



PREVALENCE OF ANEMIA AND ASSOCIATED FACTORS AMONG
SECONDARY SCHOOL ADOLESCENT GIRLS IN JIMMA TOWN,
OROMIA REGIONAL STATE, SOUTH WEST, ETHIOPIA, 2019.

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ABSTRACT

Background: *Anemia defined as a low blood hemoglobin concentration, has been shown to be a public health importance. Adolescence age group is the most neglected in public health and nutrition research as priorities are usually given to pregnant women, lactating mothers and their children less than 2 years. Current Ethiopian Food and Nutrition policy included adolescent girls in most at risk group for nutritional demands; however, only few studies have assessed deficiency of anemia and associated factors to tackle intergenerational cycle of malnutrition.*

Objectives: *To assess prevalence of anemia and associated factors among high school adolescent girls in Jimma town.*

Methods: *School based cross sectional study design was conducted among randomly selected 551 high school adolescent girls in Jimma town from December 10, 2018 to February 1, 2019, south west Ethiopia. Structured and pretested questionnaires were used to collect the data. Multi stage sampling was used to select the study participants. Data were entered into Epi-Data version 3.1 and exported to SPSS version 20 for further analysis. On Bivariate analysis $p \leq 0.25$ was considered as candidate for multivariable logistic regression. Multi variable logistic regression was done to control for confounders and to identify factors independently associated with anemia. Level of statistical significance was declared at $P < 0.05$*

Results: *A total of 528 adolescent girls were included in the study yielding a response rate of 95.8%. The prevalence of anemia was found to be 26.7%, 95% CI (22.7, 30.5). In multi-variable logistic regression analysis live separate from their family AOR=4.430 95%CI (2.204,8.904), dietary diversity score AOR=3.56895%CI(1.884,6.755) menstrual bleeding more than 5 days AOR=2.25, 95%CI (1.173,4.334) and low economic status AOR =2.162 95% CI (1.173,4.334) were positively associated factor with anemia and only having at least a secondary school in mother's educational status AOR =0.428 95%CI (0.188,0.975) was negatively associated with anemia in the study area.*

Conclusion: *Prevalence of anemia among school adolescents was moderate public health problem according to world health organization prevalence estimation of anemia. Mother educational status, living condition of the adolescent girls, dietary diversity score, duration of menses and low economic status were independent predictors of anemia. Therefore, iron rich and diversified food consumptions should be given attention.*

Key words: *Anemia, Adolescent girls, high school, Jimma*

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Acronyms and abbreviations

AOR	Adjusted Odds Ratio
BAZ	Body mass index for Age Z score
BMI	Body Mass Index
BSc	Bachelor of science
CI	Confidence Interval
COR	Crude Odds Ratio
CSA	Central Statistics Authority
DALYs	Disability Adjusted life Years
DDs	Dietary Diversity score
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization
Hb	Hemoglobin
IDA	Iron Deficiency Anemia
LMICs	Low and Middle Income Countries
MMR	Maternal Mortality Rate
MOH	Ministry of Health
NCHS	National Center for Health Statistics
OR	Odds Ratio
PCA	Principal Component Analysis
SD	Standard Deviation
SPSS	Statistical Package For Social Science
UNICEF	United Nations International Children Emergency Fund
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Adolescents are young people between the ages of 10 and 19 years (1). More than 1.2 billion adolescents are found in the world. The vast majority of adolescents (90%) live in low- or middle-income countries (LMICs) (2). In some countries, as many as half of all adolescents are stunted for their physical growth and their cognitive development has been restricted because of inadequate nutrition including iron (3). Adolescent and children constitutes about 48% of Ethiopian population and about 25% of this age group is girls (4). It is a period of rapid growth when up to 45% of skeletal growth takes place and 15 to 25% of adult height is achieved during this period (5). During the growth spurt of adolescence, up to 37% of total bone mass may be accumulated. Although, nutrition influences growth and development throughout infancy, childhood and adolescence evidences show that nutrient needs including that of iron are the greatest during the period of adolescence (5).

Iron is one of the most important micronutrients and plays an important role in human biology forming complexes with molecular oxygen in hemoglobin. Iron is present in all the cells in the human body and has several vital functions and decrease in iron may lead to anemia. Anemia, defined as a low blood hemoglobin concentration, has been shown to be a public health problem that affects LMICs and has significant adverse health consequences including morbidity and mortality, as well as adverse impacts on social and economic development (6).

Iron deficiency is the most prevalent nutritional deficiency and the most common cause of anemia in the world. It is characterized by a defect in hemoglobin synthesis, resulting in red blood cells that are abnormally small (microcytic) and contain a decreased amount of hemoglobin (hypochromic). The capacity of the blood to deliver oxygen to body cells and tissues is thus reduced. Asia and Africa are regions with higher prevalence of anemia. Nutritional deficiencies are regarded as the most important cause of anemia in the world and a major potential contributor to adolescent anemia in sub-Saharan Africa (7).

The principal determinant cause of iron deficiency anemia are the low bioavailability of dietary iron at all ages, and that intestinal helminthes were also a major factor, particularly among school-age children and adolescents (8). Hemoglobin level is known to vary naturally by age, sex, elevation and smoking status, as well as physiologic status (e.g. pregnancy). Measurement of hemoglobin or hematocrit is the most cost efficient and commonly used method to screen for anemia. Determining the concentration of hemoglobin, an iron-containing protein, in red blood cells is a more sensitive and direct indicator of anemia than hematocrit (percentage of red blood cells in whole blood) (9).

WHO defines anemia as a condition in which hemoglobin (Hg) content of blood is lower than normal as a result of deficiency of one or more essential nutrients. Based on WHO 2011, If the hemoglobin level is ≥ 12 g/dl is no anemic for males and females of age between 12-14 years and for non-pregnant women >15 years. Anemia is established if the level of hemoglobin is < 12 g/dl for non-pregnant women >15 years and children 12-14 years old and 11-11.9g/dl, 8-10.9g/dl and 8 mg/dl were consider as mild, moderate and severe anemia respectively (10). Classification of anemia as problem of public health importance generally classified as; prevalence of anemia ≤ 4.9 is no public health problem, 5.0-19.9 mild public health problem, 20.0-39.9 moderate public health problem and ≥ 40 severe health problem (11).

Among adolescent segment of population, the female once are the most vulnerable to develop anemia especially, after menarche, iron needs continue to remain high because of menstrual blood loss which averages about 20 mg of iron per month, but may be as high as 58 mg in some individuals . The overall iron requirements increase from a preadolescent level of ~ 0.7 – 0.9 mg Fe/d to as much as 2.2 mg Fe/d or perhaps more in heavily menstruating young women (1,12).

1.2. Statement of the problem

Anemia is common global public health problem affecting people of all age group. More than 1.6 billion people, which are almost a quarter of the world's population, are anemic. Adolescent girls are particularly vulnerable to iron deficiency anemia due to physiological changes with the onset of menstruation. Iron loss from menstruation must be countered by further high iron intake for young women (7).

The WHO estimates the prevalence of anemia among adolescent girls in southwest Asia countries like Indonesia, Nepal and Bhutan were 30%, 46%, and 58.6%, respectively (13). Similarly, in sub-Saharan Africa about half of adolescent girls are anemic (6). In Ethiopia there is a limited study on this segment of population but a few studies tried to reveal the magnitude of anemia like, a study conducted in Babile, Eastern Ethiopia was 32% and this study was conclude nutritional status of adolescent girls contributes to the nutritional status of the community (14). Another study conducted in Afar region, Ethiopia shows that the prevalence of anemia among school going adolescent girls was 22.9% and it was a moderate public health problem (15).

Globally prevalence of anemia had shown dramatically increment among women of non-pregnant reproductive age groups from 464 million in 2000 to 578 million in 2016. A condition is persists as a moderate to severe health problem in LMICs which was reported the overall prevalence of anemia was over 35%. So, there is still a long road ahead to achieve the SDG 2030 targets anemia in adolescent girls. In Ethiopia eighteen percent (17.7%) non pregnant women age 15 to 49 are anemic, of which Somali regional state was the highest prevalence of anemia 34.8% followed by Gambella region 26.7% and 19 % of reproductive age non pregnant women were anemic in Oromia regional state (16,17)

The associated factors of anemia among adolescent girls differ from study to study and they include, low dietary diversity score, living status of adolescents with either of the two parents, duration of menstruation, history of parasitic infestation, low socio economic status, household family size, inadequacy of dietary iron intake, drinking tea immediately after meal, high consumption of whole wheat bread, and low consumption of vitamin C rich foods and molasses, parent's level of education, parasite infections, low BMI, being stunted, underweight (18–21).

The risk of anemia increases during adolescent years with the onset of menstruation and pregnancy. Iron loss from menstruation must be countered by further high iron intake for young women; the other is ever-increasing evidence that control of anemia in pregnant women may be more easily achieved if satisfactory iron status can be ensured during adolescence (7,12). Most of the previous studies on anemia in Ethiopia were conducted on pregnant and lactating women and children. A few studies assessed anemia and its predictors among adolescent girls in the country. Some of the reasons why there are few studies done in this age groups are, they are assumed as are less vulnerable to nutritional deficiency than the other groups which is apparently not true, given the fact that adolescence exert significantly increased demands on both micro-and macronutrients due to the rapid changes occurring in physical as well as in body composition particularly among ladies experiencing their menarche. So, the aim of this study was to assess the prevalence and factors associated with anemia among school adolescent girls in Jimma town secondary schools.

2. LITERATURE REVIEW

2.1. Prevalence of anemia among adolescent girls

A cross sectional school survey conducted in Sir Lankan shows the overall prevalence of anemia, severe anemia among school female adolescents was 11.1% and 0.54% respectively (22). Another research conducted in Nepal showed that the prevalence of anemia among school adolescent girls was 42.5%, among these 38.1% of them were moderate anemia and 4.4% of them were severe anemia (23). According to a cross sectional study conducted on prevalence of anemia in selected schools Perambalur town, south India revealed that the overall prevalence of anemia was 41.1% (95% CI: 36, 46) with that of 37% and 4.1% mild and moderate anemia respectively and no one was reported as severe anemia (24).

In the same way across sectional study conducted among adolescent girls in central Kerala, India showed that the prevalence of anemia was 21%, which was much lower than the overall estimated prevalence of anemia in India adolescent girls which was 56%. Another cross sectional study conducted in Chennai, Nadu, India revealed 78.75% females were anemic with varying degrees ranging from mild, moderate and severe which were 37.5%, 35% and 6% respectively. The prevalence was higher in public schools (43.75%) than in private schools (25). Similar study conducted among adolescent girls the prevalence of anemia, the overall prevalence of anemia was 39% with that of 27.9%, 10.6% and 0.5% mild, moderate and severe anemia respectively (26).

An interventional study conducted in Amravati city, India showed that the overall prevalence of anemia found to be 55%. Mean and standard deviation of Hb in adolescents was significantly increased from 10.57(\pm 1.09) to 11.78(\pm 0.99) after intervention. The risk factors for anemia were low economic status, onset of menarche, family size and vegetarian diet (27).

A study conducted among school adolescent girls in Bangladesh was revealed that the overall prevalence of anemia was 51.6% among this 46%, 5.4% and 0.2 were mild, moderate and severe anemia respectively. However, mild anemic were comparatively higher among younger adolescents (48.3% Vs 43.8) and in contrast moderate anemia were higher in late adolescents (6.1% Vs 4.6%) (28). On the other hand a study conducted in Turkey on adolescents revealed that 8.3% girls were anaemic(29).

A research done in urban slum of Kanpur, Uttar Pradesh India revealed that the overall prevalence of anemia among adolescent girls was found to be 78.5%, of which 40% had mild,

33% had moderate, and 5.5% had severe anemia(30). Another study done in four populous villages namely, Bhajanpuri, Pachokara , Mau & Sirsa of district Amroha,Uttar Pradesh, India was also revealed that about 69.2% of adolescent girls were anemic(31).

A study conducted in Labore, Pakistan, on prevalence of anemia and dietary iron intake among female adolescents was revealed that the overall prevalence of anemia 43%, 24%, and 28% was found among the study subjects severe, moderate and mild anemia respectively. Hemoglobin level varied from less than 8 mg/dl to more than 12 mg/dl (32).

A cross sectional study conducted in west Nigeria revealed that the prevalence of anemia was 47.5% (33). Another study conducted in Kenya shows the mean Hb (\pm SD) of the respondents was 12.3 (\pm 2.19) with a range from 6.3 to 15.4g/dl and 26.5% girls were anaemic, of which 65.6% had mild anemia, 27.9% were moderately anaemic, and 6.5% were severely anaemic (21)

An institutional based cross sectional study conducted in Berhale district Afar region, north east Ethiopia revealed that the overall prevalence of anemia among female school going adolescents was 22.8%. Anemia among school going female adolescents was moderate public health problem and low socio economic status, low consumption of egg, meat and other vegetables and high consumption of milk were the significant causes for anemia(15). A study done in Dembia district, North west Ethiopia, among adolescent school girls revealed that the overall prevalence of anemia was 25.5%, out of the total anemic adolescents 92.4%, 5.9% and 1.7% were mild, moderate and severe anemia respectively (34).

