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UNDERNUTRITION AND ASSOCIATED FACTORS AMONG ADOLESCENT GIRLS
ATTENDING GOVERNMENT SCHOOLS IN ASELLA TOWN, OROMIA REGION,
ETHIOPIA: A MIXED METHOD STUDY

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Abstract

Background: Undernutrition is a consequence of a deficiency in nutrient intake and/or absorption in the body or it can result from a disease or infection that affects nutritional intake or metabolism. Adolescent undernutrition including stunting and thinness remains a significant public health problem in low- and middle-income settings.

Objective: This study aimed to assess undernutrition and associated factors among adolescent girls attending government schools in Asella town, Oromia, Ethiopia.

Methods: school-based mixed method cross-sectional study was conducted. A total of 618 adolescents were enrolled in the study. Structured interview administered questionnaire was used to collect data. Height-for-age and body mass index-for-age z-score were calculated using WHO antroplus software as indicators of stunting and thinness respectively. Descriptive statistics, bivariable and multivariable logistic regression analysis were done. Statistically significant associations of variables were determined based on the Adjusted Odds ratio with its 95% confidence interval (AOR, CI) and p-value of ≤ 0.05 . Qualitative data was collected through Focus Group Discussions with adolescent girls.

Result: The prevalence of stunting and thinness among adolescent girls was 15.5% (95%CI= 12.6%-18.4%) and thinness was 11.3% (95%CI= 8.8%-13.8%) respectively. Being in older age, larger family size, lack of nutrition information and poor handwashing practices associated with stunting. Thinness was associated with consuming fewer than three meals per day, delayed menarche, and low awareness on the importance of good nutrition. Qualitative findings revealing limited nutrition knowledge, inconsistent hygiene practices and household food availability and meal frequency as major contributors to undernutrition.

Conclusion: Adolescent girls' undernutrition is a public health problem in the study area. Adolescent undernutrition is influenced by interconnected factors. Interventions targeting nutrition education, improved hygiene practices, menstrual health support, and household-level food access are crucial to improving adolescent nutritional outcomes.

Keywords: adolescents, stunting, thinness, mixed-methods, nutrition, Asella, Ethiopia

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ABBREVIATIONS AND ACRONYMS

AOR	Adjusted odds Ratio
BAZ	Body Mass Index for Age Z score
BMI	Body Mass Index
CI	Confidence Interval
COR	Crude odds ration
EDHS	Ethiopian Demographic Health Survey
FGD	Focus Group Discussion
HAZ	Height for Age in Z-score
LMIC	Low and Middle-Income Countries
SD	Standard Deviation
SPSS	Statistical package for social sciences
SSA	sub-Saharan Africa
WHO	World Health Organization

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1. INTRODUCTION

1.1. Background

The World Health Organization (WHO) defined adolescence as the age group between 10 and 19 years, with the second most rapid growth rate next to infants. It is a period of rapid growth, and 45% of skeletal growth, 15%–25% of the adult height, and up to 37% of total bone mass is achieved during this period (1). Undernutrition is a consequence of a deficiency in nutrient intake and/or absorption in the body or it can result from a disease or infection that affects nutritional intake or metabolism. According to the World Health Organization (WHO), undernutrition includes wasting, stunting, underweight, and micronutrient deficiencies (2). Under nutrition starts before birth, goes into adolescence and adult life, and can span into generations and results in short stature, lean body mass, and is associated with deficiencies in muscular strength (3).

Undernutrition is an indicator of poor nutrition and has major consequences on human health as well as the social and economic development of the population (4).

Adolescence under nutrition has been linked to delayed growth spurt and increases the risk of morbidity and mortality. Ensuring that adolescent girls are nutritionally fit before they become mothers is vital to disrupt the vicious cycle of malnutrition (5). Inadequate diet during this period can result in a decreased learning ability, delayed sexual maturity, micronutrient deficiency, and lack of concentration, impaired school performance, undermining physical and economic growth, limiting the body's ability to appropriately absorb nutrients, and perpetuating poverty (6).

Adolescents have typically been considered at low risk of poor health and getting less attention from health care and adequate dietary as well. Dietary diversity is critical in adolescents because they need the energy to grow and develop both physically and mentally (7).

1.2. Statement of the problem

In 2016, underweight affected more than 16.2 million adolescent girls globally (8)

Globally, the prevalence of stunting has been declining steadily from 40.2% in 1990 to 22.3% in 2022. At 44.7%, Africa had one of the highest prevalence of any continent

Even Though Africa also experiences a downward trend, the decline rate is so slow that the gross number of stunted children continues to increase.(9).

The world's current teenage cohort (10–19 y) is the largest in human history, 90% of who live in low- and middle-income countries (LMIC). In Sub-Saharan Africa, the prevalence of adolescent under nutrition is 15–58%, which is higher from other African countries (10).

In developing countries, undernutrition among late adolescent females is far worse and remains a major public health problem; however, it has received less policy attention (11).

Ethiopia currently has a National Nutrition Program and national school health and feeding initiatives that were created by the government to improve adolescent nutrition. Studies conducted in a separate region of Ethiopia, however revealed that dietary concerns continue to be one of the major public health problems affecting people at all stages of life particularly among adolescent girls (8).

A community based cross sectional study conducted in Damot shows that the prevalence of stunting and thinness among adolescent girl was 29.6% and 19.5%, respectively and it is a major public health problem, when compared to the national nutrition baseline survey reports in Ethiopia (12).

Like other developing countries of the world, under nutrition remains a major public health problem in Ethiopia. Among the women, 17 % had chronic energy deficiency (BMI < 18.5), 6 % had experiencing night blindness in their most recent pregnancy, 27 % had anemia. This clearly reflects that rate of undernutrition in Ethiopia is high (13).

Evidence showed that undernourished adolescent girls are the upshot of stunted young and preschool children; again, they will continue to become also malnourished mothers in the future who in turn give birth to low-birth-weight babies that continued to become inter-generation cycle (14).

In Ethiopia, even if there is economic progress the burden of malnutrition is still very high. Among adolescents' undernutrition will lead to retarded physical growth, sexual

immaturity, and poor reproductive performance later in life which is reflected in a population as slower growth rate, and short stature (15).

In light of the significant health and developmental implications of undernutrition among Adolescent girls and given the limited localized research on this issue in the study area, there is a pressing need to understand the current situation and its determinants.

In Ethiopia, children and adolescents made up more than 48% of the population, with adolescent girls making up 25% (16). According to EDHS Statistics (2016), around 23.8% of adolescent girls are anemic. Approximately 50% of all types of anemia are caused by iron deficiency, which is caused by increased nutritional needs due to the rapid growth rate of adolescent girls and is worsened by menstruation (17). The consequences of adolescent undernutrition are severe and far-reaching. Malnourished girls are at increased risk of complications such as low birth weight, preterm birth, and stillbirth, which affect not only their own health but also the well-being of their children and the broader community (18).

Several quantitative studies have attempted to characterize the dietary pattern and nutritional conditions of adolescents. Nonetheless, there is limited information on attributes that may affect nutritional status.

1.3. Significance of the study

Adolescence is a critical period for growth and development and nutritional status during this stage has long term implications for health, academic performance and future reproductive outcomes. Despite this, adolescent nutrition remains a neglected area in many low and middle income countries, including Ethiopia.

While existing literature highlights the pervasive nature of undernutrition among adolescents and identifies various contributing factors globally and within Ethiopia, there remains a notable paucity of recent, localized data specifically focusing on school going adolescent girls in Asella. Understanding the unique interplay of factors influencing undernutrition in this specific demographic and geographic context is crucial for developing targeted and effective interventions. Therefore, this study aimed to investigate the prevalence of undernutrition and its associated factors among adolescent girls in Asella, Ethiopia to fill this critical knowledge gap and inform evidence based public health strategies.

2.LITERATURE REVIEW

2.1 Magnitude of undernutrition among adolescents

Globally, the prevalence of stunting has been declining steadily from 40.2% in 1990 to 22.3% in 2022. At 44.7%, Africa had one of the highest prevalence of any continent. Even though Africa also experiences a downward trend, the decline rate is so slow that the gross number of stunted children continues to increase ((9).

A synthesis of scoping reviews across seven global regions shows that double burden of malnutrition was evident across the world regions reviewed: stunting, thinness, anaemia and other micronutrient deficiencies persisted, alongside rising overweight and obesity prevalence. Transitions towards diets increasingly high in energy-dense, processed and micronutrient-poor foods were observed (19).

In a cross-sectional study conducted in Pakistan among the total 84 adolescent girls, 86.9% of girls were underweight, whereas 13.1% had a normal BMI ((20). Institutional based Cross-sectional Study conducted in government school of Shuklaphanta Municipality reveals that majority of adolescents were underweight that is 64.3% (21).

Secondary data analysis was conducted from women's data of four consecutive Ethiopian Demographic and Health Surveys (EDHS) from 2000 to 2016. Undernutrition was clustered nationally during each survey (Global Moran's $I = 0.009-0.045$, $Z\text{-score} = 5.55-27.24$, $p\text{-value} < 0.001$). In the final model, individual and community level factors accounted for about 31.02% of the regional variations for undernutrition. The odds of undernutrition among 18–19 years of adolescent girls, was 57% lower than those 15–17 years old (22).

An institution based cross sectional study conducted in Amhara region found that 12.3% and 9.6% of school adolescent girls were stunted and thin, respectively.(23) A school based cross sectional study was conducted in Bedelle found that The prevalence of underweight among adolescent girls was 28% by having BMI less than 18.5kg/m². 5.2% were at risk of developing obesity by having BMI ≥ 25 kg/m² (24).

A community based comparative cross sectional study in Debarke found that The overall prevalence of stunting and thinness were 20.1% and 10.3%, respectively. Stunting among

rural adolescent girls was 24.2%; whereas it was 16% among urban residents. Likewise, thinness among rural adolescent girls was 8.5%; whereas it was 12.1% among urban dwellers (25).

A school-based cross-sectional study in Dessie town, South Wollo Zone found that the overall prevalence of stunting among high school adolescent was 15.7% (26). A cross-sectional study conducted in high schools of the Yeka sub-city Addis Ababa revealed low dietary diversity among 43.3% of adolescent girls, which is in line with a study conducted in South Ethiopia with 46.8% of adolescent girls scoring low dietary diversity score. But the finding was higher than the study conducted in Gondar city (25.5%) (27).

