool and technique

Validated standard structured questionnaires developed by Food and Nutrition Technical Assistance (FANTA) were used in the food security assessment. Individual face to face interviews were conducted with participants. Household food insecurity was assessed for the past 4 wk. Similarly, to assess nutritional status, anthropometric elements such as height and weight were measured and BMI calculated. Height was measured using a portable Bioplus<sup>®</sup> stature meter and the measurement was recorded in centimeters. The participant was asked to stand on a flat surface with their feet 10 cm apart, ensuring removal of footwear or any head accessories, and their heels against the wall and their knees straight. Weight was recorded in kilograms and measured using a portable digital seca<sup>®</sup> weighing scale ensuring footwear was removed and the participant was wearing light clothing. Trained enumerators were involved in data collection. In addition, due to COVID-19, partial data collection was carried out using full health and safety measures as prescribed by the UN only after the government of Nepal eased lockdown measures.

### Data processing and analysis

Data were entered in a predetermined format of Statistical Package for the Social Sciences (SPSS) version 20.0 and imported into STATA version 13.1 for further analysis. Prior to analysis, the master sheet was reviewed. Continuous variables were recoded, the food security score was calculated using the Household Food Insecurity Assessment Scale (HFIAS) tool (maximum score 27 and minimum 0), and nutritional status indicators were determined based on the WHO Child Growth Standards SPSS 2007 package. Since reference data for weight-for-age were not available for children beyond the age of 10 y, analysis for weight-for-age in our study only included children aged 10 y. Variables identified with >10% missing values were excluded.

All the collected data were analyzed using Stata version 13.1. Results were obtained using the frequency distribution and cross tabulation of the variables. Univariate and bivariate analyses were performed.



**FIGURE 1** Map of the Sinamangal area.

Bivariate analyses were performed to analyze 2 variables using crosstabulations, chi-square tests, and regression analysis. Results were considered to be statistically significant at the 5% level of significance unless otherwise stated. Data is presented visually through figures, frequency tables, and 2 × 2 tables.

**Data quality management**

Data quality was ensured by developing a questionnaire in English which was translated to the local language (Nepali). Consistency was then assured by the person who spoke both languages fluently followed by the subsequent backtranslation of the questionnaire to English for its conceptual equivalence. Intensive training was given to the enumerator by the investigator covering study objectives, a thorough review of the questionnaire, and the use of survey instruments, interview techniques, and directions on how to administer the structured questionnaire and how to take anthropometric measurements and maintain ethics during fieldwork in line with the predesigned training module. Measurements were taken using standard instruments of a weighing scale and stature meter which were routinely checked and adjusted to maintain accuracy. Calibration of the indicator against a zero reading was checked before and after weighing every individual early adolescent. Data validity and reliability were maintained through close supervision of the enumerator by the investigator involved in this study.

**Ethical consideration**

Written informed consent was taken from each participant. Similarly, written consent was also sought from the parents/guardian to enroll the

adolescent participants. The purpose of the study, including the benefits and risks, was explained. Anonymity was maintained throughout the process to keep the records confidential. Data collected was used for this study purpose only. Participation in the interview was entirely voluntary and the participants had the right to leave the study at any time. Ethical approval was obtained from the Ethical Review Board of Nepal Health Research Council (NHRC).