Another cross sectional study conducted in Somali region, eastern Ethiopia revealed that the overall prevalence of anemia among school age children were 23.66%. The vast majority (73.81%) of the anemic children had mild anemia. Moderate and severe anemia accounted for 25% and 1.19% of the anemic children, respectively(19).Another study conducted in Mekelle, northern, Ethiopia to identify risk factors for intestinal parasitosis, anemia and malnutrition shows the prevalence -of parasitic infections 72%, anemia 11%, stunting 35%, and thinness 34%, (18).

A school based cross sectional study conducted in Bahirdar, Ethiopia, on school adolescent girls to assess the magnitude of anemia and associated factors was revealed that the overall prevalence of anemia was 11.1% of which 97.8% of them had mild anemia (35). A cross sectional study conducted among school adolescent girls in Kebena district Guraga zone south west, Ethiopia revealed that the overall prevalence of anemia was 12 % with that of 0.9% and 11.1% moderate and mild anemia respectively (36).

Across sectional household survey to determine the prevalence and severity of anemia among school children in Jimma town, south west, Ethiopia revealed that the overall prevalence of anemia was 37.6% out of which, 18.1% had mild while 19.6% of them had moderate anemia. The prevalence of anemia among the age group of 6–11 years was 40.5% while the prevalence among the group of 12–14 years old children was 30.1% (37).

2.2. Factors associated with Occurrence of Anemia

2.2.1. Socio economic variables

A study conducted in Chennai, Tamil, India revealed that a significant association ($p < 0.05$) of anemia is with type of family, socioeconomic status and diet (38). Father educational status was significantly associated with anemia among school adolescent girls conducted In Nepal (23). In the same way across sectional study conducted in Bangladesh among adolescent girls to assess the prevalence of anemia, house hold with low quintile was a predictor variable to develop anemia (28). Another study conducted in Tangail, Bangladesh on adolescent school girls to determine the prevalence of anemia and risk factors was revealed that the overall prevalence of anemia was 17.5% of which 0.8% severe, 5.8% moderate and 10.9% were mild anemia. Adolescent girls whose family income less than 6000 TK was risk factor to develop anemia (39).

A research done in urban slum of Kanpur, Uttar Pradesh India was revealed that the risk factors to develop anemia among adolescents girl were whose mothers either illiterate or having only primary education and those belonging to lower socio economic status(30) . A similar school based cross sectional study done in four populous villages of India, identified that anemia was significantly association of anemia was found among those belonging to the low economic classes, increased family size, father and mother level of education (31)

A study conducted in Kenya showed factors that were independent significant predictors associated with anemia among adolescent girls aged between 17-19 years were 3 times more likely to develop anemia. But, the risk of anemia was reduced by 78.6% among participants whose father had at least a primary level of education and by 67.4% among participants whose fathers had at least post-secondary level of education (21).

Another study conducted in Filtu town, Somali region, south east Ethiopia, revealed that factors that were independently significant predictors were monthly house hold income <500 Ethiopian birr were 9.44 times higher than among children whose families monthly income > 2000 Ethiopian Birr (19). A similar study conducted in Bahirdar, north west Ethiopia in order to assess the prevalence of anemia and associated factors was revealed that a predictor variables that affect anemia are house hold family size >5 were 3 times more likely to develop anemia compared to those who has house hold family size <5, average monthly income less than 500 ETB 10 times is more likely to be anemic compared to those of average household family income 501-1000 ETB. (35) .A study conducted in Tigray, northern Ethiopia father educational status were associated with anemia(40).

2.2.2. Dietary related factors

A study conducted in Nepal was revealed that consumption of green vegetables were the predictor variable to develop anemia (23). A research done in Tang ail, Bangladesh on adolescent girls to determine the prevalence of anemia and risk factors was revealed that among the predictor variables BMI for age as strongly associated with anemia (28).

Another research conducted among adolescents in Nepal, Terai the overall prevalence of anemia among adolescent girls was 38% and among the predictors of anemia an individual who consumed more than four food groups was protective (41). A study conducted in Nigeria, on low dietary diversity score are predisposed to iron deficiency anemia, among the independent variables which affect anemia among Adolescent School girls were girls with low DDS were at significantly higher risk (33).

Considering study conducted in Kenya, levels of anemia depends on the individuals' daily dietary intake. The intake of heme versus none-heme iron was likely to be 10.7% and 74.7% respectively adequate. Extent of inadequacy was likely to be 100% for both heme and non-heme iron. The participant who had inadequate daily dietary iron intake was 10 times more likely to develop anemia as compared to respondents who had adequate daily iron intake (21).

A significant association has been reported in a study conducted in Afar region, North East Ethiopia, between “low frequency of meat, vegetables, egg, fruits and highly frequent consumption of milk to anemia. Adolescents who do not consuming/ week of meat, egg, vegetable and fruits were more likely anemic than consuming greater/equals three times /week (15).

A cross sectional study conducted on three districts in Ethiopia known as Debrelibanose, Damotegale and Laygayint revealed that the overall prevalence of anemia ranges from 24 to 38% with average 29%. Less than half of the girls heard the term of anemia and the risk of anemia were early adolescent, adolescent girls lived in moderately food insecure households, but knowing the term anemia was found to be protective against the risk of anemia (42).

Study done in Dembia district north west Ethiopia, in order to identify the prevalence and associated factors among Adolescent School girls, the independent factors associated with anemia were dietary diversity score , house hold food security status , living status of adolescents with either of the two parents and guardians (34). Across sectional study conducted in Jimma town on nutritional iron deficiency anemia; and its predictors among school age children between 6-12 years showed, all of the children consume grain foods at least once per week. Majority (71%) of the children had a low dietary diversity score and the remaining (29%) had a high dietary diversity score. The mean weight and height of the children were 27.3 kg and 131cm, respectively. Thinness and severe thinness were recorded in 57 (9.7%) and 50 (8.5%) of the children respectively. Not-consuming protein source foods, not-consuming dairy products not-consuming discretionary calories, low family income and intestinal parasitic infections were identified as independent risk factors of IDA (37).

2.2.3. Anthropometric and health related factors

A school based cross sectional study conducted in India among 340 adolescent girls in order to assess the prevalence and associated factors of anemia was revealed that the independent factors associated with anemia was history of excessive menstrual bleeding and vegetarian diet (26). Another study conducted in central Kerala, India also revealed that the associated factors of anemia among female adolescents were, number of pads use per day during menstruation and worm infestation (25). Study conducted in Tangail, Bangladesh the risk factors to develop anemia among adolescent girls was menstrual flow is greater than five days (39).

Another study conducted in Kenya revealed that factors that were independent significant predictors are inadequate iron intake, Presence of malaria parasitemia and worm infestation (21). A local study conducted in Filtu town, Somali eastern Ethiopia was revealed that the factors which affect the occurrence of anemia among adolescent girls were being stunted, underweight and parasitic infestation (19). Another study conducted in Bahirdar, northern Ethiopia was revealed that among the predictor variables history of intestinal parasite, adolescent girls experienced menstrual flow > 5 days per each cycle and BMI for age were independent predictors to develop anemia among adolescent girls(35). A study done in Mekelle, northern Ethiopia also revealed that among the predictor variables parasitic infestation was associated with anemia among adolescent girls (18).

2.3. Conceptual frame work

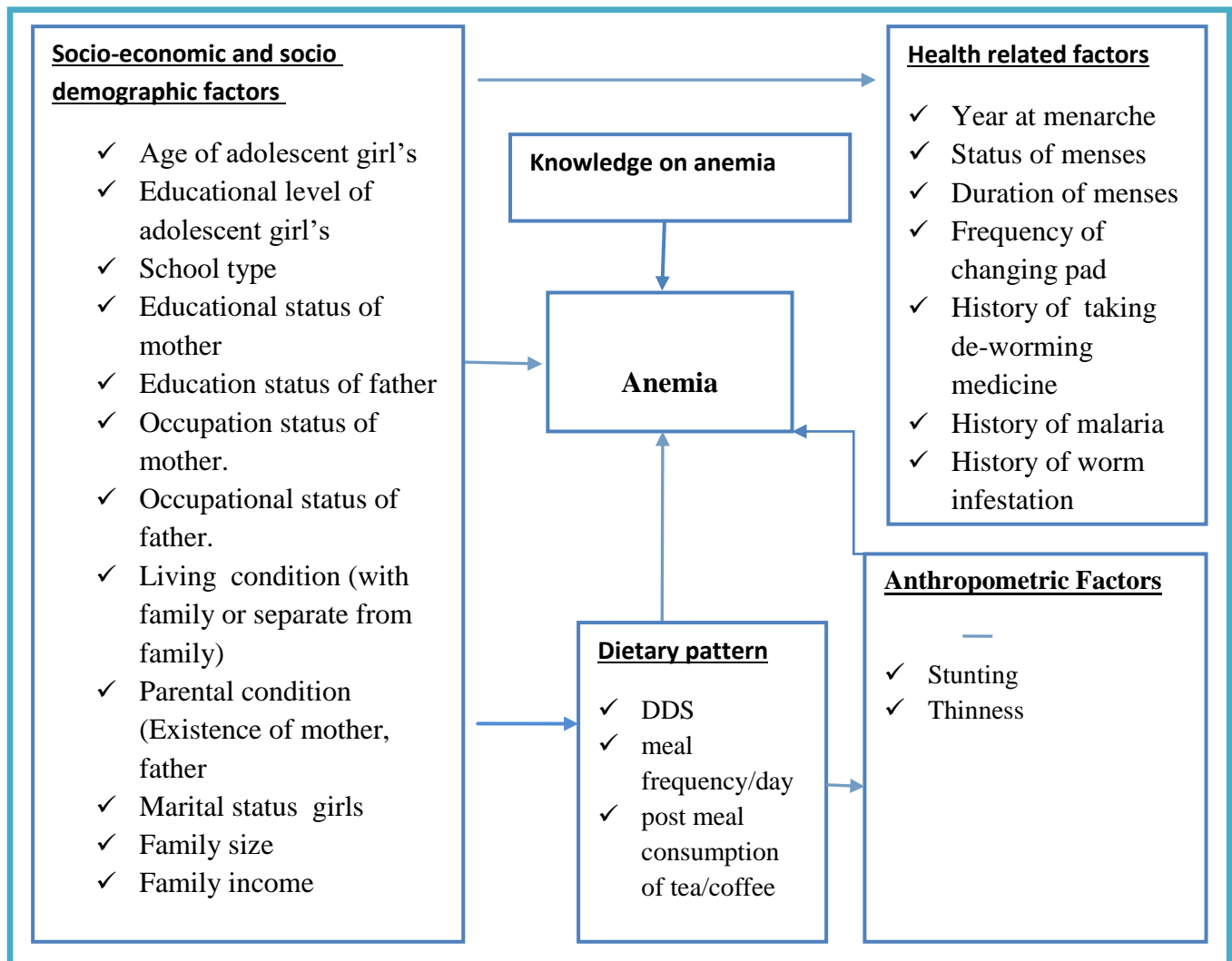


Figure 1: Conceptual frame work adapted by reviewing of different literatures, to assess anemia among school adolescent girls, Jimma Ethiopia, December 10, 2018 to February 1, 2019

2.4. Significance of the study

The major reasons focusing on adolescents is that this period gives a unique opportunity to break arrange of vicious cycles of structural problems that are passed from one generation to the next, of those things are poor health and nutrition like Anemia. Adolescence may represent a window of opportunity to prepare nutritionally for a healthy life. Currently Ethiopian Food and Nutrition policy included adolescent girls in most at risk group for nutritional demands particularly deficiency of iron. It is imperative that nutrition intervention based on evidence in adolescent girls may contribute to breaking the vicious cycle of intergenerational malnutrition because they are future mothers.

This study was tried to give information about the magnitude and factors that contribute for anemia and provide more information for any intervening organizations since limited study conducted to identify factors responsible for anemia among school adolescent girls in Jimma town. Additionally the result of the study will have positive contribution for policy makers, health providers, educators, and researchers to improve the health of female adolescents especially regarding to anemia.

3. OBJECTIVES

3.1. General objectives

- To assess the prevalence of anemia and associated factors among adolescent girls in Jimma town high schools, Oromia, South West, Ethiopia, December 10, 2018 to February 1, 2019

3.2. Specific objectives

- To determine the prevalence of anemia among adolescent girls in Jimma town secondary schools, south west, Ethiopia.
- To identify factors associated with anemia among adolescent girls in Jimma town secondary schools, south west, Ethiopia.