An institution base cross sectional study conducted in Goba town found that the prevalence of thinness was 11.9%. This finding is relatively similar with the national nutrition baseline survey report for the NNP of Ethiopia (14%) , studies done in Agarfa Ethiopia (13.6) and Hyryana, India 13.7%). However this prevalence is higher than the finding of previous study done in Addis Ababa Ethiopia (6.2 %).(13).A school-based cross-sectional study in Afar, Northeastern Ethiopia revealed that the prevalence of thinness and stunting were 15.8% and 26.6%, respectively (28).

According to a study conducted in Hawzen woreda, Tigray regional state the overall prevalence of underweight and stunting were 32.2% and 33.2% respectively. This prevalence is low as compared to the magnitude reported from studies conducted in Mekelle city (37.8%), Eastern Tigray (55%) and Tigray (58.3%) (40).

According to a study conducted in eastern Arsi zone the prevalence of stunting and thinness were 20.2% and 14.8% respectively (29).

2.2 Factors associated with nutritional status

In sub-Saharan Africa Studies have found that factors associated with adolescent diet quality include socioeconomic status, age, sex, urbanization, maternal education, and employment status and gender difference in consumption of healthy diet (30).

According to a study conducted in Gindeberet district, central Ethiopia adolescent girls who did not begin menstruation were 1.71 times more likely to develop stunting when compared

to those who started to see menstruation. The study stated that adolescent girls who engaged in vigorous-intensity activities were 2.51 times more likely to develop thinness when compared to those who did not engage in vigorous-intensity activities(31).

An institution based cross sectional study conducted in Goba town shows that Stunting, height-for-age Z Scores less than -2 SD was significantly associated with dietary diversity practice and Menstruation status of adolescent girls (13). A cross section study conducted in northwest Ethiopia. The findings revealed poor dietary practices among school-going adolescent girls and highlighted the coexistence of nutritional deficiencies alongside nutritional excess. While nutritional excess was observed in some participants, the overall evidence of inadequate nutrition among these girls' calls for urgent public health intervention, as these adolescents will become future mothers.(32)

School based cross sectional study in Afar revealed that Adolescents have specific health and development needs, and many of them face challenges that hinder their well-being, especially on adolescent girls such as adverse reproductive outcomes, pregnancy outcomes, and birthweight. Despite this fact, many studies in Ethiopia are still carried out focusing on the vulnerable groups like infant, pregnant and lactating women, and limited on adolescent girls (29).

A community-based cross-sectional study was conducted in Damot Gale district revealed a high prevalence of inadequate intakes of both macro- and micronutrients among adolescent girls in the study area.(33)

According to a institution based mixed method cross sectional study conducted in north west ethiopia Compared with those with high fast food intake, those with low fast food intake were 69% less likely to be stunted. Similarly, compared with those in the early adolescent stage, those in the late stage were 85% less likely to be thin (34).

A facility-based cross-sectional study was conducted among adolescents in secondary schools of Wolaita Sodo town disclosed that separation of parents has significantly lowered the academic performance of students when compared with students whose parents are in marital union. This result is consistent with the results of studies conducted in Addis Ababa and Ghana (35).

A systematic review and meta-analysis study that found the odds of having stunted adolescents were 2.25 times higher in households with a family size of ≥ 5 members.(36)A community based cross sectional study conducted in Damot revealed that the number of meals being eaten per day was significantly associated with thinness. Adolescent girls who usually eat two and less meals per day were 1.8 times more likely to be thin as compared to those who usually eat three meals per day(12).

A school based cross-sectional study conducted in Hawzen woreda showed the father's educational status was associated with adolescent girls underweight. Higher educational status of a father can relate with a good income, good knowledge, availability and access to a balanced diet.This study also found that Adolescent girls from grades four to eight were more likely to be underweight as compared to grade 9–12 adolescent girls (40).

A community-based cross-sectional study conducted at Nifas Silk Laphto sub-city, Addis Ababa shows that The proportion of low dietary diversity was in line with a study done Gurage zone 73.2%, Gondar adolescent 75.4% and higher when compared to another study done in Jimma town 12% of school adolescents had low, Dembia, northwest Ethiopia 32.3% , Addis Ababa, Yeka Sub-city 43.3%, Woldia 49.1% , South West Ethiopia 61.3% (37).

2.3 Conceptual framework

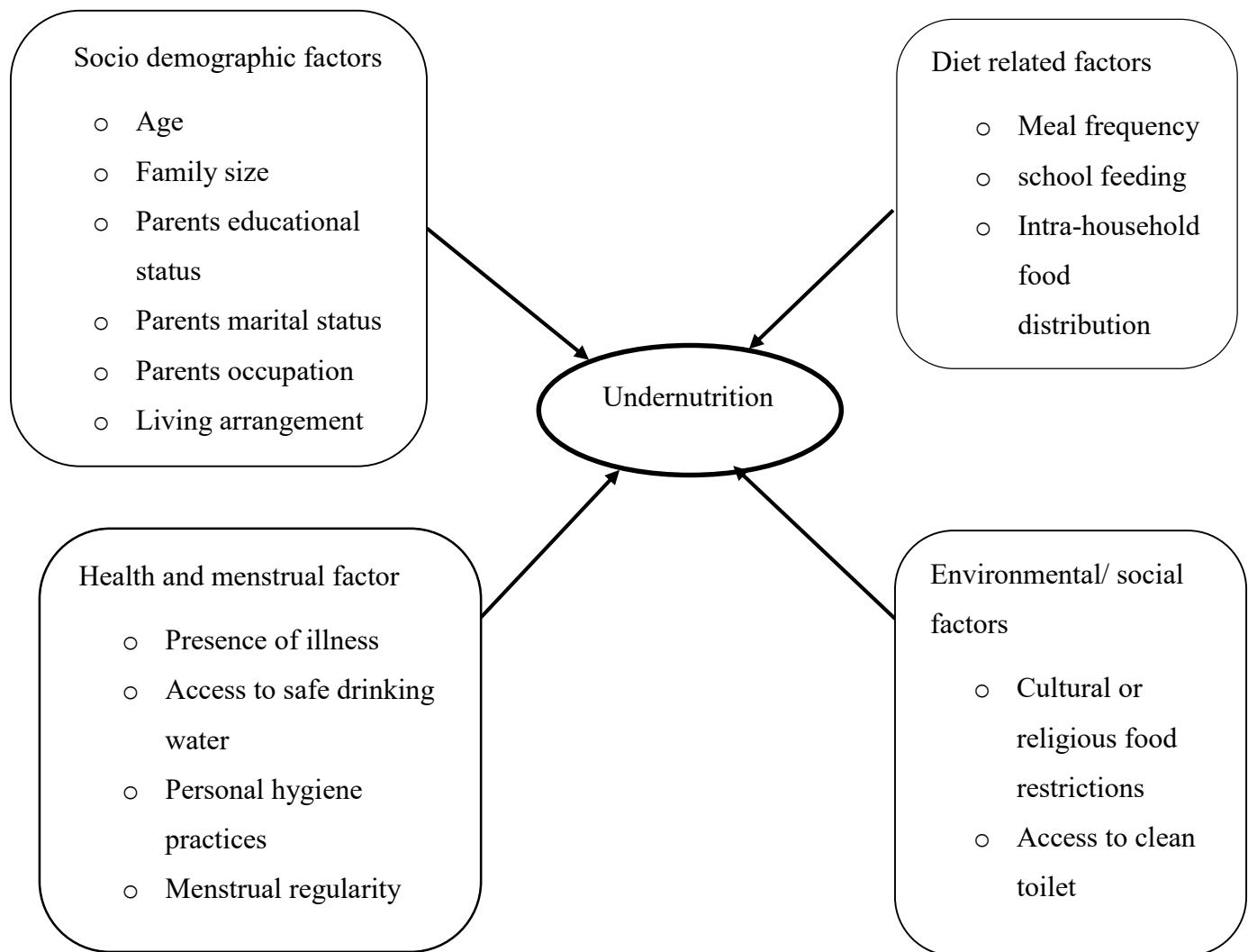


Figure 1: Conceptual framework showing factors associated with undernutrition from different literatures

3.OBJECTIVES

General Objective

This study aimed to assess undernutrition and its associated factors among adolescent girls attending government schools in Asella town, Oromia, Ethiopia 2025.

Specific Objective

- To assess undernutrition among adolescent girls attending government schools in Asella town, Oromia, Ethiopia 2025.
- To identify factors associated with undernutrition among adolescent girls attending government schools in Asella town, Oromia, Ethiopia 2025.
- To explore the perception, experiences and contextual factors influencing undernutrition among adolescent girls attending government schools in Asella, Oromia, Ethiopia 2025.

4. METHODS

4.1 Study area

This study was conducted in Asella town, located in the Arsi zone of oromia regional state, Ethiopia. Asella town is located 159 Km to the south of Addis Ababa (the capital city of Ethiopia) on the shoreline of the Chilalo mountains. The estimated population of Asella town in 2022 is 113,445 of whom 57290 are male and 56,155 are female. The town has both public and private schools that serve a wide demographic of students. According to the education office of the town, Asella town has a total of 15 public schools (9 primary and 6 secondary).

4.2 Study design and period

Sequential explanatory mixed method study was conducted.

For quantitative study: school -based cross-sectional study was conducted from September to October 2025.

For qualitative study focus group discussion was conducted.

4.3 Source and study population

4.3.1. Source population

All adolescent girls aged 10-19 years who attend government schools in Asella town.

4.3.2. Study population

The study populations were adolescent girls attending selected government schools during the study period.

Inclusion criteria

All adolescent girls attending government schools during the data collection period were included.

Exclusion Criteria

Adolescent girls with any illness, acute or chronic or limb deformities that could affect nutritional status or the accuracy of anthropometric measurements and those who are pregnant or lactating at the time of the study were excluded.

4.4. Sample size determination and sampling technique/sampling procedures

4.4.1. Sample size determination

- Quantitative component

Sample size was determine using a single population proportion formula.

Sample size (n)= $z^2 \cdot p(1-p)/d^2$

Where

Z=confidence interval 95% (standard value 1.96)

P =prevalence of stunting 24.2% (based on a study conducted in Debark)(25)

d=margin of error (5%)

Now, n= $z^2 \cdot p(1-p)/d^2$

$$n = (1.96)^2 \cdot 0.242 \cdot (1-0.242) / (0.05)^2 = 281$$

The sample size adjusted to components for non-response rate of 10% and final sample size was 309.