**Results**

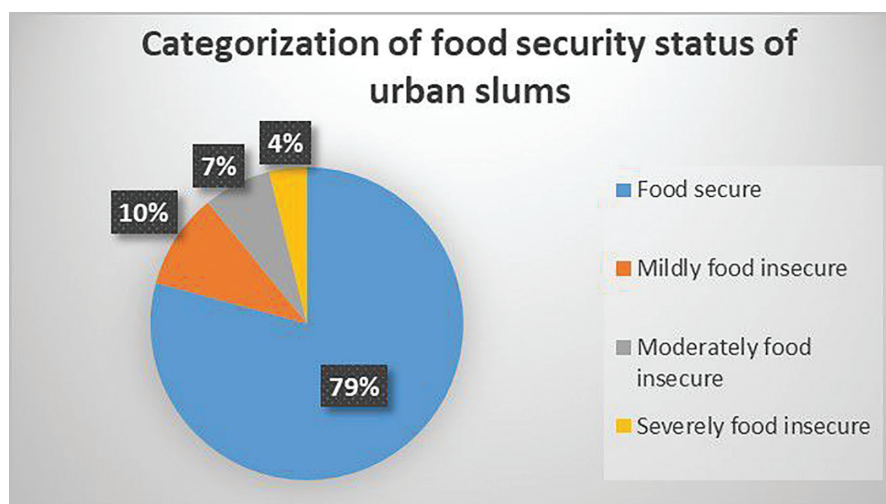
A total of 384 early adolescents and their mothers were studied to determine the food security and nutritional status of early adolescents.

**Sociodemographic characteristics of the participants**

Among the total participants, more than half were male (52.1%). The age of the participants ranged from 10 to 14 y and the mean age was 12.1 y. More than half (57.8%) of the participants included in this study were in the age group 10–12 y (**Table 1**).

**TABLE 1** Age and sex distribution of the participants

Characteristics (n = 384)	Frequency	Percent	
Gender	Male	200	52.1
	Female	184	47.9
Age group	10–12 y	222	57.8
	13–14 y	162	42.2



**FIGURE 2** Categorization of food security status.

#### **Classification of household food security status.**

More than one-fifth (21%) of the households had some form of food insecurity ranging from 4% of the households having severe food insecurity to 10% of the households having mild food insecurity. Nearly four-fifths (79%) of the households were food secure (Figure 2).

#### **Classification of nutritional status based on BMI-for-age, height-for-age, and weight-for-age**

The nutritional status of early adolescents is calculated based on BMI using the WHO child growth standard SPSS WHO 2007 package based on the BMI-for-age z-score, height-for-age z-score, and weight-for-age z-score. Among 5 categories of BMI-for-age, the majority of early adolescents (68.9%) had healthy nutritional status, 18.2% and 4.7% were overweight and obese, respectively, 5.5% were moderately undernourished, and 2.6% were severely undernourished. Based on the height-for-

age z-score, more than four-fifths (85.8%) of early adolescents were normal whereas the percentage of moderately and severely stunted were 8.4% and 5.8%, respectively. Similar to height-for-age, more than four-fifths (85.7%) of the participants were normal when classified on the basis of weight-for-age. Moderately and severely underweight accounted for 13.0% and 1.3% of early adolescents, respectively. Among boys, 12.6%, 9.1%, and 17.2% belonged to stunted, undernourished and underweight nutrition status, respectively. Likewise, 7.2% of girls were undernourished and 16% and 11.9% of girls belonged to stunted and underweight nutrition status, respectively (Table 2).

#### **Relation between sociodemographic characteristics and food security status.**

The prevalence of food insecurity was slightly higher (23.0%) among households of male participants compared with female participants (18.5%). Comparing across age groups, food insecurity was higher

**TABLE 2** Classification of nutritional status of early adolescents

Indicator	All N (%) (CI value)	Boys N (%) (CI value)	Girls N (%) (CI value)
Height for age (n = 379) <sup>1</sup>			
Normal	325 (85.8) (81.8–88.9)	173 (87.4) (81.9–91.4)	152 (84.0) (77.8–88.7)
Stunted ( $\leq -2$ z-score and $\geq -3$ z-score)	32 (8.4) (6.0–11.7)	19 (9.6) (6.2–14.6)	13 (7.2) (4.2–12.0)
Severely stunted ( $\leq -3$ z-score)	22 (5.8) (3.8–8.7)	6 (3.0) (1.4–6.6)	16 (8.8) (5.5–14.0)
BMI for age (n = 380) <sup>1</sup>			
Normal	262 (68.9) (64.1–73.4)	141 (71.2) (64.5–77.1)	121 (66.5) (59.3–73.0)
Overweight	69 (18.2) (14.6–22.4)	32 (16.2) (11.6–22.0)	37 (20.3) (15.1–26.9)
Obese	18 (4.7) (3.0–7.4)	7 (3.5) (1.7–7.3)	11 (6.0) (3.4–10.6)
Moderate malnutrition	21 (5.5) (3.6–8.3)	12 (6.1) (3.5–10.4)	9 (5.0) (2.6–9.3)
Severe malnutrition	10 (2.6) (1.4–4.8)	6 (3.0) (1.4–6.6)	4 (2.2) (0.8–5.8)
Weight for age (n = 77) <sup>2</sup>			
Normal	66 (85.7) (75.8–92.1)	29 (82.9) (65.7–92.4)	37 (88.1) (73.6–95.2)
Underweight	10 (13.0) (7.0–22.8)	5 (14.3) (5.8–31.1)	5 (11.9) (4.9–26.4)
Severely underweight	1 (1.3) (0.2–9.0)	1 (2.9) (0.4–19.2)	—