4. MATERIALS AND METHODS

4.1. Study Area and Period

The study was conducted in selected high schools in Jimma town. Jimma is located in south west Ethiopia and about 347 kilometers away from the capital city of the country Addis Ababa. It is found in Oromia regional state and it's also the administration town of Jimma zone. Jimma zone is bordered in the south by the southern nations, nationalities and peoples region, in the North West Illubabor, on the north by Wollega town and on the north east by West Showa. According to 2007 Central Statistics Agency (CSA) of Ethiopia report Jimma town has a total population of 159,009 of whom 80,897 were males and 78,112 were females. In the town there are about 14 secondary schools of which six are governmental and the rest eight are private schools. According to the Jimma town education office the total number of students in 2011 E.C both government and private in secondary schools are 10,964 of whom 5065 (46.2 %) are males and 5899 (53.8 %) are females of which 5694 (96.5%) are adolescent girls. The study was conducted in Jimma town from December 10, 2018 to February 1, 2019.

4.2. Study Design

School based cross sectional study design was employed.

4.3. Population

4.3.1. Source population

The source population are all secondary school adolescent girls who attending their education in Jimma town.

4.3.2. Study Population

Randomly selected adolescent girls found in randomly selected from each of sampled secondary schools in Jimma town.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

Adolescent girls whose age are 10 to 19 years of old from grade 9 to grade 12.

4.4.2. Exclusion criteria:

Adolescent girls who are under treatment of anemia, pregnant adolescents and who are reside in the study area for less than 6 months.

4.5. Sample Size Determination

The sample size calculation for this study was considered the outcome variable and various factors significantly associated with anemia accordingly. For general objective and the specific objective the sample size was calculated separately and the larger sample size was taken to be used for this study.

For the first objective: The sample size was calculated by using a formula for estimation of a single population proportion formula.

$$n = \frac{(Z_{\alpha/2})^2(p)(1-p)}{d^2}$$

Z_{α/2}=critical value at 95% Confidence level of certainty (1.96)

P=Prevalence of anemia (32%) among adolescent girls in Babile district(14).

q=(1-p).

d= the margin of error (tolerance) between the sample and the population that is 0.05.

So, the sample size is, $n = \frac{(1.96)^2(0.32)(0.68)}{(0.05)^2} = 334$.

Based on the above calculation sample size is found to be 334, but considering non response of the respondent, used 10% (33 adolescents) of non-response rate which is 367. And finally the sample size becomes 551 after multiplying by 1.5 of design effect.

For the 2nd objective: Factors associated with anemia among adolescent girls. The sample size for the second objectives of this study was determined by considering factors that are significantly associated with the outcome variable, two sided confidence level of 95%, margin of error of 5%, power of 80% and ratio of exposed to unexposed 1:1 using Epi Info Version 7. The possible calculated sample size for the selected factors after multiplied by design effect of 1.5 with 10% non-response rate is shown below (**Table 1**).

Table 1: Sample size determination for the study on anemia and associated factors among secondary school adolescents of Jimma town, south west Ethiopia, December 10, 2018 to February 1, 2019.

Variables	% of outcome in unexposed group	Confidence interval	Power	Odds ratio	Total sample size	References
History of worm infestation	8.3	95%	80	2.7	538	Getachew M et al, 2019
Family size	7	95%	80	3.2	436	Getachew M et al, 2019
Meal frequency	18.9	95%	80	4.48	132	Shaka F et al ,2018
Living status of adolescent girls	22.7	95%	80	2.4	356	Goneta etal,2018

Finally the required sample size for this study was decided by taking the maximum, from the sample size calculated for the first (551) and 538 for the second objectives. Thus, 551 school adolescent girls were included in the study.

4.6. Sampling procedure

Multi stage sampling followed by simple random sampling was used to select the study participants. First all secondary schools found in the town were registered then, five schools were selected randomly by using lottery method, assuming at least 30% of them must be included in the study. Secondly, the study participants in the target age group enrolled in the selected schools were identified, and the total number of students was obtained from each school director. The sample size was distributed among the selected schools proportionally based on student size in each school. Then, the number of participants required to be included were allocated proportionally based on the number of students in each class and grade level. Finally female students in each class were selected by simple random sampling technique.

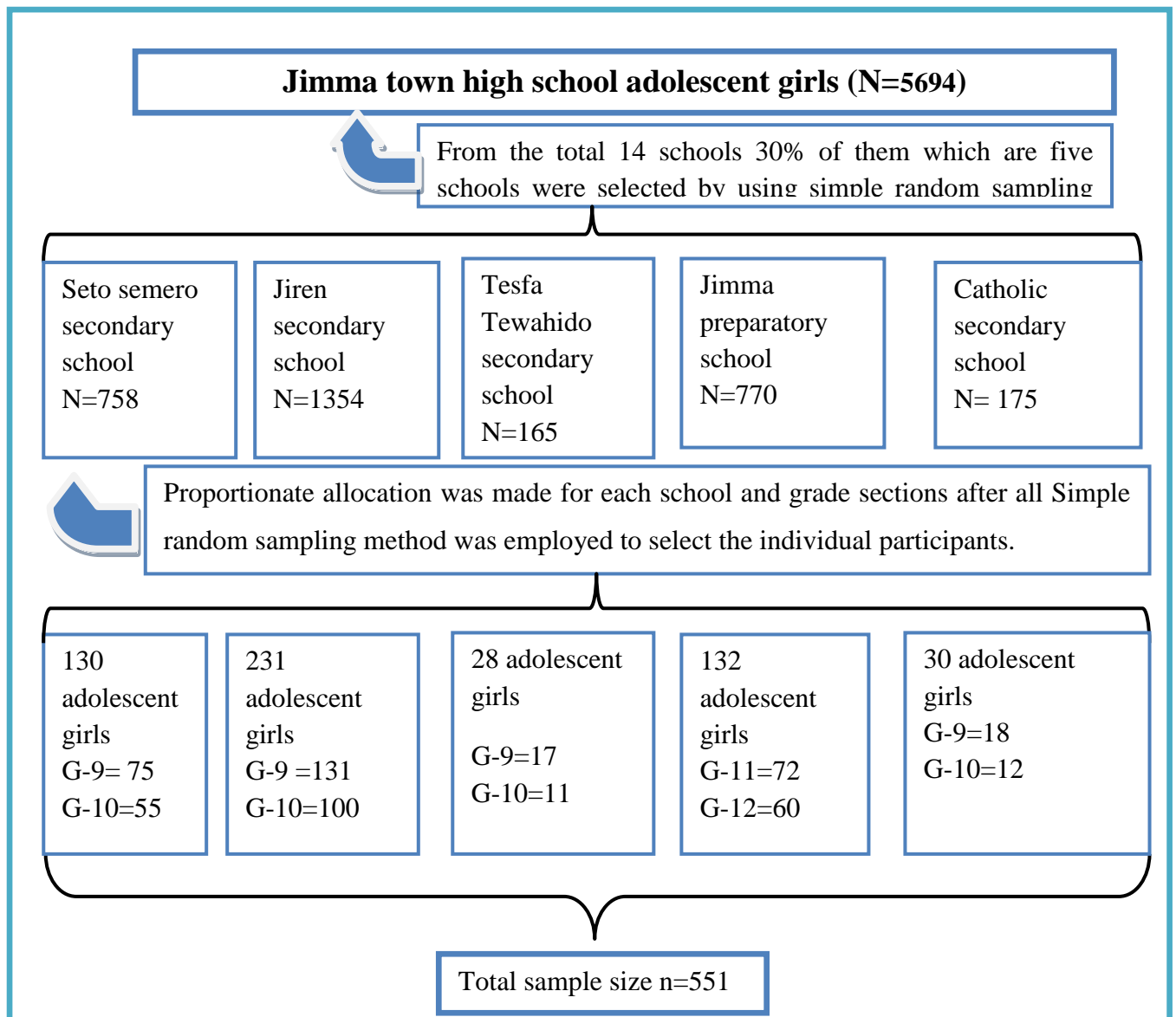


Figure 2: Schematic representation of sampling procedure, to assess the prevalence of anemia and associated factors among school adolescent girls, Jimma, Ethiopia, December 10, 2018 to February 1, 2019.

4.7. Study variables

4.7.1. Dependent variable

4.7.1.2 Anemia

4.7.2. Independent variables

Socio demographic and socio-economic factors; Age of adolescent girls, ethnicity, religion, educational status of adolescent girls, educational status of mother, education status of father, occupation status of mother, occupation status of father, living condition (with family or

separate from family), parental condition (Existence of mother, father), marital status, family size and house hold wealth status.

Anthropometric: Height, Weight, BAZ (Thinness), Stunting (HAZ).

Health related factors:, Year at menarche, status of menses, duration of menses, frequency of changing pad, history of taking deworming medication, history of malaria and history of worm infection.

Dietary pattern: Meal frequency per day, DDs and time and frequency of consumption of tea/coffee.

Knowledge on Anemia: (poor knowledge and good knowledge).

4.8. Operational and standard definitions

Anemia: Those adolescent girls who have hemoglobin level of $<12\text{mg/dl}$ were considered as had anemia while if adolescent girls who have hemoglobin level of $\geq 12\text{mg/dl}$ were considered as no anemia(10).

Adolescent girls: Female students whose age are between 10-19 years(1).

Menses: The discharge of blood from the uterus of female, which occurs roughly every month.

Menarche: on set of menstruation; the first menstrual period in the life cycle of adolescent girls.

Thinness: Defined as if adolescent girls having BMI for age z –score of $<-2\text{SD}$ (47).

Stunting: Defined as if adolescent girls having Height for age Z score of $<-2\text{SD}$ (47).

Dietary Diversity Score: The total count of different food groups (nine food groups) irrespective of the amount consumed by adolescent girls over the 24 hour period (44).

- ✓ **Low dietary diversity:** If adolescent girls who are eat ≤ 3 food groups out of nine food groups within twenty four hours.
- ✓ **Medium dietary diversity:** Adolescent girls who are ate having eaten 4-5 food groups out of nine food groups within 24hrs.
- ✓ **High dietary diversity:** Adolescent girls who ≥ 6 food groups out of nine food groups within twenty four hours

Wealth index: Developed based on ownership of fixed asset using PCA then it was ranked as low, medium and high.

Knowledge: Having good knowledge if adolescent girls who have responded equal or greater than 50% of knowledge questions and having poor knowledge: if adolescent girls who have scored less than 50% of knowledge questions.

4.9. Data Collection procedure and instrument

Data were collected face-to-face by trained four diploma nurses using a pretested and structured 'Afaan Oromoo and Amharic' language version questionnaires which was adapted from EDHS, FAO and reviewed from existed literatures, two lab technicians to determine the Hb level and two BSC nurse supervisors. Socio demographic characteristics, reproductive health status (age of menarche) and history of taking deworming medicine, dietary pattern (food item intake pattern and frequency of meal/snacks per day), nutritional status and knowledge regarding anemia was asked. For obtaining information about food intake pattern, participants were asked to recall their food intake within 24 hour in terms of dietary diversity score.

Dietary Diversity Score (DDS): It was assessed in adolescent girls consuming over 24 hours from 9 food groups which are starch (cereals, and white roots), vegetables, fruits, fish , tubers, meat (including organ meat), milk, egg and legumes. Each food group had been counted only once resulting in a possible score of 0 to 9. In this study food groups are categorized into low dietary diversity (≤ 3 food groups), medium dietary diversity score who consumed four and five food groups and high dietary diversity (≥ 6) (44).

Anthropometry: Weight was measured by electronic digital weight scale (Secca Germany) with minimum/lightly/clothing and no shoes/jewelry and recorded to the nearest 0.1kg. Calibration was done every morning and before every weight measurement the data collectors assured the scales reading exactly at zero. Weight scale was validated against known object weighing 2kg measured regularly. The same measurer was employed for a given anthropometric measurement to avoid variability after intensive training was given. All measurements had been taken twice and the average was computed. Similarly Height, measurements was carried out using a wooden height measuring board with a sliding head bar. The subjects was asked to stand straight on leveled surface with heels together and their heads positioned and eyes looking straight ahead (frankfert plane) without shoes. Heals, buttocks, shoulder blades should touch the vertical surface of the Stadiometer. The moving head piece of the Stadiometer was apply to lower to rest flat on the top of the head and reading was to the nearest 0.1cm (45).

Knowledge; anemia related knowledge was assessed by using a pretested questionnaire. Adolescents in this study have been interviewed anemia related Knowledge questionnaire that had been adapted from assessing KAP FAO guidelines. It consisted eight questions which asked about anemia, iron rich foods and health consequence of anemia and the like. The answer to each question was analyzed as know and don't know. And finally from the total 8 items for each correct answer was coded as 1 which is known and for each wrong answers 0 (don't know) score was given. Maximum attainable score was 8 and minimum possible score is zero. The answers to each question changed to a percentage. An individual who scored 50% and above was have been taken as good knowledge and adolescent girls who scored below 50% have been taken as poor knowledge (46).