The initial sample size calculated was 309 however, to account for the multistage sampling design, a design effect of 2 was applied. To maintain the statistical power of the study, the sample size was adjusted accordingly, resulting in a final sample size of 618.

Qualitative component

Purposive sampling was used to select participants for focus group discussions (FGDs). Four focus group discussions were conducted. Each session consists of 6-10 participants.

4.4.2. Sampling procedure

A multistage sampling technique was employed through three stages

Stage 1: Clustering – All government schools were grouped into two clusters: primary schools and secondary schools.

While there will be variation within primary and secondary schools, this initial clustering helps to create two relatively more homogeneous groups compared to mixing all schools together. This sets a good foundation for the subsequent stratification.

Stage 2: Stratification – Within each cluster, schools were stratified. A random selection of schools from both clusters was made using the lottery method, ensuring equal selection probability for each school.

Following the initial clustering, a stratified random sampling approach were applied independently within each of the identified clusters (primary schools and secondary schools). This stratification is crucial to ensure that the sample accurately reflects the heterogeneity present within each school level.

Stage 3: Grade and Class Selection – In each selected school, further stratification was conducted based on grade level. From each grade, classes were selected using simple random sampling to ensure unbiased representation within the school structure.

Additional details of this process are illustrated in Figure 2.

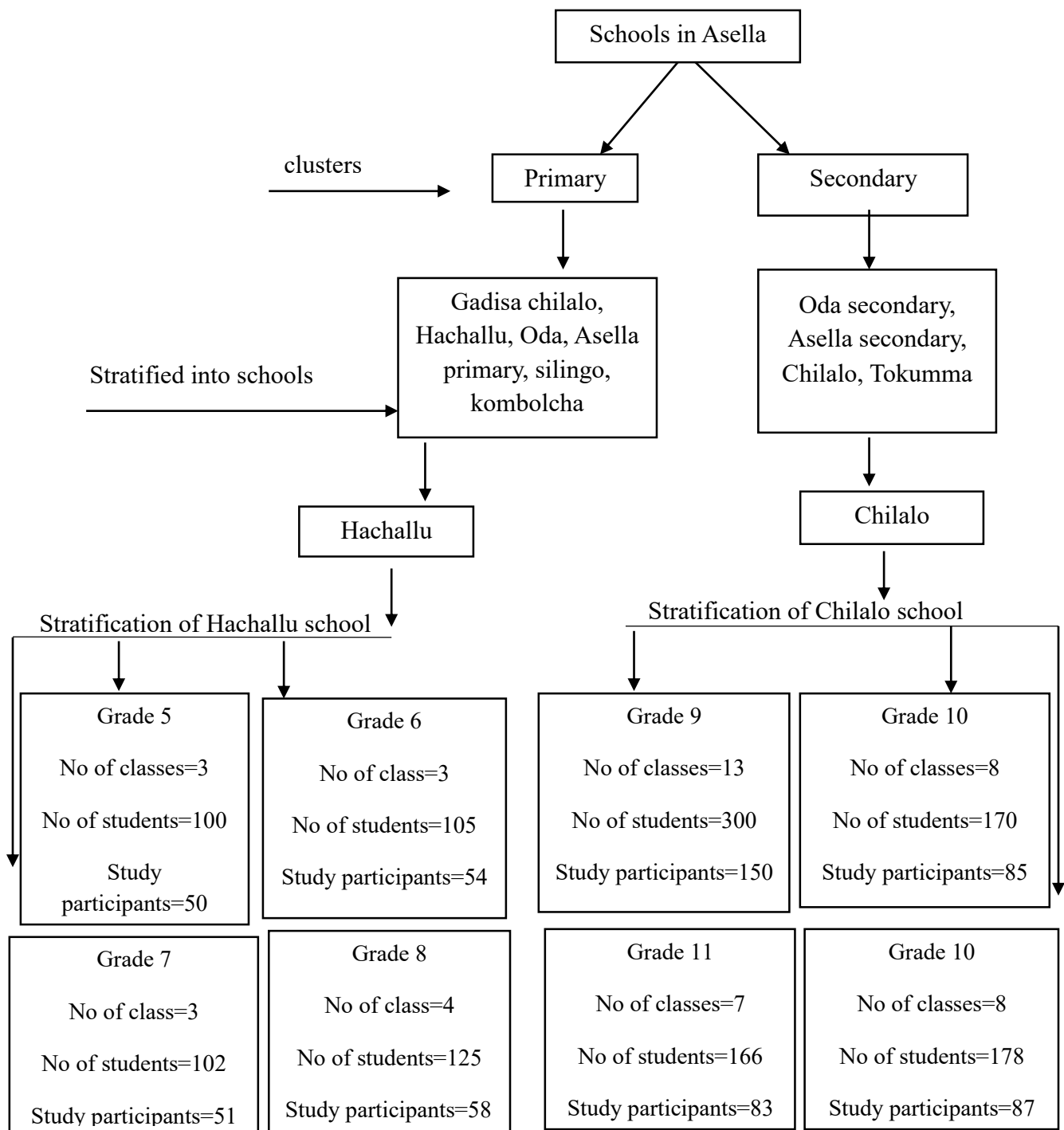


Figure 2: A flow diagram illustrating the multistage sampling procedure, including clustering of schools by level, stratification, and random selection at the school, grade and class levels

Qualitative component

A purposive, non-probability sampling technique was employed to recruit participants who are adolescent girls attending the selected schools. A stratified purposive sampling was applied to ensure representation across key categories such as age group (10-14 years and 15-19 years) and school level (primary and secondary). This approach allowed the inclusion of participants with shared characteristics within each group, while also enabling maximum variation across strata to capture diverse perspectives.

Four focus group discussions were conducted. Each session consisted of 6-10 participants; participants were recruited with the help of school administrators and teachers, ensuring voluntary participation.

Table 1: stratified focus group sampling frame

Focus group	Aged 10-14 years	Aged 15-19 years	Total
Chilalo secondary school (focus group 1)		6-10	6-10
Chilalo secondary school (focus group 2)		6-10	6-10
Hachallu primary school (focus group 1)	4-6	2-4	6-10
Hachallu primary school (focus group 2)	4-6	2-4	6-10
Total sample size			40

4.5. Study variables

4.5.1. Dependent variables

- Undernutrition

4.5.2. Independent variables

- Socio-demographic characteristics
 - ✓ Age
 - ✓ Family size
 - ✓ Parents educational status
 - ✓ Parents marital status
 - ✓ Living arrangement
 - ✓ Parents occupation

- Diet related factors
 - ✓ Meal frequency
 - ✓ Participation in school feeding program
 - ✓ Intra-household food distribution
 - ✓ Have home gardening
- Health and menstrual factor
 - ✓ Presence of illness
 - ✓ Access to safe drinking water
 - ✓ Personal hygiene practices
 - ✓ Menstrual regularity
- Environmental/ social factors
 - ✓ Cultural or religious food restrictions
 - ✓ Access to clean and functional toilet

4.6. Operational definitions

- Undernutrition: nutritional status, which is classified as either stunting or thinness
- Stunting is if the height-for-age Z score is found to be below -2 SD of the 2007 WHO growth reference. Severe stunting is diagnosed if it is below -3 SD
- Thinness is if the BMI-for-age Z score < -2 SD of the WHO growth reference 2007. Severe thinness is diagnosed if it was below -3 SD
- Body mass index (BMI) is defined as weight in kilograms divided by height in meters squared = $\text{Weight(kg)}/\text{Height (m}^2\text{)}$ —normal weight if $18.5 \text{ kg/m}^2 < \text{BMI} < 25 \text{ kg/m}^2$, underweight if $\text{BMI} < 18.5 \text{ kg/m}^2$,
- Focus group discussion: group interview conducted with 6-10 participants who share relevant characteristics related to research topic.
- Anthropometric measurement: the process of assessing the height and weight of adolescent girls, to determine nutritional status
- Adolescent girls: girls aged 10-19 years.

4.7. Data collection procedures

Quantitative data

A structured interviewer-administered questionnaire was used to collect relevant information from each study respondent. Data were collected using structured questionnaires administered through face-to-face interviews with study participants via the Kobo Collect digital app. The questionnaire was prepared by reviewing different related literature with modifications in line with the objectives of this study and was prepared in English and then translated into local languages (Amharic and Afan Oromo). The questionnaire covered socio-demographic characteristics, dietary habits, health and menstrual history, environmental factors and cultural practices. Four trained BSc nurses were serving as data collectors, supervised by MSc level supervisor.

Anthropometric measurements were taken to assess the nutritional status of participants. Standing height was measured in centimetres using a portable stadiometer, with participants barefoot, heels together and head positioned in the Frankfurt plane. Weight was measured in kilograms using a calibrated digital weighing scale, with participants barefoot and wearing light clothing. Each measurement was taken twice, the average recorded.

Qualitative data

The qualitative data was gathered through focus group discussions (FGDs) with adolescent girls. A semi structured discussion guide was developed to explore perceptions, experiences and contextual factors influencing adolescent nutrition.

4.8. Data analysis procedure

Quantitative analysis

The data was coded and entered using Statistical Package for Social Sciences (IBM SPSS, version 27.0). Descriptive statistics were used to summarize data. Bivariate logistic regression was first used to assess associations between independent variables and nutritional outcomes. Variables with p-value <0.05 were entered into multivariable logistic

regression to identify independent predictors of undernutrition. Significance was set at p-value < 0.05 with 95% CI.

Anthropometric data (height and weight) was converted into BMI-for age Z- scores (BAZ) and height-for- age Z-scores (HAZ) using the WHO anthro plus software.

Nutritional indicators:

- Stunting was defined as HAZ <-2 SD
- Thinness was defined as BAZ <-2 SD
- Normal nutritional status was defined as BAZ between -2 SD and +1 SD.

Qualitative analysis

The qualitative data from the focus group discussions (FGD) were analyzed using thematic analysis. Audio recordings was first transcribed verbatim and checked for accuracy, with all identifying information removed to maintain confidentiality. The principal investigator read and re-read the transcripts to become familiar with the data before conducting open coding to identify significant statements and ideas. Codes were then be grouped into categories and refined into broader themes that reflect participants' perceptions and experiences in relation to the study objectives. Verbatim quotes were used to illustrate key themes. To ensure trustworthiness, strategies such as triangulation with quantitative findings, maintaining an audit trail of analytic decisions and providing thick descriptions of the context was employed.