<sup>1</sup>Extreme values excluded.

<sup>2</sup>Analysis for participants aged 10 y as reference value beyond 10 y is not available for weight for age.

**TABLE 3** Sociodemographic characteristics and food security

Characteristics (n = 384)		Food security status		P value <sup>1</sup>
		Food secure	Food insecure	
Gender	Male	154 (77.0)	46 (23.0)	0.276
	Female	150 (81.5)	34 (18.5)	
Age	10–12 y	169 (76.1)	53 (23.9)	0.086
	13–14 y	135 (83.3)	27 (16.7)	

<sup>1</sup>Chi-square test.

(23.9%) among households of adolescents in the 10–12 y age group compared with those in the age group of 13–14 y (16.7%) (Table 3).

#### Relation between sociodemographic characteristics and nutritional status.

Based on the classification of BMI-for-age, a slightly higher proportion (9.1%) of males were undernourished in comparison to females (7.1%). A higher proportion of early adolescents in the age group of 10–12 y (9.1%) were undernourished compared with the 13–14 y adolescent age group (6.1%). Based on height-for-age classification, more female participants were stunted (16.0%) in comparison to male participants (12.6%). With regards to the age groups, this proportion was higher (16.1%) in the 13–14 y age group compared with those in the 10–12 y age group (12.8%) (Table 4).

#### Relation between food insecurity and nutritional status.

As shown in Table 5, 19.4%, 7.4%, and 9.1% of the adolescents who were undernourished and stunted based on classification of BMI-for-age and height-for-age, respectively, were found to have some form of food insecurity in their households.

## Discussion

Adequate food intake has proven to be crucial for both physical and mental health, overall productivity, and functional coherence of adolescents. However, a dearth of evidence exists regarding household food insecurity and the nutritional status of adolescents living in neglected communities such as slums. Hence, this cross-sectional study

approached and interviewed a total of 384 early adolescents and their caregivers living in a targeted neighborhood to assess the nutritional status and household-level food security.

Our study indicated that 21% of the households residing in a poor neighborhood experienced some degree of food insecurity in the 1 mo preceding the survey. A study conducted among urban slum-dwellers in Sri Lanka supported findings from our study reporting 28% of participants being food insecure (20). Similar to the findings from our study, a study conducted in a slum area of 3 urban areas of Nepal; Rajbiraj, Nepalgunj, and Kathmandu (15) reported 32.4% of households had enough food for <3 mo claiming a serious food insecurity situation. A slightly higher prevalence of food insecurity (43%) was reported in a study carried out in unnotified slum settings in India (21). A much worse scenario of food insecurity for slum residents was observed in India (22) and Nigeria (23) whereby food insecurity was a staggering 78% and 81%, respectively, much higher than the figure reported in our study.