Wealth status: A 26 items used to assess the household assets. The tool was adapted from Ethiopian demographic and health survey (EDHS) and it was ranked as tertile (low, medium and high).

Hemoglobin: A portable battery operated HemoCue Hb 301+ analyzer was used to measure the hemoglobin. It's used mainly in primary care and blood donation setting; simple and convenient solution in poor resource setting. A sample of capillary blood was collected from the ring finger using lancet under strict aseptic precaution, using your thumb, lightly press the finger from the top of the knuckle towards the tip. This stimulates the blood flow towards the sampling point. The first drop of blood was wiped away and the second drop was used for Hb determination. One microcuvette is used for only once per individual. After that the microcuvette was put in the haemoglobinometer and the reading observed within 1 minute. Then reading was classified as normal $hg \geq 12$ g/dl and anemic if the hemoglobin value < 12 g/dl based on the WHO 2011 recommended cut off points after adjustments to altitude was made. Adjusted Hb (hemoglobin) concentration was made calculated as $Hb = -0.32 * (\text{altitude in meters} * 0.0033) + 0.22 * (\text{altitude in meters} * 0.0033)^2$ for average altitude of the Jimma town (1780m) above sea level to subtract (which was 0.56gm/dl) the adjustment from the individual measured Hb concentration values (10).

4.10. Data Quality Management

To assure the data quality the following measurements were under taken; The questionnaire was prepared in English, then translated into the languages of both Afan Oromo and Amharic version then retranslated back to English by experts to ensure consistency of the instrument. Two days training was provided by principal investigator which is focusing on

objective of the study, to create common understanding about the questionnaire administrations, anthropometric measurements, interviewing approach and ethical issues. A pretest was conducted among 28 adolescents in Agaro town secondary school, which is 42 kilo meter (Km) from Jimma town. After pre-testing the necessary corrections were made based on the results of the pretest and checked the reliability test through Cronbach's alpha (0.758) for selected variables like knowledge. Multi-Collinearity was checked (maximum VIF 1.242).

Standardization was done for anthropometric measurements, weight scale was calibrated before data collection with a known standardized object weighing 2 kg and it was checked the functionality routine in between before measured the respondents weight. HemoCue Hb301 analyzer was validated before started the actual data collection in Jimma university medical center which is found in south west Ethiopia by comparable to Sysmex Pyramid XT-1800i model which was taken as a golden standard at facility level to determine different hematological tests including hemoglobin. Hemoglobin measurement was taken place at a time with the same sample for 20 individuals' blood sample in both machine and then we were seen the relationship of them through Pearson correlation coefficient ($r=0.985$) and coefficient of variation ($CV= 0.44$).

Data coding and cleaning was performed by cross-checking the printout data for obvious errors. Missing values and outliers was checked before analysis by running descriptive statistics. Supervision was carried out through out data collection period both by the supervisors and by principal investigator to keep the quality of data correctly completed.

4.11. Data processing and analysis

The collected data were checked for completeness and consistence by manually before entry into computer. Then the questionnaires were coded and data was entered in to Epidata version 3.1. Then, the data were exported to SPSS for windows version 20 for further analysis. And then normality was checked by different plots (Q-Q plot, Box plot and Histogram) for continues predictor variables (anthropometric, food groups, knowledge and hemoglobin).

Height and weight is transferred in to WHO Anthro plus considering age to convert nutritional data in to Z-score of indices HAZ and BAZ using standard of WHO 2007 growth reference. According to this reference if adolescent girls had $BAZ \leq -2SD$ considered as thinness, normal if BAZ between $-2SD$ and $+1$ and overweight was considered as if the $BAZ \geq +2SD$. Whereas if the respondents $HAZ \leq -2SD$ was stunting (47).

The household wealth status was computed using PCA method by considering locally available household assets, which were dummy coded. Before running the PCA, its assumptions checked: like sampling adequacy with Kaiser-Meyer-Olkin and the results of each analysis was >0.5 , presence of substantial correlation was checked by correlation matrix, which showed more than two items has > 0.3 correlation-coefficients. In addition, Bartlett's Test of Sphericity was checked and it was significant at $p<0.05$. After the entire checkup from the total 26 variables, 18 variables with six components were left. Finally the household wealth status was computed and categorized into three categories after checking chi-square assumption.

Descriptive statistics like table and pie charts were used to present data. Frequencies and percentages were used to organize the categorical independent variables, mean/standard deviation were used to describe a continuous variable and cross tabs were done to identify adolescents with and without anemia and the prevalence of anemia by its severity. Interaction was checked for selected predictor variables like school type with wealth status of adolescent families and it was not have statically significant association with anemia at $p < 0.05$.

Backward likelihood ratio with 0.1 probability removal was used to develop the model. Goodness of fit of the final model was checked using Hosmer Lemeshow test of goodness of fit considering good fit at $P\text{-value} \geq 0.05$ (0.195). Both bivariate and multivariable logistic regression analyses were employed to identify the candidate variables and contributing factors of anemia in adolescent girls respectively. Binary logistic regression analysis was used to identify the candidate variables for multi variable logistic regression at $p \text{ value} \leq 0.25$. The association between independent variables and anemia was analyzed for each variable one by one in bivariate logistic regression using crude odds ratio. All explanatory variables with $p\text{-value}$ less than or equal to 0.25 in the bivariate analysis were included in the multivariable logistic regression analysis. Adjusted Odds ratio (AOR) with 95% CI were used to determine the predictors of the outcome independently and to show the strength of an association, $P\text{-value}$ less than 0.05 was considered as statistically significant.

4.12. Ethical Consideration

Ethical clearance was obtained from Ethical Review Board of Jimma University, Institute of health, College of public health and medical science and it also get permission from Jimma Zone Education Department, Jimma zone health office, Jimma town health office Jimma town administrative education office, school directors and Keble units. Capillary blood

collection was performed after obtaining a sign written informed consent from parents for adolescent girls less than 18 years of age and an oral assent from the girls. Girls who are 18 years and above, were sign a written informed consent form. The aim of the study was explained to all students. Each study participants were informed about the right to withdraw the consent and stop participation at any time without any form of prejudice. Privacy and confidentiality was maintained at each step of the study process. Aseptic techniques' was assured by like wearing gloves during blood collection and using new lancet for finger pricking. Penetrating injuries was avoided by using fresh self-retractable lancets for all participants to draw minimal drop of blood for the anemia testing.

The sample blood was never used for further investigation other than hemoglobin analysis and subject as informed accordingly. For adolescent girls who have anemic had given nutritional education and to visit the nearest health facility.

4.13. Plan for dissemination

Dissemination for the scientific community will be mainly through presentations and publications. The research finding presented and submitted to Jimma University scientific community. It will also to be presented to scientific community in selected workshops and regional and national nutrition plat forms. Effort also will be made to publish the findings in scientific journals.

5. Result

5.1 Socio-Demographic Characteristics of the Study Participants

Five hundred twenty eight adolescent girls, 528, were interviewed in this study, yielded 95.6% response rate. The mean ages of the respondents were 16.48 ± 1.17 years. Majority (89.2%) of respondents was from government schools and 224 (40.3%) students were from grade 9. More than half (52.8%) of the respondents belongs Oromo ethnic group. Two hundred nineteen (41.5%) of the respondents were orthodox by religion followed by Muslims 179 (33.9%). The majority 498 (94.3%) of the adolescent girls marital status were single. Three fourth 394(74.6%) of the adolescent girls are living with their parents. The majority (80.1%) of the respondent's parents was both Alive (**Table2**).

Table 2: Socio economic and demographic characteristics of adolescent girls in Jimma town, Oromia, southwest Ethiopia, December 10, 2018 to February 1, 2019

Variables (N=528)	Categories	Frequency(n=528)	Percent (%)
Age	14-16	274	51.9
	17-19	254	48.1
School type	Government	471	89.2
	Private	57	10.8
Ethnicity	Oromo	279	52.8
	Amhara	100	18.9
	Guraga	42	8.0
	Dawuro	28	5.3
	Keffa	23	4.4
	Yeme	30	5.7
	Others ¹	26	4.9
Religion	Orthodox	219	41.48
	Muslim	179	33.9
	Protestant	117	22.16
	Catholic	13	2.46
Family size	≤ 5	239	45.3
	>5	289	54.7
Marital status	Single	498	94.3
	Married	30	5.7
Parental condition	Both parents alive	423	80.1
	Father alive	47	8.9
	Mother alive	40	7.6
	Both parents died	18	3.4
Living status of adolescent girls	Living with parents	394	74.6
	Living with relatives	69	13.1
	Living separate from family	65	12.3

Other¹, Tigray, Silta, Wolayita

Regarding to parental level of education, more than one-fourth 151(28.6%) adolescent girls' fathers were grade 12 and above followed by secondary school (Grade 9-12) (22.5%). Similarly, One fourth (25%) of girl's mother were above 12 by education and 12.5% of adolescent girls mothers were cannot read and write (Figure 3).

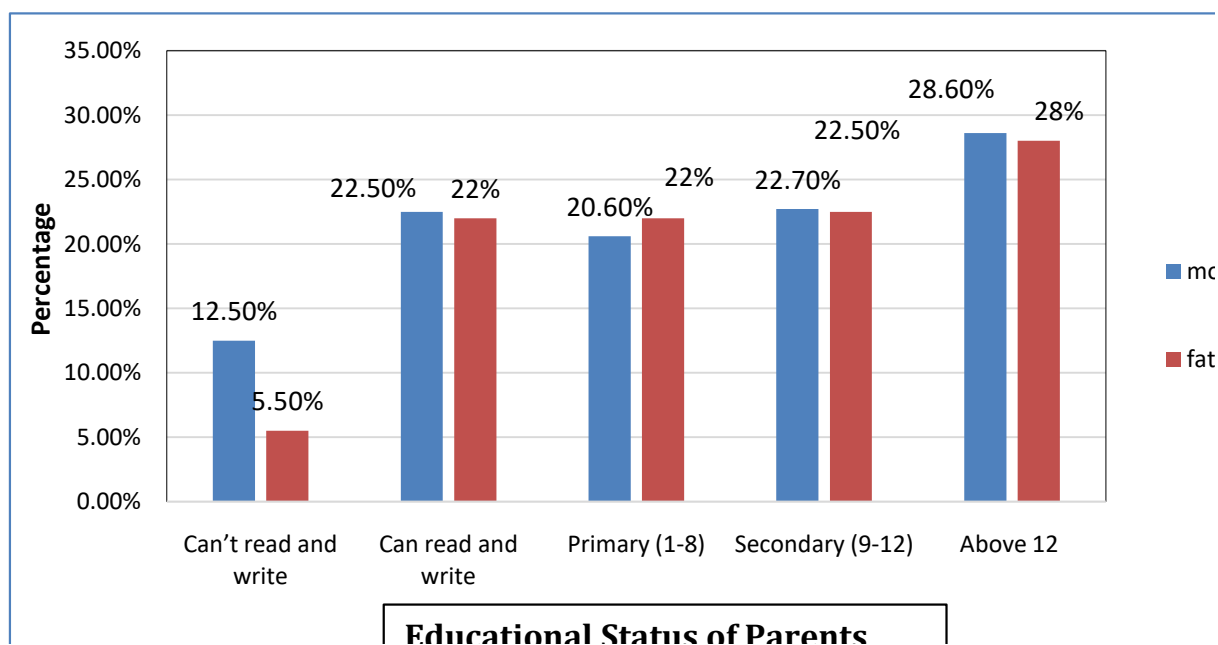


Figure 3: Educational status of parents among adolescent girls in Jimma town high schools, Oromia, south west, Ethiopia, December 10, 2018 to February 1, 2019 (n=528).

Regarding to parental occupational status, 232 (43.9%) of mothers were housewife, whereas 26.9% of mothers were government employee. Forty three percent of fathers of adolescent girls were government employee, 29.2% of them were merchants and 3.4% of fathers were daily laborer. More than one third (35%) of adolescent parents were under low economic class (table- 3).

Table 3: Parental occupational status and their wealth status among adolescent girls in Jimma town high schools, Oromia, south west, Ethiopia, December 10, 2018 to February 1, 2019

Variable (N=528).	Category	Frequency	Percentage
Mother Occupation	House wife	232	43.9
	Merchant	91	17.2
	Government employee	145	26.9
	Private employee	48	9.1
	Daily laborer	12	2.3
Father Occupation	Government employee	228	43.2
	Merchant	154	29.2
	Daily laborer	18	3.4

	Private employee	103	19.5
	Farmer	25	4.7
Wealth status	Low	185	35
	Medium	172	32.6
	High	171	32.4

5.2 The prevalence of anemia among adolescent girls

The prevalence of anemia among adolescent girls was 141(26.7% (95%CI: 22.7, 30.5)) of which 16.3% were mild and 10.4% were moderate anemia. No girls reported as having severe anemia (**Figure: 4**). Hemoglobin level of the adolescent girls ranged from 8.34g/dl to 16.84g/dl with a mean (\pm SD) value of 13.004 ± 1.706 g/dl.