4.9. Data quality assurance

The tool was reviewed by two senior experts and pre-test on 5% of the sample size, before administration. All required revisions were made to the study tool based on the experts' comments and the pretest. Four BSc nurses and one MSc nurses were recruit for data collection and supervision respectively. Data collectors were trained on the objective, relevance of the study, data collecting and interviewing approach.

For anthropometric measurements, data collectors were receiving practical training on standardized measurement techniques. Standardization exercise was conducted prior to data

collection to minimize inter- and intra-observer errors. Digital weighing scales were calibrated daily and zero adjustment made before each measurement. Stadiometers were checked for proper placement and alignment. Each measurement and height and weight were taken twice, the average recorded. Participants were measured wearing light clothing, and positioned according to WHO recommendations (heels, buttocks, shoulders, and head touching the vertical surface of the stadiometer). Supervisor was routinely monitor measurement sessions to ensure adherence to protocol.

For qualitative data a semi structured discussion guide was developed and pre-tested to ensure clarity and appropriateness of questions. Before each session, informed consent was obtained and participants were briefed on the purpose of the study, confidentiality and their right to withdraw at any time, each FGD was moderated by a trained facilitator, discussions were conducted in a quiet, comfortable environment and audio recorded with permission. To minimize bias in focus group discussions data collectors were trained in qualitative interviewing techniques, ethical considerations, and facilitation skill to ensure neutrality, consistency and a safe environment that encourages open participation.

4.10. Ethical consideration

Ethical clearance was obtained from the ethical review committee (ERC) of Arsi University College of Health Sciences and a supportive letter was obtained from the Asella town education bureau. Finally, an official letter was submitted to each respective school.

Prior to data collection, the purpose and objectives of the study was explained to the participants. informed consent was obtained from each participant aged 18-19 years. For those younger than 18years, assent was obtained from adolescent girl, and consent was also obtained from her parent or legal guardian by phone call. Confidentiality of information strictly maintained. Questionnaires were not included personal identifiers. Response was coded, and results reported in aggregate form only.

For anthropometric measurements, standard ethical procedures were followed to respect participants' privacy and dignity. Measurement was taken individually in a private setting by trained data collectors of the same sex as the participants. results were not shared in front of peers to avoid embarrassment or stigma.

For qualitative component, participants were informed that discussions will be audio-recorded for transcription purposes, with their permission and that recordings will be stored securely and destroyed after analysis. Participation was voluntary, and participants have the right to decline to answer any question or withdraw at any time without penalty.

All participants were assured that their decision to participate or not will not affect their school attendance or access to any services.

5. RESULTS

5.1 Socio-demographic characteristics

This study included all 618 eligible participants, resulting in a 100% response rate. The mean age was 15.22 years $\pm$ 2.13, with the age range of 11-19 years. of the study participants 421 (68.2%) were adolescent girls within the age group of 15-19 years. The grade of respondents ranged from grade 5 to grade 12, with the largest group being grade 9 12 students (65.5%). Among the study participants around the half were orthodox (49.4%) followed by Muslim (38.7%) In terms of ethnicity, 68.6% were Oromo. Majority of participants (86.2%) were living with their parents. Most respondents came from families with more than five members (64.0%). Of the study participants 400 (64.7%) respondents reported that their parents are married. about 27.5% of respondents reported that their parents were divorced or separated. Regarding parental educational status more than half of fathers (52.6%) had a collage level education or above. Only 8.3% of fathers had no formal education. For mothers, 50.5% had completed primary education, while 13.4 had no formal education. In terms of occupation, nearly half of fathers (49.8%) were government employees,14.2% merchant and 16.3% private employees. Among mothers, 70.1% were housewives.

Table 2: Socio-demographic factors among school adolescent girls in Asella, Oromia, Ethiopia 2025(n=618)

Variable	Frequency (%)
Age group	
10-14 years	197(31.8)
15-19 years	421(68.2)
Grade level	
5-8	213(34.5)
9-12	405(65.5)
Religion	
Muslim	239(38.6)
Orthodox	305(49.4)
Protestant	74(12)
Ethnicity	
Oromo	424(68.6)
Amhara	149(24.1)
Tigray	3(0.5)

Gurage	26(4.2)
Other	16(2.6)
Living arrangement	
With parents	533(86.2)
With relatives	54(8.7)
Alone	31(5.0)
Family size	
≤5	223(36.0)
>5	395(64.0)
Parents current relationship	
Divorced or separated	170(27.5)
Married	400(64.7)
Widowed	48(7.8)
Father educational level	
Collage or above	325(52.6)
No formal education	51(8.2)
Primary education	89(14.4)
Secondary education	153(24.8)
Mother educational level	
Collage or above	88(14.2)
No formal education	83(13.4)
Primary education	312(50.5)
Secondary education	135(21.9)
Father occupation	
Daily laborer	28(4.5)
Farmer	93(15.1)
Government employee	308(49.9)
Merchant	88(14.2)
Private employee	101(16.3)
Mother occupation	
Farmer	4(0.6)
Government employee	57(9.2)
House wife	433(70.1)
Merchant	45(7.3)
Private employee	79(12.8)

5.2 Dietary habit and food intake factors

Majority of the respondents (89.9%) reported eating three or more meals per day, while 10.1% ate only two or less meals per day. A small proportion (14.7%) admitted skipping meals during the day. Intermis of fruit and vegetable consumption, only 8.9% ate them daily, while 77.2% did so occasionally. Meat and dairy counsumption was relatively low, with 48.7% eating them occassionaly and 51.3% rarely. Only 12.5% of adolescents reported consuming fast food regularly. Almost all respondents (99.5%) indicated there were no food restrictions in their households due to cultural or religious reasons. When asked about food sharing practices, 97.1% said food was shared equally among family members. Most of the respondents (79.4%) reported that they did not have home gardening.

Table 3:diatery habit and food intake factors among adolescents in Asella, Oromia, Ethiopia, 2025(n=618)

Variable	Frequency (%)
Meal frequency per day	
Two or less	62(10.1)
Three or more	556(89.9)
How often do you eat fruit and vegetables	
Daily	55(8.9)
Occasionally	417(77.2)
Rarely	86(13.9)
How often do you eat meat and dairy products	
Occasionally	301(48.7)
Rarely	317(51.3)
Do you skip meal	
Yes	91(14.7)
No	527(85.3)
Do you consume fast food regularly	
Yes	77(12.5)
No	541(87.5)
Do you participate in the school feeding program	
no	618(100)
Are there any food restriction in your household due to cultural or religious reason	
yes	3(0.5)
no	615(99.5)
How is food usually shared in your family	
Equally to all members	600(97.1)
Preferentially to certain members	18(2.9)

Do you have home gardening	
Yes	127(20.6)
No	491(79.4)

5.3 Environmental and sanitation factors

Majority of respondents (97.1%) did not have access to clean and functional latrine in school. 98.5% have a toilet facility at home. Of those with a facility, 97.1% used a pit latrine. Regarding drinking water while 100% reported using tap water as their source at home, 97.1% do not treat this water before consumption. Nearly two thirds of respondents ,410 out of 618 (66.4%) do not wash their hands after using the toilet.

Table 4:environmental and sanitation factors among adolescent girls in Asella, Oromia, Ethiopia, 2025(n=618)

Variable	Frequency (%)
Do you have access to clean and functional latrine in school	
Yes	18(2.9)
No	600(97.1)
Do you have toilet facility at home	
Yes	609(98.5)
No	9(1.5)
What type of toilet is available	
Pit latrine	600(98.5)
Flush toilet	9(1.5)
Wash your hands after toilet	
Yes	208(33.6)
No	410(66.4)
Source of drinking water at home	
Tap water	618(100)
Do you treat your drinking water	
Yes	16(2.6)
No	602(97.4)

5.4 Knowledge and attitude towards nutrition

The study shows that 398 out of 618 respondents (64.4%) have not received any formal information about nutrition. Only 35.9% of the study participants had nutrition information. 77.3% of respondents rating their knowledge about balanced diet as poor, 19.3% of them rating their knowledge as moderate and only 2.9% of respondents have good knowledge about balanced diet. Additionally, a large portion of respondents were uncertain about the value of diet, with 60.6% of girls reporting that they don't know if good nutrition is important to their health and academic performance.

Table 5: knowledge and attitude factors among adolescent girls in Asella, Oromia, Ethiopia, 2025 (n=618)

Variables	Frequency (%)
Have you received any information about nutrition	
Yes	220(35.6)
No	398(64.4)
How do you rate your knowledge about balanced diet?	
Poor	478(77.3)
Moderate	122(19.7)
Good	18(2.9)
Do you think good nutrition is important to your health and academic performance?	
Yes	196(31.7)
No	48(7.7)
I don't know	374(60.6)

5.5 Health and menstrual history

The study found that 81.4% of adolescent girls were started menses and 97.4% were seen their menstruation at the age less than or equal to 14 years. In terms of menstrual regularity, majority of respondents (91.5%) have regular menstrual cycle. Immediate health status appears generally good, as 93.0% of respondents reported that they had not been ill in the past two weeks. About 43(7.0%) of the participants had a history of illness two weeks before data collection. Regarding physical activities, the majority of adolescents (97.1%) engaged in physical activities.

Table 6: health and menstrual factors among adolescent girls in Asella, Oromia, Ethiopia, 2025(n=618)

Variables	Frequency (%)
Have you been ill in the past two weeks?	
Yes	43(7.0)
No	575(93.0)
Do you start menstruation	
Yes	503(81.4)
No	115(18.6)
Age at menarche	
≤14	490(97.4)
>14	13(2.6)
Do you experience regular menstruation?	
Yes	460(91.5)
No	43(8.5)
Do you participate in any form of physical exercise?	
Yes	600(97.1)
No	18(2.9)

5.6 Nutritional status

A total of 618 adolescents were assessed for nutritional status. Undernutrition among adolescents were indicated by stunting and thinness. The mean weight was 42kg and the mean height was 150cm. The prevalence of stunting was 15.5% [95%CI= (12.6-18.4)] and thinness was 11.3% [95%CI= (8.8-13.8)] among school adolescent girls in Asella town. About 1.1% of adolescents have both stunting and thinness.