To measure the nutritional status of early adolescents, z-scores for BMI-for-age, height-for-age, and weight-for-age were calculated based on the WHO 2007 package for children aged 5–19 y. BMI-for-age revealed 18.2% and 4.7% were overweight and obese, respectively, 8.1% were undernourished/low BMI-for-age, whereas 14.2% of adolescents were stunted (low height-for-age) and 14.3% were underweight/wasted (low weight-for-age). Similar to findings from our study, a study conducted in India among the urban poor revealed 19.9% of school children (5–15 y) were stunted; however, a higher figure was reported for underweight (38.4%) (24). A higher prevalence of stunting (31.3%) and thinness (25.7%) was reported by another community-based cross-sectional study among adolescent girls (10–19 y) in Assam (25). Close to the figures from our research, a study in the urban slums of Moradabad

**TABLE 4** Sociodemographic characteristics and nutritional status

Characteristics		Malnutrition (n = 380)		P value <sup>1</sup>
		No	Yes	
Gender	Male	180 (90.9)	18 (9.1)	0.488
	Female	169 (92.9)	13 (7.1)	
Age	10–12 y	199 (90.9)	20 (9.1)	0.418
	13–14 y	150 (93.2)	11 (6.8)	
		Stunting (n = 379)		
		No	Yes	
Gender	Male	173 (87.4)	25 (12.6)	0.345
	Female	152 (84.0)	29 (16.0)	
Age	10–12 y	190 (87.2)	28 (12.8)	0.363
	13–14 y	135 (83.9)	26 (16.1)	

<sup>1</sup>Chi-square test.

**TABLE 5** Relation between food insecurity and nutritional status

Characteristics		Food security status		P value <sup>1</sup>
		Food secure	Food insecure	
Malnutrition (n = 380)	No	275 (78.8)	74 (21.2)	0.809
	Yes	25 (80.6)	6 (19.4)	
Stunting (n = 379)	No	250 (76.9)	75 (23.1)	0.009 <sup>2</sup>
	Yes	50 (92.6)	4 (7.4)	

<sup>1</sup>Chi-square test.<sup>2</sup><0.05.

district, India, showed 15.6% of adolescent girls were underweight (26). Similarly, another cross-sectional study carried out among adolescent girls in selected slum areas in Bangladesh supports findings from our study reporting 13.3% of the girls were undernourished, 10% of the girls were severely stunted, and 24% girls were mild to moderately stunted (17).

Although our study reported a lack of association between household food security and nutritional status of adolescents, based on our results, households with undernourished adolescents reported some form of food insecurity. Supporting findings from our study, research conducted using longitudinal data collected from 2 informal settlements in Nairobi, Kenya, between 2006 to 2012 showed children from severely food-insecure households were 21% (HR: 1.21, CI: 1.09–1.33) more likely to be stunted than those from food-secure households and the risk increased significantly by 19% and 22% among children from moderately food-insecure and severely food-insecure households (27).

This study found that mild to severe food insecurity was prevalent among a substantial proportion of early adolescents residing in a poor neighborhood. Likewise, the problems of stunting, undernutrition, and underweight were also prominent among these groups of the population. Considering these findings, this study could be useful to inform policies and interventions to address the issues of food insecurity in these kinds of settlements. In addition, nutrition-specific and nutrition-sensitive intervention planning could also be informed by the findings of this study targeting the need for improvement in the nutritional status of early adolescents.

Limitations of this study include the households in a poor neighborhood area being purposively selected, therefore, the sample represents only a certain segment of a poor neighborhood. So, generalization could not be made to the entire population of a poor neighborhood in Kathmandu. In addition, there might have been a possibility of recall and reporting bias in food security; the height was measured using a stature meter by only 1 enumerator; and establishing a causal relation between food security and the nutritional status of early adolescents was not possible since the study was cross-sectional.

In conclusion, this study found that a substantial proportion of households were food insecure. Similarly, the prevalence rates of underweight, stunting, and wasting among early adolescents residing in our targeted poor neighborhood were high. Although no significant association was observed between household food insecurity and nutritional status of the adolescents, some degree of food insecurity was prevalent in households with undernourished adolescents.

Considering the household food insecurity and higher prevalence of underweight, stunting, and wasting among early adolescents there is a need for social protection policies to address household food insecurity and targeted interventions to reduce malnutrition among

early adolescents particularly focusing on vulnerable urban poor households.

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### Data Availability

Data will be made available upon request.

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