Seventy-three (52%) of adolescent girls who had anemia were in the age group of 17-19 years, Whereas 68(48%) of them were in the age group 14-16 years old. From the total anemic adolescent girls about 53.2% of girls heard or having information about anemia and 46.8% of them were had no information about anemia. Similarly from the total anemic adolescent girls 48.9% of them live with their family followed by 29.8% girls who live away from their family and the rest 21.3% were living with relatives who were anemic The prevalence of anemia was 61% and 23.9% among girls who were thinness and stunting respectively.

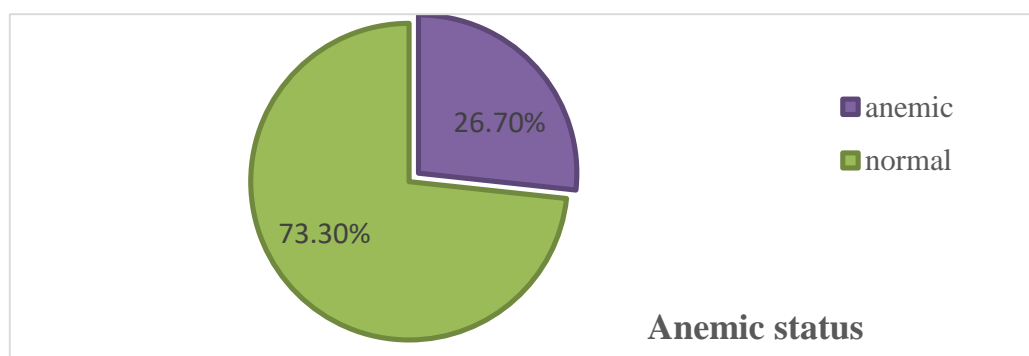


Figure 4: The prevalence of anemia among female adolescent girls enrolled secondary schools, Jimma, south west Ethiopia December 10, 2018 to February 1, 2019.

5.3. Knowledge of adolescent girls related to anemia

Three hundred seventy one (70.3%) girls heard about iron deficiency anemia. The majority 302 (82.7%) of them responded less energy/weakness in order to recognize somebody has anemia. One hundred sixty (43.0%) of adolescent girls responded that lack of iron in the diet or eating too little was the causes of iron deficiency anemia followed by heavy bleeding

during menstruation 117(22.2%). Nearly one-third (32.2%) of adolescent girls were responded about the consequence of anemia for pregnant women was risk of dying during or after pregnancy.

One hundred fifty seven (29.7%) of girls responded that eating or feeding iron rich foods or having a diet rich in iron could be taken as the prevention methods of anemia. Out of 371 respondents who heard about anemia 296(79.6%) study subjects had poor knowledge related to anemia (Table 4).

Table 4: Knowledge related to anemia of study participants among adolescent high school girls in Jimma town, Oromia, south west, Ethiopia December 10, 2018 to February 1, 2019

Variables (N=371)	Category	Frequency	Percent (%)
How can recognize someone has anemia			
Less energy or weakness	Yes	306	82.3
	No	66	17.7
Paleness	Yes	28	7.5
	No	344	92.5
Spoon nails or bent nails	Yes	9	2.4
	No	363	97.6
More likely to become ill	Yes	45	12.1
	No	327	87.9
Iron rich foods which are easily absorbable			
Organ meats	Yes	136	36.7
	No	235	63.3
flesh meat(lamp, goat, chicken)	Yes	44	11.9
	No	327	88.1
Legumes	Yes	72	13.6
	No	299	56.6
Vitamin C rich foods(spinach, pumpkin)	Yes	82	19.4
	No	289	80.6
Red meat	Yes	87	23.5
	No	284	76.5
The cause of iron deficiency anemia			
Lack of iron in the diet/eat too little, not much	Yes	160	43.0
	No	212	57.0
Sickness/infection (malaria, hookworm infection, other infection such as HIV/AIDS)	Yes	26	7.0
	No	342	97.0
Heavy bleeding during menstruation	Yes	117	31.5
	No	255	69.5
The consequence of anemia for pregnant women			
Risk of dying during or after pregnancy	Yes	170	45.7
	No	202	54.3

Difficult delivery	Yes	139	37.4
	No	233	62.6
Consequence of anemia for infants and young children			
Delay of mental and physical development	Yes	140	37.8
	No	231	62.2
The prevention methods of anemia			
Eat/ feeds iron rich foods /having a diet rich in iron	Yes	157	42.4
	No	213	57.6
Eat /give vitamin c rich foods during or after meals	Yes	76	20.4
	No	296	79.6
Take /given iron supplements if prescribed	Yes	131	35.2
	No	241	64.8
Treat other causes of anemia (worms, malaria)	Yes	26	7.0
	No	346	93
Continue breast feeding (for infants 6-23 months years old	Yes	22	5.9
	No	350	94.1
Vitamin c foods increase iron absorption	Yes	177	47.8
	No	195	52.2
Foods that decrease iron absorption			
Coffee	Yes	93	25
	No	278	75
Tea	Yes	80	21.6
	No	291	78.4

Knowledge scored		
Good Knowledge	296	79.6
Poor Knowledge	76	20.4
Mean score with 95% CI	35.1% (33.37%-36.71%)	

5.4 Dietary diversity practice of the adolescent girls

Nearly two third 344(65.2%) of adolescent girls consumed three times per day and only a few 12(2.3%) respondents ate once per day. The majority (79.1%) of the girls consumed other fruits and vegetables. More than half (53%) of the respondents consumed eggs. In contrast, only small numbers of individuals consumed organ meat 65(12.3%). Three hundred fifty five (67.2%) respondents drank coffee or tea usually after consumed meals. The majority 189 (41.4%) girls drank coffee or tea right after meal, followed by 161(35.2) they were drank coffee or tea during a meal (table 5).

Table5: Dietary diversity of the study participants among high school adolescent girls in Jimma town, Oromia region, South West, Ethiopia December 10, 2018 to February 1, 2019

Variables (N=528).		Frequency	Percent (%)
Meal frequency	One times	12	2.3
	Two times	81	15.3
	Three times	344	65.2
	Four and above	91	17.2
Group of food items consumed in the last 24 hr			
Starchy staples (cereals or white roots)		476	90.2
Dark green vegetables		376	71.2
Other vitamin A rich fruit and vegetable groups		346	65.5
Other fruits or vegetables		421	79.7
Organ meats		65	12.3
Meat groups(flesh meats or fish or sea foods		161	30.5
Eggs		284	53.8
Legumes, nuts, seeds, lentils and seeds		359	68.0
Milk and milk products		232	43.9
Oils and fats		467	88.4
Sweets		386	73.1
DDS	Low DDS	103	19.3
	Medium DDS	195	36.9
	High DDS	230	43.6

Regarding to DDS, the mean dietary diversity score of the adolescent girls was 5.15(\pm 1.99). Two hundred thirty (43.6%) girls had high dietary diversity score of six and above food groups followed by 195(36.9%) of the adolescent girls who had medium dietary diversity score who consumed four and five different food groups (Table 5).

The minimum dietary diversity score of adolescent girls was 1 (consumed only one food groups) and the maximum dietary diversity score was 9 out of nine food groups (figure 5).

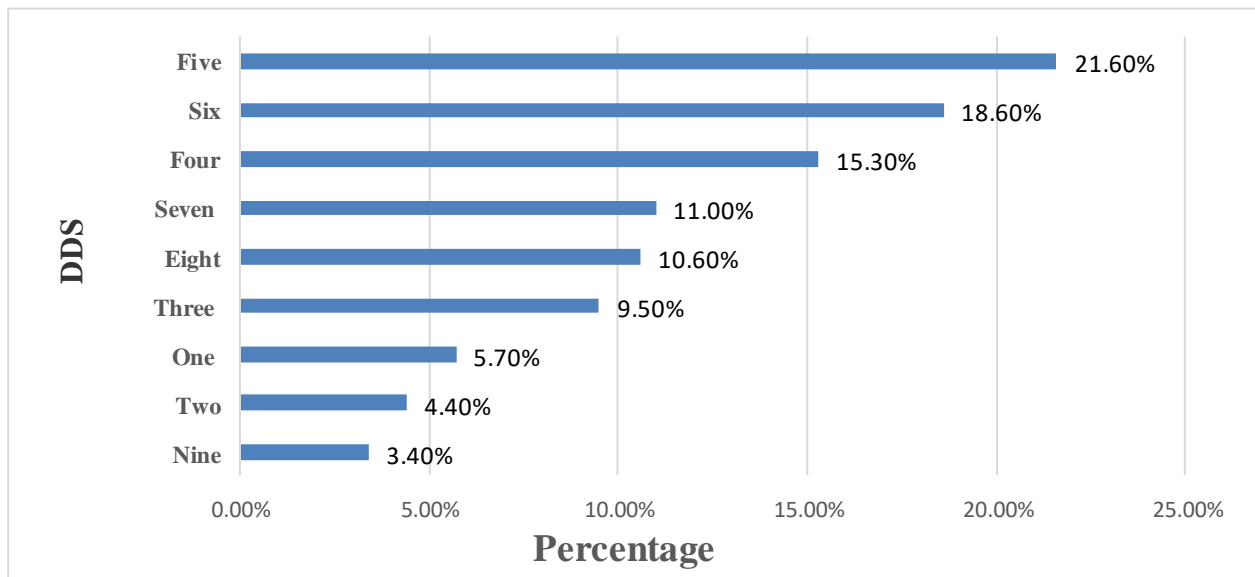


Figure 5: Percentage distribution of respondents on dietary diversity score among adolescent girls in Jimma town, south west Ethiopia December 10, 2018 to February 1, 2019

From the total nine food items which measured DDS, did not consuming meat (red meat or flesh meat), did not consuming dark green vegetables and did not consuming organ meat showed statistical association with anemia by chi-square test ($p < 0.05$).

5.5 Health and anthropometric characteristics of adolescent girls

Almost all 519 (98.2%) of adolescent girls had attained menarche with reported age of menarche ranged from 9 year to 16 years with a mean age of 14 years of menarche. Out of five hundred nineteen girls 57 (10.7%) were on menstruation during data collection time. Four hundred twenty three (81.5%) girls changed their pads three and below three times per day. A small number of adolescent girls had history of malaria infection within one month. Ninety two (17.4%) girls had a history of worm infestation within one month during data collection time and 83 (15.7%) of adolescent girls had taken de-worm medicine within one month (Table: 6).

The mean height and weight of the adolescent girls was 157.3 (± 6.056) centimeters (cm) and 50.66 (± 7.35) kg respectively. The mean body mass index for age Z score was -0.259 (± 1.0775) and the mean height for age Z score was -0.7690 (± 0.895) respectively. Thinness were recorded in 41 (7.8%) of the girls of which 10 (1.9) were sever thinness. Sixty one (11.6%) of girls were overweight of which only few individuals 4 (0.8%) were obese.

Stunting which is the chronic form of malnutrition seen in 46(8.7%) adolescent girls in the study area.

Table 6: Health related characteristics of the study participants among adolescent high school girls in Jimma town, Oromia, south west, Ethiopia December 10, 2018 to February 1, December 10, 2018 to February 1, 2019.

Variables	Category	Frequency	Percent
Status of menarche	Attained	519	98.3
	Not attained	9	1.7
Age at the onset of menarche(N=519)	≤14	412	79.4
	>14	107	20.6
Duration of menses in each cycle(N=519)	≤5 days	452	87.1
	>5 days	67	12.9
Frequency of changed pad/day (N=519)	≤ 3 times	427	82.3
	> 3times	92	17.7
Had menstruation currently (=519)	Yes	57	10.7
	No	462	89.3
History of malaria(N=528)	Yes	51	9.7
	No	477	90.3
History of worm infestation(N=528)	Yes	92	17.4
	No	436	82.6
Taking deworm medicine (n=528)	Yes	83	15.7
	No	445	84.3

5.6 Factors associated with anemia

In order to get the predictors of outcome variable, multivariable logistic regression analysis was performed after selected the candidate variables through bivariate logistic regression. Mother's educational status, father's educational status, lived condition of the respondent, ever heard about anemia, meal frequency per day, menstrual status during data collection period, thinness, dietary diversity score, wealth status, family size, frequency of changed pad per day and duration of menses had shown association during the binary logistic regression at P-value ≤ 0.25 . Out of these mothers educational status, lived condition of the adolescent girls, dietary diversity score, and duration of menses, meal frequency and wealth index were found to be a significant association with anemia by multivariate logistic regression at p-value < 0.05 .