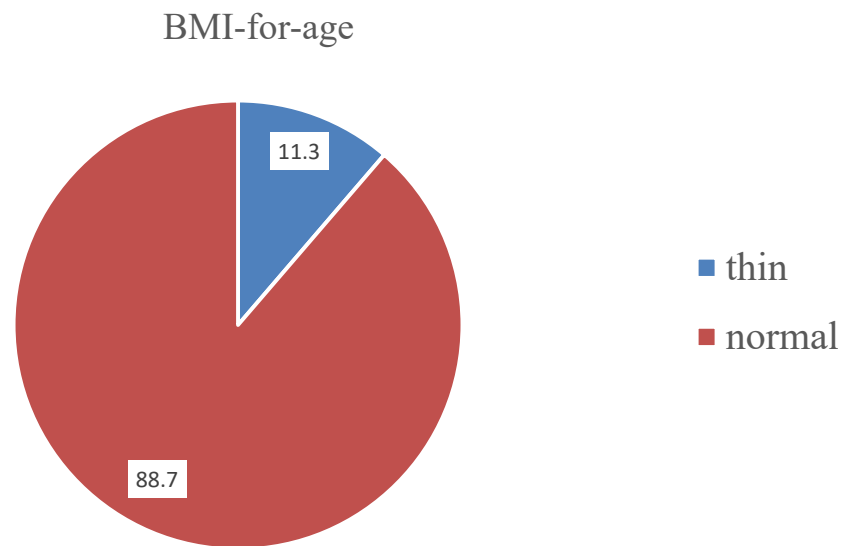


Figure 3: Presents a graphic representation of the BMI-for-age distribution for adolescent girls

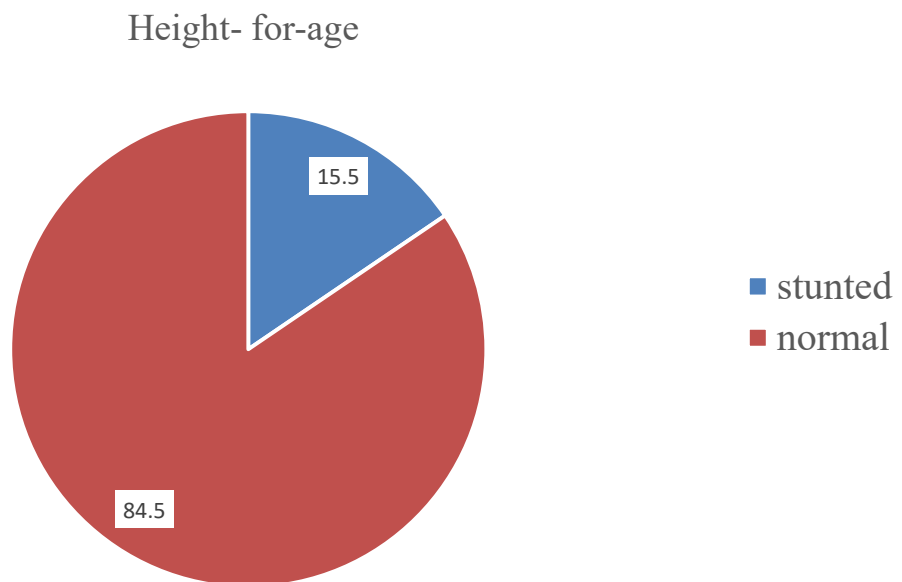


Figure 4: Presents a graphic representation of the height-for-age distribution for adolescent girls

5.7 Factors associated with adolescent nutritional outcome/stunting

Each independent variable was computed in bivariate logistic regression model those variables whose p-value <0.25 were entered into multivariable logistic regression such that age group, family size, information on nutrition and hand washing after toilet were statistically significantly associated with stunting. The study showed that younger adolescents aged 10-14 years have 12% [AOR=0.88, 95% CI (0.80,0.97)] lower odds of being stunted compared to those aged 15-19 years. Similarly, adolescents from household with five or fewer members were 47% [AOR=0.53,95%CI (0.32,0.88)] less likely to be stunted than those from larger families.

This study found that adolescent girls who do not have information on nutrition were 1.91 times more likely to develop stunting when compared to those who have information on nutrition. [AOR=1.91, 95%CI (1.05,3.47)]. Adolescents who do not wash hands after toilet were 2 times more likely to be stunted when compared to their counterparts. [AOR=2.02, 95%CI (1.11,3.46)].

Table 7: Bivariate and multivariate result of factors associated with stunting among school adolescent girls in Asella town, Oromia, Ethiopia 2025

Variables	<u>Stunting</u>		COR (95% CI)	AOR (95% CI)	P-value
	Yes (%)	No (%)			
Age group					
10-14 years	37 (5.9)	160(25.9)	0.90(0.81-0.99)	0.88(0.80-0.97)	0.017
15-19 years	59(9.5)	362(58.6)	1	1	
Family size					
≤5	26(4.2)	197(31.9)	0.61(0.37-0.99)	0.53(0.32-0.88)	0.014
>5	70(11.3)	325(52.6)	1	1	
Begin menstruation					
No	25(4.0)	90(14.6)	1.69(1.01-2.81)	1.08(0.48-2.41)	0.851
Yes	71(11.5)	432(69.9)	1	1	
Fast food consumption					
Yes	18(2.9)	59 (9.5)	0.55(0.30-0.98)	0.55(0.31-0.99)	0.050
No	78 (12.6)	463(75)	1	1	
Information on nutrition					
No	74(12)	324(52.5)	2.05(1.23-3.41)	1.91(1.05-3.47)	0.032
Yes	22 (3.5)	198(32)	1	1	
Washing hand after toilet					
No	74 (12)	336(54.5)	1.86(1.12-3.09)	2.02(1.11-3.46)	0.011
Yes	22 (3.5)	186(30)	1	1	

5.8 Factors associated with adolescent nutritional outcome/ thinness

On multivariable analysis number of meals per day, menstruation status and attitude towards nutrition were statistically significantly associated with thinness. Meal frequency demonstrated a significant association with nutritional status. Adolescents who consumed three or more meals per day were 60% less likely to be thin than those consuming two or fewer meals [AOR=0.40, 95%CI (0.18,0.91)]. The study showed that girls who had not yet started menstruation were 2.28 times more likely to be thin [AOR=2.28, 95%CI (1.28,4.06)]. Additionally, who did not experience regular menstruation had 2 times higher odds of thinness [AOR=2.04, 95%CI= (1.15,3.64)].

Perception about nutrition also influenced thinness. Adolescent girls who did not know about the importance of good nutrition were 2.79 times [AOR=2.79,95%CI (1.05,7.44)] more likely to be thin and who believed good nutrition is not important were 2 times [AOR=2.05, 95%CI (1.15,3.64)] more likely to be stunted as compared to girls who believed good nutrition is important.

Table 8: Bivariate and multivariate result of factors associated with thinness among school adolescent girls in Asella town, Oromia, Ethiopia 2025

Variables	<u>Thinness</u>		COR (95% CI)	AOR (95% CI)	P-value
	Yes(%)	No(%)			
Grade level					
5-8 grades	32(5.2)	181(29.3)	0.58(0.35-0.96)	0.68(0.40-1.15)	0.153
9-12 grades	38(6.1)	367(59.4)	1	1	
Parent relationship					
Married	41(6.7)	359(58.1)	1	1	
Divorced	18(2.9)	152(24.6)	0.39(0.17-0.91)	0.43(0.18-1.00)	0.051
Widowed	11 (1.8)	37(5.9)	0.38(0.18-0.81)	0.46(0.21-0.99)	0.050
Number of meals per day					
Two or less	51(8.2)	11(1.8)	1	1	
Three or more	19(3.1)	537(86.9)	0.39(0.17-0.83)	0.40(0.18-0.91)	0.031
Fast food consumption					
Yes	14 (2.3)	63(10.2)	0.52(0.27-0.98)	0.53(0.27-1.01)	0.056
No	56(9.1)	485(78.4)	1	1	
Home gardening					
Yes	8(1.3)	119(19.2)	1	1	
No	62 (10.1)	429(69.4)	0.46(0.21-0.99)	0.50(0.23-1.10)	0.086

Begin menstruation					
Yes	24(3.9)	479(77.5)	1	1	
No	49(7.9)	66(10.7)	2.07(1.18-3.61)	2.28(1.28-4.06)	0.005
Experience regular menstruation					
Yes	43(8.5)	417(83)	1	1	
No	37(7.3)	6(1.2)	2.16(1.22-3.82)	2.04(1.15-3.64)	0.015
Do you think good nutrition is important					
Yes	7(1.1)	189(30.6)	1	1	
I don't know	48(7.8)	326(52.7)	2.67(1.01-7.05)	2.79(1.05-7.44)	0.039
No	15(2.4)	33(5.4)	1.85(1.01-3.40)	2.05(1.10-3.81)	0.023

5.9 Qualitative findings

To support the findings from quantitative findings, focus group discussion was conducted with adolescent girls at the selected schools. Important findings were summarized, narrated and incorporated. The thematic analysis identified several key themes that helped explain the results of the quantitative study.

Theme 1: knowledge and perception about nutrition

Most participants explained that they had only limited understanding about good nutrition. Some girls mentioned that they heard the word nutrition but they did not clearly know what type of food are important for their growth.

“We learn in biology that food helps the body, but I don't know exactly which food is balanced. We just eat what is available at home.” Adolescent A, 17 years old

Some participants believed that good nutrition is mainly for children or pregnant women, and they did not think it was important for adolescents. A few girls said that they have never received any formal education on nutrition either at school or from health workers. others mentioned that parents rarely talk about nutrition at home. This lack of information supports why girls without nutrition information were more likely to be stunted and thin in the quantitative study.

“I don't really know what foods are healthy, I just eat what is there.” Adolescent B, 15 years old

Another girl added

“At home nobody talks about nutrition. We just eat what my mother prepares.” Adolescent C, 11 years old

Theme 2: Household Food Availability and Family Size

Family size played an important role in determining what and how much girls could eat. Participants from large families reported that meals were often limited and sometimes insufficient.

One girl explained:

“We are seven at home. Sometimes the food is not enough, so we all just eat a small amount.” Adolescent D, 14 years old

“When there are many people at home, sometimes we all cannot eat three meals in a day.” Adolescent E, 15 years old

some participants explained that in some families, boys and male household members were prioritized during mealtimes, leaving girls to eat last. One participant expressed this concern, stating,

“At home, we girls usually eat after the boys. Sometimes when it is my turn, the food is already small, so I just eat whatever is left.” Adolescent F, 16 years old

Girls from families with fewer members said that they had better access to food and sometimes could eat more frequently during the day. These views support the finding that adolescents from families with five or fewer members were less likely to be stunted.

Theme 3: eating habits and meal frequency

The FGD revealed irregular eating patterns among adolescents. Participants described different eating patterns. Some adolescents said that they skip breakfast, especially when they are late for school and during the fasting season.

“Sometimes I eat only lunch and dinner. In the morning I am rushing to school”
Adolescent G 18 years old

Theme 4: hygiene practices and handwashing

Although most girls were aware of the importance of hygiene especially washing hands after using the toilet, participants explained that they do not always practice it because of lack of water or soap at school.

“Our school sometimes has water, sometimes not. If there is no water, we can’t wash our hands even if we want.” *Adolescent H, 12 years old*

Some girls mentioned the soap is not always available and this makes the practice more difficult.

“Sometimes there is no soap at home, so I don’t wash my hands after using the toilet.”
Adolescent I, 14 years old

Theme 5: menstrual health challenges

Menstruation emerged as an important area influencing girls’ perception of their health. Some girls who had not yet started menstruation expressed concern about their growth.

“My friends started their period but I didn’t. I think it is because I am thin or not eating enough.” *Adolescent J, 14 years old*

Other girls who have irregular menstruation said they often feel weak or tired during the month.

“Sometimes my period does not come for months. When that happens, I feel my health is not in good condition.” *Adolescent K, 16 years old*

These narratives support the quantitative findings that girls who had not started menstruation or had irregular menstruation were more likely to be thin.

6. DISCUSSION

This study has attempted to determine the prevalence of undernutrition and its associated factors among school adolescent girls. The result of this study indicated that the prevalence of stunting and thinness were 15.5% and 11.3% respectively. The prevalence of thinness in this study was lower than that reported in India, where the rate was 49.7% (38). However, the findings were comparable to those from Abuna Gindeberet district, where stunting and thinness were reported as 15.4% and 14.2% [95% CI (11–17%)] respectively (31). Similarly, the prevalence of stunting in this study aligns with results from a school-based study conducted in Dessie town, South Wollo Zone, which reported a prevalence of 15.7% (26). The thinness rate found in this study also closely matches results from Goba town, where the prevalence was 11.9%, and is consistent with the national nutrition baseline survey report of the National Nutrition Program (NNP) of Ethiopia (13).

In contrast, the prevalence of stunting and thinness observed in this study was relatively higher than findings from a study conducted in the Amhara region where the prevalence of stunting and thinness among adolescent girls were 12.3% and 9.6% respectively (23). This difference may be due to variations in socio-economic conditions, dietary practices, environmental factors, and access to nutrition and health services between the study areas.

The prevalence of stunting found in this study was lower than results reported from Afar, northeastern Ethiopia (26.6%) and from Adama town (34.1%) (2,28). It was also lower than the prevalence of stunting documented in a community-based comparative cross-sectional study conducted in Debark, which reported a rate of 20.1% (25). Similarly, the thinness prevalence observed in this study was lower compared to studies conducted in Adwa (21.4%) and Hawzen Woreda, Tigray (32.2%) (39,40). These differences in undernutrition levels across studies could be due to differences in the study setting, socio-economic status, sampling methodology, cultural differences, geographic location, environmental conditions, study time variation and other contextual differences.

In this study, adolescents who consumed three or more meals per day were 60% less likely to be thin compared to those who ate two or fewer meals. This result is consistent with a study conducted in India which reported that adolescents consuming fewer than three meals per day had 2.28 times higher risk of being thin than their counterparts (38). A

similar association was also observed in a community based study in Damot, which showed that adolescents who ate two or fewer meals per day were 1.8 times more likely to be thin than those who consumed three meals daily(12).

The current study also revealed that poor hand washing practice was significantly associated with stunting. This finding aligns with results from a study conducted in Adama town which also demonstrated a strong link between hand hygiene and stunting(2). This may be because poor hand washing increases the exposure to disease causing bacteria and viruses leading to repeated infections and that compromise nutrient absorption and overall growth. When adolescents frequently fall ill due to hygiene related infections, their bodies struggle to use nutrients effectively, creating a cycle that exacerbates poor growth and increases vulnerability to stunting.

Nutrition information was another important factor associated with stunting. Adolescent girls who lacked information on nutrition were 1.91 times more likely to be stunted compared to those who had received such information. This result is in agreement with findings from a community-based study in the Diga district, where adolescents without access to health and nutrition information were more than three times more likely to be stunted than their informed peers (41). Having proper knowledge about food choices, meal planning, and healthy eating behaviors may empower adolescents and their families to make better nutritional decisions, thereby reducing the risk of undernutrition.

Family size also showed a significant association with stunting in this study. Adolescents from households with five or fewer members were 47% less likely to be stunted compared to those from larger families. This finding is supported by a meta-analysis that reported higher odds of adolescent stunting in households with five or more members.(36).

Similarly, a study conducted in Adwa found that girls from families with more than five members were 2.05 times more likely to be stunted than those from smaller families (39).

Larger family size may place greater pressure on household resources, leading to reduced food availability and lower dietary diversity for adolescent girls, which increases the risk of stunting. If the household income does not increase proportionally with family size, food quality and quantity decline, leading to undernutrition.

7.CONCLUSION

This study assessed the nutritional status of adolescent girls in Asella town, Oromia Region, Ethiopia, and examined factors associated with stunting and thinness using both quantitative and qualitative methods. The findings revealed that undernutrition remains a significant concern in the study area. The quantitative analysis identified predictors of adolescent undernutrition. Stunting was associated with older age, larger family size, lack of nutrition information and poor handwashing practice. Thinness, on the other hand was associated with low meal frequency, delayed or irregular menstruation and limited awareness of the importance of good nutrition.

the qualitative findings enriched the quantitative data by revealing the practical challenges faced by adolescent girls in meeting their nutritional needs, including limited access to healthy foods, irregular eating habits, low family income, inadequate hygiene facilities, and insufficient nutrition education.

The triangulation of quantitative and qualitative evidence underscores the need for comprehensive, multi-level interventions. School-based nutrition education, improved hygiene facilities, family centered awareness programs, and targeted support for younger adolescents and those from larger households are necessary to improve adolescent nutritional status. Strengthening menstrual health education and ensuring better access to adequate food are also essential components. Therefore, government bodies, families, adolescent girls and non-governmental organizations should focus on importance of frequency of meals per day and increased nutritional requirement during adolescent age to improve adolescent girls' nutritional outcome.

8. RECOMMENDATION

1. **Strengthen Nutrition Education Programs:** Schools and community health workers should provide regular, age-appropriate nutrition education to improve adolescents' understanding of healthy eating, meal frequency, and the long-term consequences of undernutrition.
2. **Promote Hygiene Practices:** Interventions that emphasize proper handwashing especially after using the toilet should be prioritized, as poor hygiene significantly increased the risk of stunting.
3. **Support Menstrual Health Education:** Programs should focus on menstrual health awareness, encouraging early detection of irregular cycles and educating girls on how menstrual patterns relate to overall health and nutrition.
4. **Encourage Adequate Meal Frequency:** Families and schools should promote the importance of eating at least three meals per day, given its strong protective effect against thinness.
5. **Engage Families and Communities:** Parents, especially in households experiencing marital disruption or economic challenges, should be involved in awareness programs to better support adolescents' nutritional needs.
6. **Integrate School-Based Interventions:** Schools can incorporate feeding programs, health clubs, and hygiene promotion activities to create an enabling environment that supports healthy growth.

9. STRENGTH OF THE STUDY

The key strength of this study is the combination of quantitative and qualitative approach allowed for a more comprehensive understanding of adolescent undernutrition. Quantitative findings identified statistically significant predictors, while qualitative data provided deeper insight into the contextual, cultural and household factors behind those associations. The other strength of this study is that adolescent nutrition is often overlooked in public health research, making this study relevant for evidence-based interventions in this age group.

10. LIMITATION OF THE STUDY

Despite its strengths, this study also had some limitations. Using a cross sectional study design is a limitation because it does not help to determine cause and effect relationship. Some variables such as meal frequency, hand washing habits and menstruation experiences were based on participants self-reports which may be influenced by social desirability bias, but during data collection adequate information given to participants about the importance and confidentiality of information to minimize the bias. Some essential dietary and physical activity patterns have not been fully captured, as the study focused on general habits rather than detailed assessments. Number of FGD participants were relatively small due to financial problem and shortage of time and may not capture all perspectives across different socio-economic background

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ANNEX, QUESTIONNAIRES

Informed consent explanation and consent for study participants

I am MPH students in the department of public health in Arsi University: I am conducting a study on undernutrition and associated factors among in school adolescent girls at selected government schools, Asella town, Oromia, Ethiopia 2025.

Purpose

This study seeks to assess undernutrition and associated factors among adolescent girls attending government schools in Asella town, Oromia, Ethiopia 2025.

Voluntarism

Participation in this study is completely voluntary, if you decide not to participate in the study, there is no penalty for such a decision. If you agree to take part in the study, you are free to withdraw from participating in the study at any time if you decide to participate you are free to decline questions that you are not comfortable with.

Risk

There is no major risk for participating in this study.

Benefits

There is no direct benefit to the school or students for participating in the study. But the result of this study will be utilized for planning in future intervention that may benefit the society as whole.

Confidentiality

The response you provide will be kept confidential. Name will not appear in the questionnaires study participant will be assigned codes. The data collected for this study is for educational purposes only; confidentiality of the response will therefore strictly adhere to.

Any question

If you have any questions regarding what I have explained to you, you are free to ask.