The odds of having anemia was 4.4 times higher among girls who lived separate from their parents compared to girls live with their parents (AOR=4.43 (95% CI, 2.20, 8.90), $p < 0.001$). Similarly, the odds of having anemia was 3.6 times higher among adolescent girls who had low DDS compared to girls who had high DDS (AOR= 3.57 (95% CI, 1.88, 6.76, $p < 0.001$). Additionally, the odds of having anemia was 2.2 times higher among adolescent girls having duration of menses greater than five days compared to girls who had duration of menses less than or equal to five days (AOR=2.25(95% CI, 1.17,4.33, $p 0.028$). Adolescent girls who were from low income families were 2 times more likely to be anemic compared to that girls who had high income families AOR=2.16(95% CI, 1.17,3.99, $p 0.002$). However, Maternal educational status of having at least attended a secondary school was had negatively associated with anemia among adolescent girls compared to those mothers who can't read and write AOR=0.43 (95% CI, 0.19, 0.98, $p 0.016$) (Table: 7).

Table 7: Binary and Multivariable logistic regression model to identify factors associated with anemia among adolescent high school girls in Jimma town, Oromia, south west Ethiopia December 10, 2018 to February 1, December 10, 2018 to February 1, 2019

Variables	Category	Outcome Variables		COR 95%CI	AOR 95%CI
		Anemia (%)	Normal (%)		
Father education	Can't read and write	12(41.4)	17(58.6)	1	
	Can read and write	38(36.2)	81(63.8)	0.66(0.29,1.53)	0.540(0.19,1.56)
	Primary(1-8)	33(30.3)	76(69.7)	0.62(0.26,1.43)	0.672(0.28,1.99)
	Secondary(9-12)	27(22.5)	93(77.5)	0.41(0.17,0.97)*	0.48(0.16,1.43)
	Above 12	31(20.5)	116(79.5)	0.37(0.16,0.85)*	0.90(0.30,2.70)
Mother education	Can't read and write	29(43.9)	37(56.1)	1	1
	Can read and write	42(44.2)	53(55.8)	1.10(0.54,1.90)	1.56(0.73,3.35)
	Primary(1-8)	36(30.8)	81(69.2)	0.57(0.304,1.06)	0.85(0.40,1.81)
	Secondary(9-12)	18(15.3)	100(84.7)	0.23(0.11,0.46)*	0.43(0.19,0.98)**
	Above 12	16(12.1)	116(87.9)	0.18(0.09,0.36)*	0.44(0.18,0.95)**
Living status	Living with parent	69(17.50)	325(82.5)	1	1
	Living with relatives	30(43.5)	39(56.5)	3.62(2.11,6.23)*	2.51(1.35,4.67)**
	living separate from family	42(64.6)	23(35.4)	8.60(4.86, 15.22)*	4.43 (2.20, 8.90)**
Heard about anemia	Yes	75(20.2)	296(79.8)	1	1
	No	66(42)	91(58.0)	2.86(1.91,4.29)*	1.140(0.66,1.96)
Meal frequency per day	Once	7(11.1)	5(88.9)	4.97(1.42,17.35)*	1.23(0.231,6.62)
	Two times	38(56.6)	43(43.4)	3.137(1.62,6.07)*	1.08(0.47,2.49)

	Three times	76(21.2)	268(78.8)	1.07(0.58,1.76)*	0.58(0.30,1.09)
	Four and above	20(22.0)	71(78.0)	1	
Menstruation status (N=519)	Yes	22(61.4)	35(38.6)	1.92(1.08,3.40)*	1.93(0.94,3.94)
	No	114(73.8)	348(24.7)	1	1
Thinness	Thinness	25(61.0)	16(39.0)	4.99(2.58,9.68)*	2.31(0.91,5.45)
	Normal	116(23.8)	371(76.2)	1	1
DDS	Low	59(57.3)	44(42.7)	7.73(4.53,13.18)*	3.57(1.88,6.76)**
	Medium	48(24.6)	147(75.4)	1.88(1.15,3.07)*	1.90(1.11,3.27)**
	High	34(14.8)	196(85.2)	1	1
Family size	≤5	43(18.6)	188(81.4)	1	1
	>5	98(33.0)	199(67.0)	2.15(1.43, 3.24)*	1.24(0.74,2.07)
Wealth index	Low	77(42.5)	104(57.5)	4.77(2.84, 8.02)*	2.16(1.17,3.99)**
	Medium	39(22.3)	136(77.7)	1.69 (0.97, 2.93)	1.24(0.66,2.32)
	High	25(14.5)	147(85.5)	1	
Frequency of changed pad (N=519)	≤3 times p/day	102(23.9)	325(76.1)	1	1
	3> times p/day	34(37)	58(63.0)	1.87 (1.16,3.01)*	1.68(0.92,2.97)
Duration of menses(N=519)	≤5 days	100(21.1)	352(77.9)	1	
	>5days	36(53.7)	31(46.3)	4(2.4,6.9)*	2.25(1.17,4.33)**

Key; * = candidate variables at $p \leq 0.25$ in bivariate logistic regression, ** predictor variables in multivariate logistic regression at $p < 0.05$.

6. Discussion

The study was attempted to assess the magnitude of anemia and associated factors among adolescent girls in Jimma town high schools. The result of this study indicated that the overall prevalence of anemia among adolescent girls was 26.7% (95% CI, 22.7-30.5). According to WHO criterion if, the prevalence of anemia within 20% to 39.9% to be consider as a moderate public health concern, so anemia in adolescent girls in Jimma town is a moderate public health concern. Among adolescent girls who had anemia, the magnitude of mild and moderate anemia was 61%, and 39% and no one was reported as severe anemia. The factors associated with having anemia among adolescent girls include mother education, duration of menses, low dietary diversity score, living condition of adolescent girls and lower economic class of the family.

This finding is in line with that of reported in Kenya 26.5% (21), the local study reported from Filtu town Somali region 23.66% (19), consistent somehow in Berhale district afar region 22.8% (15), Dembia north west Ethiopia 25.5% (34), from research done three districts of Ethiopia namely, Debrelibanose, Laygayint and Damotegale an average prevalence of anemia was 29% (42).

However the finding of this result was found to be lower than compared to those of studies conducted in Nigeria which showed the overall prevalence of anemia was 47.5% (33). The possible reason could be that a low proportion of (1.7%) of adolescents consumed organ meat that of the current study (12.3%). Similarly higher prevalence of anemia was reported in Labore Pakistan about 68.9 % participants were anemic, this might be about three fourth (77%) of the participants did not have green vegetables in their diet that of the current study which was 28.2% (32). The finding of the current study was lower than the study reported in Nepal which was the overall prevalence of anemia was 42.5%, the possible reason might be 42.4% of adolescent girls were had history of worm infestation as compared to the current study 17.4% (23).

The finding this study was higher than reported in central karalla, India which is the overall prevalence of anemia was 21 %, the possible reason might be more than half (56.25%) of the respondents were taken deworm medication that of the current study 15.7% (25). Similarly the current study result was higher than the finding reported in turkey which was the overall prevalence of anemia among adolescent school girls was 8.3 % (29). This could be due to difference in socio economic and cultural behaviors including dietary habit differences.

The result this study also higher than conducted in local studies, Bahirdar, Northern Ethiopia which is the overall prevalence of anemia was 11.1% (35). The difference might be due to nearly half of adolescent girls had a medium dietary diversity score as compared to our study (36.9%). Similar study done in Kebena garage zone, south west Ethiopia revealed that the overall prevalence of anemia was 12% and Mekelle 11% which is lower than the current finding (36,40).

In addition to mentioned the above factors to make different regarding the magnitude of anemia among adolescent girls could be due to differences in socio cultural and behavioral practice including dietary habit difference between one another in the world. The result of our study also varied with the result of local studies it might be differences of study period could lead to seasonal variation.

Adolescent girls whose mothers were attended at least secondary school were 59.6% less likely to develop anemia than adolescent girls whose mothers cannot read and write. Similar studies were reported in four populous villages of India and urban slum of Kanpur, Uttar Pradesh India, adolescent girls whose mother were either illiterate or having only primary education were developed anemia than their counter parts (30,31). This is in contrast to the finding of the study in Nepal (23), Kenya (21) where mother educational status did not show significant associated with anemia among adolescent girls. The possible justification is that there is a difference in study area and socio cultural factors of regarding the education and feeding habits of the children and adolescents. In our context it gives a high sense that when women are more educated they will have knowledge regarding to balanced diet and knew the sources of nutrients especially in this case iron sources of foods and knew how to given care to their children. In addition to this, as we know most of the time mothers are collected a variety of foods which are used for eating purpose at home and it might be required knowledge in order to incorporate foods that contain iron rich foods.

The odds of having anemia were 4.4 times higher among adolescents living separate from their family than lived with family. Similarly, the odds of having anemia were 2.5 times higher among adolescents who lived with their relatives compared to those who lived with their families. A similar finding was reported from a study conducted in Dembia North West, Ethiopia School going adolescent girls who lived with their guardians are more affected by anemia compared to their counter parts (34). The possible reason might be out of the adolescent girls who lived separate from their family about 59.6% of adolescent girls had low

dietary diversity score and 63.1% were from low house hold wealth tertile. Similarly adolescent girls lived with relatives 44.9% of their families were under low wealth tertile. This is because; economic status has significant implication in their purchasing power in order to get the balanced diet.

The present study also tells the odds of having anemia were 3.5 times higher among adolescents whose DDS is low compared to those who have high DDS. Similar study was reported from India, Nepal, Nigeria and Kenya as consumption of low diversified foods were associated with anemia among adolescent girls (21,25,33,41). This might be Dietary diversity that tells about number of variety of food groups consumed over 24 hours prior to the data collection period is widely recognized as a key dimension of diet quality in individuals and households. Diet diversity is strongly associated with nutrient adequacy including iron adequacy (43).

This finding was also consistent with report of study result conducted in Tigray north Ethiopia (18), Dembia district north west Ethiopia (34) and this might be due to socio economic similarity. This is to mean that adolescents who consumed less quality diet are more likely to be anemic since probability of nutrient adequacy increases as diet variety or diversity increases.

In this study history of worm infestation for the last one month before data collection was not significant association with anemia among adolescent girls; this is not in agreement with similar study in Bahirdar where adolescent girls with history of parasitic infection were 2.8 times more likely to be anemic than those without intestinal parasite (35). This study also not consistent with study result reported in Kenya which was adolescent girls who had history of worm infestation were 12 times more likely to be anemic than those who did not have history of worm infestation (21). This variation might be due to the number of girls with history of worm infestation in our study is small in number that could lead the regression to generate no association between worm infestation and anemia. The second reason might be due to girls who are actually infected with intestinal worm are missed and reported as not having worm infestation as this study is limited to history taking rather than laboratory stool examination

History of malaria infection for the last one month before data collection period also was not significantly associated with anemia in this study which is in contrast with study result reported in Kenya where presence of malaria parasitemia was 3.8 times more likely to be anemic than who didn't have malaria parasitemia (21). The reason for this study doesn't

have association with anemia may be smaller of cases reported to have history of malaria and this also might be due to history was collected verbally from the participants instead of any test of blood and this might have masked the actual status of the respondents. Another possible reason might be, our country Ethiopia had implemented a mass campaign distributed nearly 29.6 million long lasting insecticidal nets (ITNs) to protect all Ethiopians living in areas with ongoing malaria transmission through expansion of health extension workers (48).

The odds of anemia were 2 times higher among adolescents who had menstrual bleeding more than 5 days as compared to adolescents girls with menstrual bleeding less than or equal to 5 days. This finding was consistent with study result reported in Tang ail region of Bangladesh, central Kerala India, Nepal And locally Bahirdar, North West Ethiopia (25,35,39,41). This might be due to the fact that as increase duration of menstruation there will be high chance of more blood loss that can lead to anemia. .

This study revealed that low economic status has been a one factor for anemia in adolescent girls AOR =2.684 (1.457, 4.945). The odds of anemia were 2.6 times higher among adolescents whose families are under low wealth status than who had high wealth status families. This finding also comparable with study report result conducted in Berhale afar region (15) that was adolescent girls with low economic status was 2.8 times more likely to be anemic than compared to counterpart. This finding also consistent with conducted in Tang ail region of Bangladesh (39), Amravati city, India, Chennai, Tamil, India (49). This implies that low family income is difficult to obtain a variety of foods including iron rich food sources.

6.1 limitation of the study

Limitation of the study

The limitation of the study might be recall bias because the data collection was 24 hours based for the dietary diversity. We tried to the study participants and assisted to memorize more for more quality data. Age of respondents that should have been taken from birth certificates was recorded from respondents and cross checked from their school register to minimize inaccuracy because the respondents were hardly had certificates. Some explanatory variables such as malarial infection and worm infestation were had taken based on the recall history in the last one month and not laboratory tested during data collection period it might be compromise the accuracy of the data.

7. Conclusion and Recommendation

7.1 Conclusion

In this study prevalence of anemia was moderate public health problem. Factors associated with anemia were low wealth status, adolescent girls living separately from their parents, low dietary diversity score and duration of menses greater than five days. However, adolescents' mother who had attended at least a secondary school was a protective factor for anemia in adolescent girls in this study.

7.2 Recommendation

The finding of this study indicated that the prevalence of anemia among adolescent girls a moderate public health concern which requires public health interventions. So, based on the findings of the study the following recommendations are made.

Jimma town health district offices

- Should be facilitating school based iron supplementation program with collaboration of different stakeholders based on WHO recommendation.
- Assist and give direction for health extension workers in order to give comprehensive and routine counseling service in house to house nutrition education for families of adolescent girls focusing on diversified diet and iron rich food sources.

Researchers

- The researchers would conduct more rigorous community based supported with malaria and parasitic laboratory tests in adolescent girls.
- In the future researchers should conduct other longitudinal studies in order to know the etiology of anemia among adolescent girls.

Jimma town administrative education office and Schools

- Should work collaboratively with the health sectors on iron/ folic acid supplementation and adolescent's consumption of iron rich foods.
- Facilitate nutrition education through establishing nutrition clubs in schools
- Would facilitate and implement adult literacy program especially for mothers.
- Each school work collaboratively with parent teacher associations,

Jimma town urban job creation and food security office

- Should give job opportunity for lower class of the population in the town, in order to improve the likelihood of peoples who are unable or unemployed.
- Should assist and organize unemployed people as micro enterprise, in order to have their own income.

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Annex

Jimma University, institute of health faculty of public health

Department of population and family health, Human nutrition

Annex A: Participant Information Sheet and Consent Form for parents/students

Hello, my name is _____. I am working as a data collector for the study being conducted in this school by Mr. Kelemu Fentie who is studying for his Master's degree in Human Nutrition at faculty of public health, Jimma University, I kindly request you to lend me your attention to explain to you about the study and being selected as the study participant.

The study/project title: Anemia and its associated factors among secondary school adolescent girls of Jimma town, south west Ethiopia.

Purpose/aim of the study: The findings of this study can be of a paramount importance for the town health office to plan intervention programs to prevent and reduce anemia among school adolescents and others; there by improve adolescent health and survival in general. Moreover, this study helps as thesis for the partial fulfillment of requirements for a Master's of Human Nutrition for the principal investigator.

Procedure and duration: I will be interviewing you using a questionnaire so that you will provide me with pertinent data that is helpful for the study. I will measure your height and weight, and I will also take a drop of blood from your ring finger tip. The interview will take about 20-30 minutes. So, I kindly request you to spare me this time for the interview.

Risks and benefits: The risk of being participant in this study is very minimal, but only taking few minutes from your time and very minimal pain while pricking your finger tip. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners. In case you are found to be anemic we will counsel you and if severely anemic we will link you to the nearby health facility for further assessment and proper medical care.

Confidentiality: The information you will provide us will be confidential. There will be no information that will identify you in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons or housing. The questionnaire will be coded to exclude showing names.

Rights: Participation for this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contact address: If there are any questions or enquires any time about the study or the procedures, please contact us by the following address.

The principal investigator: Mr. Kelemu Fentie, Mobile phone: +251-9-48-95-69-32, Email address kelemu.2018fentie@gmail.com

Declaration of informed voluntary consent:

I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that my son/daughter have the right to withdraw from the study at any time or not to answer any question that he/she does not want to answer. Therefore, I on behalf of my son/daughter declare my voluntary consent to participate in this study with my initials (signature).

Name and signature of parent/guardian/student: _____.

Name and signature of data collector: _____.

Annex A 1; English version questionnaires

Part one; Demographic and socio economic characteristics questions			
s.n	Questions	Response	Remark
101	Age of the respondent	_____year	
102	Grade of the respondent	<ol style="list-style-type: none"> 1. Grade 9th 2. Grade 10th 3. Grade 11th 4. Grade 12th 	
103	Type of school	<ol style="list-style-type: none"> 1. Private 2. Government 	
104	Name of school	<ol style="list-style-type: none"> 1. Jiren sec school 2. Jimma preparatory school 3. Catholic sec school 4. Tesfa tewahido sec school 5. Sexo semero sec school 	
105.	Ethnicity	<ol style="list-style-type: none"> 1. Oromo 2. Amhara 3. Dawuro 4. Gurage 5. Keffa 6. Yemm 7. Others----- 	
106	Religion	<ol style="list-style-type: none"> 1. Orthodox 2. Muslim 3. .Protestant 4. Catholic 5. Others 	
107	Father educational status	<ol style="list-style-type: none"> 1. can't read and write 2. Can read and write 3. primary(1-8) 4. secondary (9-12) 5. above 12 	
108	Mother educational status	<ol style="list-style-type: none"> 1. Can't read and write 2. Can read and write 3. primary(1-8) 4. secondary (9-12) 5. above 12 	
109	Family size	_____	
110	What rank you got from your class in the last year.	_____rank	
111	Marital status	<ol style="list-style-type: none"> 1. married 2. single 3. others 	
112	Which explains about your family	<ol style="list-style-type: none"> 1. Both parent alive 2. Father alive 3. Mother alive 4. Both parent died 	
113	Do you have a	<ol style="list-style-type: none"> 1. Yes 	

	child(children)	2. No	
114	What is your father's/ guardian occupation?	1. government employee 2. merchant 3. daily laborer 4. private employee 5. others_____	
115	What is your mother's/ guardian occupation?	1. housewife 2. merchant 3. government employee 4. private employee 5. daily laborer 6. others_____	
116	Current living status	1. Living with parent 2. Living with relative 3. Living separate from family	

House hold wealth index

Does your house hold have any of the following(circle all answers)		Yes	No
117	Own house		
118	Car		
119	Sofa		
120	Mattress		
121	Bed /blanket		
122	Bicycle		
123	Motor cycle		
124	Television		
125	DVD/CD player		
126	Refrigerator		
127	Electric stove		
128	Electric mitad		
129	Washing machine		
130	Table and chair		
131	Mobile phone		
132	Fixed line phone		
133	Computer		
134	Video camera		
135	Digital camera		
136	Bajaj		
137	Gas stove		
138	Domestic animals		
139	Radio/ tape recorder		
140	Shelf		
141	Cow		
142	If yes for question number 141 how many cows do you have?		

Part two knowledge

I am going to ask you some questions about anemia and iron-rich foods. Please let me know if you need me to clarify any of my questions. Feel free to ask any question you may

have.i			
201	Did you ever heard of about iron deficiency anemia?	<ol style="list-style-type: none"> 1. yes 2. .no 3. don't know 	
202	If yes for question number 201 how can you recognize someone who has anemia?	<ol style="list-style-type: none"> 1. Less energy/weakness 2. Paleness? pallor 3. Spoon nails or bent nails 4. More likely to become sick 5. I don't know 	
203	Do you mention the consequences of iron deficiency anemia for infants and young children?	<ol style="list-style-type: none"> 1. Delay of mental and physical development 2. Others_____ 3. I don't know 	
204	Do you know the causes of iron deficiency anemia?	<ol style="list-style-type: none"> 1. Lack of iron in the diet/eat too little, not much 2. Sickness/infection (malaria, hookworm infection, other infection such as HIV/AIDS) 3. Heavy bleeding during menstruation 4. Don't know 	
205	Do you know the consequence of anemia for pregnant women?	<ol style="list-style-type: none"> 1. Risk of dying during or after pregnancy 2. Difficult delivery 3. Others_____ 4. I don't know 	
206	Do you mention the prevention methods of anemia?	<ol style="list-style-type: none"> 1. Eat/ feeds iron rich foods /having a diet rich in iron 2. Eat /give vitamin c rich foods during or after meals 3. Take /given iron supplements if prescribed 4. Treat other causes of anemia(worms, malaria) 5. Continue breast feeding (for infants 6-23 months years old) 6. I don't know 	
207	Do you mention iron rich foods which are easily absorbable?	<ol style="list-style-type: none"> 1. Organ meats(liver, kidney and heart) 2. Flesh meat(lamp. Goat, chicken) 3. Legumes (beans, peas, chick, soya beans peas and lentils) 4. Vitamin c rich foods(spinach, pumpkin) 5. Red meat 6. Don't know 	

208	Do you mention foods increase iron absorption?	<ol style="list-style-type: none"> 1. Vitamin c foods (fresh citrus fruits orange, lemons etc 2. Others 3. Don't know 	
209	Do you mention foods that decrease iron absorption?	<ol style="list-style-type: none"> 1. Coffee 2. Tea 3. Other 4. Don't know 	

Part three. Dietary Diversity Questionnaire For Adolescents

Now I would like to ask you about the type of foods that you ate yesterday during the day and at night. Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.

301	How many times you eat per day?	<ol style="list-style-type: none"> 1. Once 2. Two times 3. Three times 4. More 	Remark
302	Starchy staples (Cereals White roots & tubers)	Any maize, Teff, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. Injera, bread, kixaa, noodles, porridge, Atmit, bread, local pasty & biscuits.....	<ol style="list-style-type: none"> 1.yes 2.no
		Any white potatoes, white yam, white cassava, or other foods made from roots like godore, enset.	<ol style="list-style-type: none"> 1.yes 2.no
303	Dark green leafy Vegetables	Any Dark green leafy vegetables, including wild forms and locally available vitamin A rich leaves such as cassava leaves, kale, spinach , Lettuce,	<ol style="list-style-type: none"> 1.yes 2.no
304	other vitamin A rich fruit and vegetable group (Vitamin A rich Vegetables & tubers Vitamin A rich) fruit	Pumpkin, carrot, squash, or sweet potato that are orange inside and other locally available vitamin A rich vegetables (e.g. red sweet pepper)	<ol style="list-style-type: none"> 1.yes 2 no
		Any Ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 100% fruit juice made from these + other locally available vitamin A rich fruits	<ol style="list-style-type: none"> 1.yes 2 no
305	Other fruits and vegetables	Any other vegetables (e.g. tomato, onion, eggplant) + other locally available vegetables	<ol style="list-style-type: none"> 1.yes 2.no

	(Other vegetables Other fruits)	Any other fruits, including wild fruits and 100% fruit juice made from these	1.yes 2.no
306	Organ meat	Any Liver, kidney, heart or other organ meats or blood-based foods	1.yes 2.no
307	meat group	Any Beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects	1.yes 2.no
	(Flesh meats Fish & seafood)	Any Fresh or dried fish or sardines	1.yes 2.no
308	Eggs	Eggs	1.yes 2.no
309	Legumes, nuts & seeds	Any Dried beans, dried peas, lentils, nuts, seeds or foods made from these (Eg. shiro wet, kik wet, misir wet, shimbira kolo, bakela ashuk, adengware, boloke.....)	1.yes 2.no
310	Milk & milk products	Any Milk, cheese, yogurt or other milk products like aguat, arera....	1.yes 2.no
311	Oils and fats	Any Oil, fats or butter added to food or used for cooking	1.yes 2.no
312	Sweets	Any Sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes	1.yes 2.no
313	Do you usually drink tea/coffee after meal?	1. Yes 2. No	
314	If your response for q no.313 is yes do you drink every day?	1. Yes 2. No 3. I don't know	
315	When do you drink coffee or tea?	1. Two hours or more before a meal 2. Right before a meal 3. During the meal 4. Right after a meal 5. Two hours or more after a meal 6. I don't know	
Part four. Health related			
401	Status of menarche	1.Attained 2.Not attained	
402	Age at onset of menses in years	_____	
403	For how many days menstruation	1. 3 days or less	

	stay per each cycle.	2. 4 days 3. 5 days 4. 6 days 5. 7 days 6. 8 days or more	
404	How often you change your pad in a day during menstruation.	1. 3 times or less 2. 4 -6 times 3. >6 times	
405	Currently menstruating?	1.Yes 2.No	
406	History of malaria in the last one month?	1.Yes 2.No	
407	History of warm infection in the last one month?	1.Yes 2.No	
408	De-worming in the last one month?	1.Yes 2.No	
Part five anthropometric data			
501	Height the respondent in centimeter	_____ cm	
502	Weight of the respondent	_____ kg	
503	MUAC	_____ cm	
Part six; hemoglobin test			
601	Hemoglobin	_____ g/dl	

Thank you for your participation!

Annex B.AFAAN OROMOO VERSIION

Inistiitiyuuti fayyaa yunivarsiitii jimma

Unka ragaa hirmaatotta fi hayyamu maatii/ baratotaa

Akkam ani maqaan koo_____ jedhama, Yunivarsiitii jimma irrann dhufe kanafu amma waa'ee hir'ina dhigafi saaxilaa issa shamaran darggago irratti ragaa funaanufi. Qorannoochi kan gaggeefamun Inistiitiyuuti fayyaa yunivarsiitii jimmaatii kadhimamaa digri lammata kan ta'e Qalamu Fantettin waa'ee qoranniichafi maliif akka filatamtane wanan ibsuuf imaallu qalbiin na hordofuuf hayyamama ta'u kessanif issinin galateefadha.