Consent form for study participants

I. Initials have read or been explained to what the study entails, and I have also had a chance to ask questions, and I hereby agree or do not agree to participate in the study

Part A: Socio-demographic characteristics

No	List of questions	Response	Code
1.	Age of the student	_____ years old	
2.	Grade level	_____	
3.	Religion	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. others (specific)	
4.	Ethnicity	1. Oromo 2. Amhara 3. Tigray 4. gurage 5. others specific	
5.	Living arrangement	1. with parents 2. with relatives 3. alone 4. Other (specify)	
6.	Family size	1. ≤ 5 2. >5	
7.	Parents current relationship	1. Married 2. Divorced or separated 3. Widowed	

8.	Father educational level	1. no formal education 2. primary education 3. secondary education 4. collage or above	
9.	Parental education level (mother)	1. no formal education 2. primary educations 3. secondary educations 4. college or above	
10.	Father occupation	1. farmer 2. private employee 3.government employee 4. daily laborer 5.merchant	
11.	Mother occupation	1. farmer 2.housewife 3.merchant 4.private employee 5.government employee	

Part B: dietary habits and food intake

12.	How many meals do you eat per day	1. two or less 2. three or more	
13.	How often do you eat fruits and vegetables	1. daily 2.few times a week 3. rarely	
14.	How often do you eat meat and diary products	1. daily 2. few times a week 3. rarely	
15.	Do you skip one or more meals /	1.yes	

	day	0.no	
16.	Do you consume fast food regularly?	1.yes 0. no	
17.	Do you participate in the school feeding program	1. yes 0. no	
18.	Are there any food restrictions in your household due to cultural or religious reasons	1. Yes 0. No	
19.	How is food usually shared in your family	1. Equally among all members 2. Preferentially to certain members	
20.	Do you have home gardening	1. Yes 0. no	

Part C. Environmental and sanitation factors

21.	Do you have access to clean and functional latrine in school	1.yes 0..no	
22.	Do you have toilet facility at home	1. Yes 0. No	
23.	If yes for question 21, what type of toilet is available	1. Pit latrine 2. Flush toilet 3. Ventilated improved pit latrine 4. Other (specify)	
24.	Wash your hands after toilet frequently	1. yes 0. no	
25.	Source of drinking water at home	1.tap water 2. spring / river water 3. other (specify)	
26.	Do you treat your drinking water	0.no	

	at home	1. yes	
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Part D: knowledge and attitude towards nutrition

27.	Have you received any information about nutrition	1.yes 0..no	
28.	How would you rate your knowledge about a balanced diet	1.poor 2.moderate 3.good	
29.	Do you think good nutrition is important to your health and academic performance	0.no 1. yes 2. I don't know	

Part D: health and menstrual history

30.	Have you been ill in the past 2 weeks	1.yes If yes, specify sickness _____ 0.no	
31.	Do you start menstruation	1. Yes 0.No (if the answer is no skip to question 33)	
32.	Age at menarche	1. ≤ 14 2. > 14	
33.	Do you experience regular menstruation?	1.yes 0.no	

34.	Do you participate in physical exercise or sports	1.yes 0.no	

Part E: anthropometric measurements (to be measured by the data collector)

1.	Age	-----year
2.	Height	----- cm
3.	Weight	-----kg

Focus group discussion guide

1.	What do you know about “good nutrition” or a “balanced diet”?
2.	Have you ever received advice about healthy eating or growth from teachers or health workers?
3.	How often do you wash your hands, especially after using the toilet and before eating?
4.	What helps or prevents you from washing hands regularly?
5.	How many meals do you usually eat per day? Which meal do you sometimes skip, if any, and why?
6.	How many people live in your household? How does this affect the food you eat?
7.	What makes it easy or difficult for you to eat healthy foods?
8.	How do menstruation experiences affect your daily life, including eating habits or energy levels?

የጥናት ተሳታፊ ስምምነት መግለጫ እና ጥያቄ ዝርዝር

እኔ በአርሲ ዩኒቨርሲቲ የህብረተሰብ ጤና ዲፓርትመንት የማስተርስ ተማሪ ነኝ። በአሰላ ከተማ በተመረጡ የመንግስት ትምህርት ቤቶች ውስጥ ያሉ በትምህርት ላይ የሚገኙ የወጣት ልጃገረዶች የአመጋገብ ሁኔታና የተያያዙ ምክንያቶች ላይ ጥናት እያደረግኩ ነው።

ዓላማ

ይህ ጥናት በአሰላ ከተማ በተመረጡ የመንግስት ትምህርት ቤቶች ውስጥ ያሉ በትምህርት ላይ የሚገኙ የወጣት ልጃገረዶች የአመጋገብ ሁኔታና የተያያዙ ምክንያቶችን ለማጥናት ነው።

ፍቃደኝነት

በዚህ ጥናት ላይ መሳተፍ በፍቃደኝነት ላይ የተመሰረተ ነው። መሳተፍ ካልፈለጉ ምንም ቅጣት የለውም። መሳተፍ ከመጀመሩ በኋላ በማንኛውም ጊዜ መተው ይችላሉ። ላልፈለጉት ጥያቄ መልስ አለመስጠት ይችላሉ።

አደጋ

በዚህ ጥናት በመሳተፍ የሚደርስ ምንም አደጋ አይኖርም

ጥቅም

በጥናቱ መሳተፍ ለእርስዎ ወይም ለትምህርት ቤቱ ቀጥተኛ ጥቅም አይኖረውም። ነገር ግን የጥናቱ ውጤት ወደፊት ለማሻሻል ለሚደረግ እቅድ ግብአት ለማዘጋጀት ጠቃሚ ይሆናል።

ሚስጥራዊነት

የምትሰጡት መልስ በሙሉ በሚስጥራዊነት ይቀመጣል። ስምዎ በጥናቱ ሰነድ ላይ አይገለጥም፤ ተሳታፊዎችም በቁጥር ብቻ ይቀመጣሉ። የተሰበሰበው መረጃ ለትምህርት ዓላማ ብቻ ነው፤ ሚስጥራዊነቱም ይጠበቃል።

ማንኛውም ጥያቄ

ከላይ በተገለፀው ጉዳይ ጥያቄ ካለዎት መጠየቅ ይችላሉ።

የፍቃድ መረጃ

እኔ ከጥናቱ ጋር በተያያዘ ያነበብኩትን/የተገለፀኝን ተረድቻለሁ፤ ጥያቄዎችን የመጠየቅ ዕድል አግኝቻለሁ። በፍቃዴ ለመሳተፍ ወስኛለሁ።

የጥናቱ ጥያቄ ዝርዝር

ክፍል 1: ማህበራዊ መረጃ

ተ.ቁ	የጥያቄው አይነት	ምላሽ	ኮድ
1.	የተማሪው እድሜ	----- አመት	
2.	የክፍል ደረጃ	-----	
3.	ሀይማኖት	1. ኦርቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ (ይግለፁ)	
4.	ብሄር	1. አማራ 2. ኦሮሞ 3. ትግሬ 4. ጉራጌ 5. ሌላ (ይግለፁ)	
5.	የመኖሪያ ሁኔታ	1. ከወላጆች ጋር	

		2. ከዘመድ ጋር 3. ለብቻ 4. ሌላ (ይግለፅ)	
6.	የቤተሰብ መጠን	1. ከ 5 በታች 2. ከ 5 በላይ	
7.	የወላጅ የጋብቻ ሁኔታ	1. ተጋብተዋል 2. ተለያይተዋል 3. አባት/እናት በህይወት የሉም	
8.	የአባት የትምህርት ደረጃ	1. ትምህርት አልተማረም 2. መጀመሪያ ደረጃ 3. ሁለተኛ ደረጃ 4. ኮሌጅ ወይም ከዚያ በላይ	
9.	የእናት የትምህርት ደረጃ	1. ትምህርት አልተማረም 2. መጀመሪያ ደረጃ 3. ሁለተኛ ደረጃ 4. ኮሌጅ ወይም ከዚያ በላይ	
10.	የአባት ስራ	1. ገበሬ 2. የግል ሰራተኛ 3. የመንግስት ሰራተኛ 4. ቀን ሰራተኛ 5. ነጋዴ	
11.	የእናት ስራ	1. ገበሬ 2. የቤት እመቤት 3. ነጋዴ 4. የግል ሰራተኛ 5. የመንግስት ሰራተኛ	

ክፍል 2: የአመጋገብ ልምድ

12.	በቀን ስንቴ ምግብ ትበያለሽ	1. ሁለት ወይም ከዛ በታች 2. ሶስት ወይም ከዛ በላይ	
13.	ፍራፍሬ እና አትክልት በስንት ጊዜ ትበያለሽ	1. በየቀኑ 2. በሳምንት ጥቂት ጊዜ 3. አልፎ አልፎ	
14.	ስጋ እና የወተት ተዋፅኦ በስንት ጊዜ ትበያለሽ	1. በየቀኑ 2. በሳምንት ጥቂት ጊዜ 3. አልፎ አልፎ	
15.	በቀን ውስጥ ምግብ ትዘያለሽ	1. አዎ አይ	
16.	በየጊዜው ጣፋጭ ወይም የታሽጉ ምግቦችን ትበያለሽ	1. አዎ 0. አይ	
17.	በትምህርት ቤት የምገባ ፕሮግራም ትሳተፈያለሽ	1. አዎ 0. አይ	
18.	በቤተሰብ ውስጥ በባህል ወይም በሀይማኖት ምክንያት የሚከለከሉ የምግብ አይነቶች አሉ	1. አዎ 0. አይ	
19.	በቤተሰብ ውስጥ ምግብ እንዴት ይከፋፈላል	1. ለሁሉም የቤተሰብ አባል እኩል 2. በተለያዩ መጠን	
20.	በመኖሪያ ጊቢ ውስጥ የአትክልት ቦታ አለ	1. አዎ 0. አይ	

ክፍል 3: የአካባቢ እና ንጹህና ሁኔታዎች

21.	በትምህርት ቤት ውስጥ ንጹህና በተሟላ ሁኔታ የሚሰራ መፀዳጃ ቤት አለ	1. አዎ 0. አይ	
22.	በመኖሪያ ቤትሽ ውስጥ መፀዳጃ ቤት አለ	1. አዎ	

		0. አይ	
23.	የመፀዳጃ ቤት አይነት	1. ጉድጓድ ሽንት ቤት 2. የውሀ መታጠቢያ ሽንት ቤት 3. ሌላ	
24.	ከመጻዳጃ ቤት በኋላ እጅሽን ትታጠቢያለሽ	1. አዎ 0. አይ	
25.	የምትጠጫው ውሃ ምን አይነት ነው	1. የቧንቧ 2. የምንጭ/የወንዝ ውሃ 3. ሌላ (ይግለፁ)	
26.	በቤት ውስጥ የምትጠጡትን ውሀ ታክሙታላችሁ	1. አዎ 0. አይ	

ክፍል 4: የምግብ እውቀት እና አመለካከት

27.	በትምህርት ቤት ስለ ምግብ ትምህርት ተቀብላላችሁ	1. አዎ 0. አይ	
28.	ስለ የተመጣጠነ ምግብ እውቀት ምን ያህል ነው	1. ዝቅተኛ 2. መካከለኛ 3. ጥሩ	
29.	ጥሩ ምግብ ለጤናሽ እና ለትምህርት አፈጻጸም አስፈላጊ ነው ትያላሽ	1. አዎ 0. አይ	

ክፍል 4: የጤና እና የወር አበባ ታሪክ

30.	ባለፈው 2 ሳምንት የጤና ችግሮች አጋጥሞሽ ያውቃል	1. አዎ 0. አይ	
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31.	የወር አበባ ማየት ጀምረሃል?	1. አዎ 0. አይ (መልሱ አይ ከሆነ ወደ ጥያቄ 34 እለፍ)	
32.	የወር አበባ ማየት የጀመርሽበት እድሜ	1. ≤ 14 2. > 14	
33.	የወር አበባሽ መደበኛ ነው	1. አዎ 0. አይ	
34.	በአካላዊ እንቅስቃሴ ወይም በስፖርት ትሳተፈሃለሽ	1. አዎ 0. አይ	

ክፍል 5: መለኪያ (በአጥኚው የሚሞላ)

1.	እድሜ	----- አመት
2.	ቁመት	----- ሴንቲ ሜትር
3.	ክብደት	----- ኪሎ ግራም

የቡድን ውይይት መመሪያ

1.	ጤናማ ምግብ ወይም “ጤናማ አመጋገብ” ስለሚባለው ምን ታውቃለችሁ?
2.	ከመምህራን ወይም ከጤና ሰራተኞች ስለ ጤናማ አመጋገብ ምን መረጃ አግኝታቸዋል?
3.	መፀዳጃ ቤት ከተቀመጥሽ በኋላ ወይም ምግብ ከመብላት በፊት እጅሽን በምን ያህል ትታጠባለሽ?
4.	እጅ በተደጋጋሚ እንዲታጠብ የሚረዳሽ ወይም የሚከለክልሽ ምን ነው?
5.	ብዙውን ጊዜ በቀን ስንት ጊዜ ምግብ ትበላለሽ? የምትዘይው ምግብ ካለ ለምን ነው?
6.	በቤትዎ ውስጥ ስንት ሰዎች ይኖራሉ? ይህ በምትበላው ምግብ ላይ እንዴት አስተዋፅኦ ያደርጋል?
7.	ጤናማ ምግብ ለመብላት ለአንቺ ቀላል የሚያደርግልሽ ወይም ከባድ የሚያደርግብሽ ነገር ምንድን ነው?
8.	የወር አበባ በዕለታዊ ሕይወትሽ ላይ በተለይም በአመጋገብ ልምድሽመብላት ላይ ምን ተፅዕኖ

	ያሳድርብኛል?
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Ibsa waliigaltee hirmaattota barattootaa fi gaaffii.

Ani barattuu fayyaa barnoota maastarsii kutaa hawaasaa yunivarsiitii ARSI ti. Manneen barnootaa mootummaa magaalaa asallaa keessatti argaman keessatti akkaataa soorataa barattota shamarranii fi wantoota kanaan walqabatan irraatti qorannoo taasisaan jira.

Dhimma

Qorannoon kun haala soorataa barattoota shamarrani manneen barnootaa mootummaa bulchiinsa magaalaa asallaa keessatti argaman qorachuuf kan qophaa'edha.

tola ooltummaa.

Qorannoon kana irratti hirmaachuun tola ooltummaa irratti hundaa'a. Yoo hirmaachuu hin barbaanne adabbiin hin jiru. Erga hirmaattanin booda yeroo barbaaddanittii dhiisuu ni dandeessu. Gaaffii tokkoof deebii kennuu baachus ni dandeessu.

Balaa

Qorannoon kun irratti hirmaachuun balaan hin jiru.

Faayidaalee

Qorannicha irratti hirmaachuun faayidaa kallattiin siif ykn mana barumsichaaf kennu hin qabu. Haa ta’u malee, maxxansaa qorannichaa qopheessuuf gargaara.

Iccitii.

deebin isin kennitan hundi iccitii ta’ee eegama. Maqaan kessan sanada qorannoo keessatti hin mul’atu, hirmaattonni immoo lakkoofsa qofaan argamu. Odeeffannoon walitti qabame kaayyoo barnootaa qofafi fi iccitii isaa kan eegameedha.

Gaaffii

Gaaffii armaan olii yoo qabaattan gaafachu dandeessu.

Odeeffannoo hayyamaa.

Qorannichaan walqabatee waanan dubbise hubadheera, gaaffii gaafachuufis carraa argadheera. Hayyama kiyyan irratti hirmaachuuf murteesseen jira.

Gaaffiiwwan qorannoo

kutaa 1: odeeffannoowan wali-galaa

Lakk.	Akaakuu gaaffiii -----	deebii	koodii
1.	Umrii barataa	-----	
2.	Sadarkaa barnootaa	-----	
3.	amantaa	1. Ortodoksii 2. musliima 3. protesantaantii 4. kaatolikii 5. kan biroo	
4.	saba	1. amaaraa 2. oromoo	

		3. tigrée 4. guraagee 5. kan biroo	
5.	Akkaataa jireenyaa	1. maatii waliin 2. fira waliin 3. adda 4. kan biroo	
6.	Lakkoofsa maatii	1. ከ 5 gadi 2. ከ 5 oli	
7.	Haala maatii	1. Cidha qabna 2. Addaan baane 3. Haadha fi abban lubbuun hin jiran	
8.	Sadarkaa barumsa abbaa	2. Hin baranne 3. 1-8 4. Kutaa 12 5. Kollejji ykn sanaa ol	
9.	Sadarkaa barumsa haadhaa	2. Hin baranne 3. 1-8 4. Kutaa 12 5. Kollejji ykn sanaa ol	
10.	Hojii abbaa	1. Qonnaan bulaa 2. Hojii dhuunfaa 3. Hojii mootumma 4. Hojjetaa guyyaa 5. daldalaa	
11.	Hojii haadha	1. Qonnan bulaa 2. Haadha manaa 3. daldaltuu 4. hojii dhuunfaa	

		5. hojii mootummaa	
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kutaa 2: akkaataa nyaataa

12.	Guyyatti yeroo meeqa nyaata nyaatta	1. tokko- lama 2. sadii ol	
13.	Kuduraa fi muduraa yeroo meeqa nyaatta	1. Guyyaa guyyaan 2. Torbanitti yeroo tokko 3. Darbee darbee	
14.	Fooni fi annan kkf yeroo meeqan nyaatta	1. Guyyaa guyyaan 2. Torbanitti yeroo tokko 3. Darbee darbee	
15.	Nyaata irra ni darbitaa	1.eeyyee 0. lakki	
16.	Nyaataa mi'aawaa dhugaatii lallaafaa ni fayyadamtaa	1. eeyyee 0. lakki	
17.	Nyaata mana barumsatti kennamu irratti ni hirmaattaa	1. eeyyee 0. lakki	
18.	Maatii keessatti nyaanni aadaa ykn fedhidhaan qoodamu jiraa	1.eeyyee 0.lakki	
19.	Maatii keessatti nyaanni akkamitti qoodama	1.Maatii guutuuf wal-qixa 2.Graa-garummdhan	
20.	Mana keessan kessati iddoon kuduraa fi muduraa itti biqilchitan ni jiraa	1. Eeyyee 0.lakki	

kutaa 3:

21.	Mana barumsaa keessan kessan manni fincaani wanta hunda guttate ni jiraa	1.eeyyee 0. lakki	
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22.	Mana kee kessatti manni fincaani jiraa	1.eeyyee 0.lakki	
23.	Akaakuu mana fincaanii	1. mana fincaanii Boolean 2. mana fincaanii bishaanii ittin dhiqatan qabu 3. kan biraa	
24.	Erga mana fincaaniti deebita harka ni dhiqattaa	1.eeyyee 0.lakki	
25.	Bishaan ati dhugdu	1.Birkaa 2.Burqaa/laga irraa 3.Kan biroo	
26.	Mana kessatti itti fayadamtan bishaan qulqulludhaa	1.eeyyee 0. lakki	

kutaa 4: beekumsa nyaata madaalawaa

27.	Mana barumsatti waa'ee nyaataa barattee jirtaa	1.eeyyee 0.lakki	
28.	Waa'ee nyaataa madaalawaa hamam beekta	2.gadii 3.Jiddu-galeessa 4.gaarii	
29.	Nyaanni gaarin barumsaa fi fayyaadhaf gaaridhaa	1.eeyyee 0. lakki	

kutaa 5: fayyaa fi waa'ee marsaa xurii laguu

30.	Turban 2 darbee kessatti dhukubsatanii jirtu	1.eeyyee 0. lakki	
31.	Laguu arguu eeegaltee?	1.eeyyee 0. eeyyee (eyyeen tanan lakk 34 darbii)	

32.	Yeroon marsaa laguu ilaaluu eegalte	3. ≤ 14 4. > 14	
33.	Marsaan laguu sirriidhaa	6. eeyyee 0. lakki	
34.	Spoortii nan hojjadha	0. eeyyee 0. lakki	

kutaa 6: safartuu (kan guutamu)

1.	Umrii	-----
1.	dheerina	----- cm
2.	ulfaatina	----- kg

Gaaffii qorannoo kanaaf oolu .

1.	Waa'ee nyaataa madaalawa wanti beektu maali?
2.	Kanan dura waa'ee nyaata madalawaa barsiisaa irraa yookin ogeessa fayyaa irraa gorsa argatte beektaa?
3.	Nyaataan dura kessaattu mana fincaanii erga senten booda yeroo hunda harka kee ni dhiqatta?
4.	Yeroo hunda harka kee akka dhiqanne kan si dhorkuu maali?
5.	Guyyatti yeroo meeqa nyaata nyaata? Ganama guyyaa moo galgala irra darbita yoo jiraate. Maalif?
6.	Mana kessan kessatti nama meeqatu jiraata? Innis hangam nyaata kessan miidha
7.	Nyaata madaalawa akka hin nyaanne yeroo hunda kan si godhu maali?

Declaration of Advisors

We, the undersigned, hereby declare that we have carefully reviewed this thesis paper and provided guidance for its preparation. We confirm that this thesis paper is ready for defense with our approval as the university advisor(s), and to the best of our knowledge, the work presented meets the academic standards and is in partial fulfillment of the requirements for the degree of Master of Public Health in General Public Health.

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Date: 01/04/2018 EC

2. Name of Co-Advisor: Gebi Agero

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Date: 10/12/2025