Matadureen qorannoocha; Hir'ina dhiga fi saaxilla issa shamaran darggago irratti mana barumsa sadarka lammata jimma irratti kan adeemsifamuu

Kaayyon qorannoocha; kaayyon qorannoochas shamaran darggago irratti mana barumsaa sadarka lammata jimma irratti hir'ina dhigaa maal akka fakkatufi sababotta issaf saaxillan addan baasufi. Bu'aan qorannoocha kan irra argamu birron magaalicha hir'ina dhiga shamaran darggago irratti mul'atu ittisuuf karoora baffachufi raawwiif issa gargaaraa. Kan irra kan darbe digri lammata saayinsi nyaata eebifamuuf akka galumsatti gargaara.

Yeroo turmaata qorannoochaf adeemsa issa; raagan issin na laataan galmaa ga'uu qorannoochaf baayy'ee barbaachisadha. Ulfatiinafi hojja/dheerina ke nan safaraa sana boda harka bitaa qubeela ke irra dhiga xiqqoo fudhe qorannoo hir'ina dhigaa kanin si gaggessuu ta'a, kun hundinu kan raawwatamu daqiiqaa digdama hanga soddomaa kessatti.

Iccittumma qorannoocha; maaqan kessan raagacha keessa hin seenu, raagan issin naa laataan hunduma iccittiin akkan eeguu waada galaa

Mirga keessan illalchise; qorannoo kan irratti hirmaachuuf guutumman guutuutii hayyamamuman barbachisadha.

Hirmaachuuf hirmaachuu dhiisuunu mirga qabdu,.hirmaachuuf murteessiitani garu qorannoocha hin fedhuu jechuun yeroo barbaadanitii addan kutuuf mirga qabdu.

Teseso qoratiicha; gaffii kamiyyuu kan qorannoochan wal qabate bilbilan ykn emailiin gaffaachu ni dandeessuu

lakkoofsa mobaayilaa ; 0948956932

email; kelemu.2018fentie@gmail.com

Unka hayyamamaa ta’u keessan

Unka hirmaatotta na dubbifame ykn dubbise hubadhera. kaayyo qoranniicha bu’aaf rakkoo isa, iccituma isa,hirmaachuuf hirmaachuu dhiisuu fi kan ani hin hubane yoo jiraate qorataacha akkan gaffadhu akkasumas muccan koo qorannoocha itti fufuu yoo hin barbaane mirga addan kutuu akka qabdu kan na hubachise fi muccan koo qorannoocha keessatti akka hirmaatuu hayyamama ta’u koo mallatto koottiin nan ibsa

maaqaafi mallatto maatii/gudiisaa/barataa _____

Maaqaafi mallatto raga funaana _____

Annex B 2:

Kutaa:-1 gaaffilee haala hawas-dinadgee ilaallatu.			
Lakk	Gaaffii	Deebii	Remmarkii
101	Umrii	Waggaa _____	
102	Kutaabarnootaa	1. kutaa 9ffaa 2. kutaa 10ffaa 3. kutaa 11ffaa 4. kutaa 12ffaa	
103	Gosamanabarum saa	1. Mootummaa 2. Dhuunfaa	
104	Maqaa Manabarumsaa	1. Mana barumsa jireen sad.2ffaa 2. Mana barumsaa qophaa’ina jimmaa 3. Mana barumsaa kaatolikii sad.1ffaa fi 2 ffaa 4. Mana barumsa tasfaawahidoo sad.2ffaa 5. Mana barumsaa satoo samaroo sad. 2ffaa	
105	Sabumaankeema al?	1.Oromoo 2.Amaara 3.Dawuroo 4.Guraagee 5.Kafaa 6.Yem 7.Kan birooibsi _____	
106	Amantaankeema alii?	1.Ortodoksii 2.Musliima 3.Protestantii 4. Caatolikii 5.kan birooibsi _____	

107	Sadarkaanbarnoo taabbaakee?	1-Hin baranne 2-Barreessuuf dubbisuu 3-Kutaa barnootagad-aanaa(1-8) 4-Kutaa barnootaolaanaa(9-12) 5-kutaa 12 ol	
108	Sadarkaabarnoot ahaadhakee?	1-Hin baranne 2-Barreessuuf dubbisuu 3-Kutaa barnootagad-aanaa(1-8) 4-Kutaa barnootaolaanaa(9-12) 5-kutaa 12 ol	
109	Baay'namaatiike essanii?	_____	
110	Sadarkaawaggaa darbee baate?	_____	
111	Haalagaa'ilaa	1-Hin heerumne 2-Kan heerumte	
112	Haalamaatii	1.Maatiinlammaanuulubbuun jiru 2.Abbaaqofatuulubbuunjira 3. Haadhaqofatuulubbuun jira 4.Lammaanuulubbuunhinjiran	
113	Ijoolleeqabdaa?	1-Eyyee 2-Miti	
114	Hojiinabbaakeeti i/guddiftuu/maali?	1-Hojii mootummaa 2-Daldalaa 3-Qonnaan bulaa 4-Kan biro ibsi	
115	Hojiinhaadhakee /guddiftuu/keem aali?	1-Haadha manaa 2-Qonnaan bulaa 3-Hojii mootummaa 4-Daldalaa 5-Kan biro ibsi _____	
116	Ammaeenyufaan ajiraata?	1-Maatii faana 2-Fira faana 3-Maatii irraaddaba'uun	

Gaaffilee qabeenya meeshalee manaa ilaallatu

MannikeessanMeeshaarmaangadiiqaa baa?		Eyyee	Miti
117	Manajireenyaa		
118	Konkolaataa		
119	Soofaa		
120	Firaashii		
121	Siree/uffataqorraa		
122	Saaykili		
123	Doqdoqee		
124	Television		
125	DVD/CD player		

126	Firiiji		
127	Stooviiibsaa		
128	Elee elektirikii		
129	Maashiniiuffatamiicu		
130	Xarapheezaa fi taa'umsa		
131	Mobaayelii		
132	Bilbilamanakeessaa		
133	Compiitera		
134	Kaameraaviidiyoo		
135	Kaameraadigiitaalaa		
136	Baajaajii		
137	Butaagaazii		
138	Horii manaa		
139	Raadiyoo		
140	Madardaraa		
141	Sa'aa		
142	YooLakk 141 eyyeeta'emeeqa?		
Kutaa-2 GaaffiiHubannoowaa'eehanqinadhiigaatii fi gosootanyaataaalbuudaayiranii of keessaaqaban			
201	Waa'eehanqinadhiigaadhagee sseebeektaa?	1. Eyyee 2.miti	
202	Yoogaaffiin 201 eyyeeta'enamnitokkohanqina dhiigaaqabaachuuisaaakkamit tiaddaanbaasu?	1. Ni dadhaba 2. Ni addaata 3. Akkasalpaattidhukkubsata 4. Hinbeeku	
203	Miidhaahanqinnidhiigaadaa'i manii fi ijjoollleeirratifidubeektaa?	1. Turtiiguiddinaqaamaa fi sammuu 2. Kanbiraa_____ 3. Hinbeeku	Yoohinbeek neisaitiaan uttidarbi
204	Karaahanqinnidhiigaanamatti dhufubeektaa?	1. Nyaatakeessattidhibamuuyknx iqqaachuualbuudadhiigaa 2. Dhukkubootaakkabusaa ,raammoogaraa fi HIV 3. Dhiigagaramalee 4. Hinbeeku	
205	Miidhaahanqinnidhiigaadubar tootaulfaairratifidubeektaa?	1. Yerooda'umsaa fi da'umsaboodadu'uudanda'u 2. Da'uudadhabuu 3. Kanbiroo_____ 4. Hinbeeku	
206	Karaaaitiinnanqinadhiigaaoffir raaitisanbeektaa?	1. Nyaataalbuudadhiigaa of keessaaqabannyaachuu 2. Nyaatavaaytaaminoota of keessaaqabannyaatafaanayknn	

		yaataboodafudhachuu 3. Kiniinadhiigaayeroonamaafaja jamufudhachuu 4. Dhukkubootaakkabusaa fi raammoogaraayaalamuu 5. Daa'immanji'a 6-23harmaittifufaniihoosisuu 6. Hinbeeku	
207	Gosootanyaataaalbuudadhiiga of keessaaqabanii fi akkasalphaattiqaamakeenyaw aliinwalfudhachuudanda'anbe ektaa?	1. Foonakka (tiruu,onnee fi kale) 2. Foonre'ee ,lukkuu 3. Baaqelaa,aatoo,misira 4. Gosootanyaata vaaytaminii c of keessaaqaban(dabaaqula) 5. Foondiimmaa 6. Hinbeeku	
208	Gosootanyaataaalbuudnidhiigaaqaamnikeenyakeessattifaca' uudabalanibsuudandeessaa?	1. Gosootanyaataavaaytamiic of keessaaqaban foods (loomii, burtukaana 2. Kanbiroo 3. Hinbeeku	
209	Gosootanyaataaalbuudnidhiigaaqaamnikeenyakeessattifaca' uuhir'isanibsuudandeessaa?	1. Buna 2. shayii 3. kanbiroo 4. hinbeeku	
<p>Kutaa -3 Gaaffiiwaa'eenyaatamadaalawaa. Ammakanansigaafadhugosootanyaataakaleessaganamaa(ciree) kaasteehangahar'aganamaatti(cireetti) manaa fi manaaalattinyaatenaafibsita.</p>			
301	Guyyaattisi'ameeqanyaata?	1. Al tokko 2. Al lama 3. Al sadii 4. Al afurii fi isaaol	
302	Gosootamidhaandheedhii fi hiddaa	Xaafii,boqqolloo,ruuzii,qamadii,boobee,daagussaaykngosootanyaataakan irraahojjetame(buddeena,daaboo,paas taa.....)	1.Eyyee 2.Miti
		Gosootadinichaaadii,goodarreeqooccoo.	1.Eyyee 2.Miti
303	Gosootakuduraalee fi fuduraaleemagarisata'an	Gosootanyaataavaaytaminii A of keessaaqaban (raafuu,salaaxaa fi qosxaa)	1.Eyyee 2.Miti
304	Gosootavaaytaminii A kanbiroo	Dabaaqula,kaarotii,maangoo ,paapayyaabifajuusiinisyoota'e.	1.Eyyee 2 Miti
	Kuduraaleefifuduraaleekanbiro	Timaatimii,qullubbii,abukaadoo,kook	1.Eyyee

305		iifikkf.	2.Miti
306	Foonqaamaa	Gosootafooniikanakka ; tiruu,kaleonnee fi kkf	1.Eyyee 2.Miti
307	Gosootafoonii,qurxummii fi nyaatagalaanaa	Gosafooniikamiyyuukanhoriire'eeluk kuu fi kkf	1.Eyyee 2.Miti
308	Killee/Hanqaaquu		1.Eyyee 2.Miti
309	Gosootabaaqelaa fi ataraa;lawuzii	Gosootanyaata kana irraahojjetaman (Fkn. Ittooshiroo, misiraa wet, shimbiraa, adenguare, boloke.....)	1.Eyyee 2.Miti
310	Annanii fi bu'awanannanii	Annanii fi bu'awanannanii,annani ,ittittuu,areera	1.Eyyee 2.Miti
311	Gosootazayiitii	Gosootazayiitiinyaatabilcheessuuffay yadanyknnyaatatidabalaman	1.Eyyee 2.Miti
312	Gosootanyaatami'aawaa	Sukaara,damma, karamellaa,juusiisukaaraqabu,keekii fi kkf	1.Eyyee 2.Miti
313	Nyaataaboodabunayknshayiimid hugdaa?	1. Eyyee 2. Miti	Yoomitita' egaralakk. 401 darbi
314	Yoo lakk..313 eyyeeta'eyeroohundadhugdaa?	1. Eyyee 2. Miti 3. Hinbeeku	
315	Yerookambunayknshayiifayyad amta?	1. Nyaatadurasa'aalamaafisaaol 2. Nyaatadura 3. Nyaatafaana 4. .Nyaatabooda 5. Nyaataaboodasa'aalamaafisaa ol 6. Hinbeeku	
Kutaa.4 Waa'e Fayyummaa			
401	Waa'ee lagu	1. 1.Arguu jalqabdee 2.Arguu hinjalqabne	
402	Umurii yeroo jalqaba lagu sitti mu'ate		
403	Laguun yeroo sitti dhufu guyyaa meeqa sirra tura	1.Guyyaa 3fi isaa gad 2. Guyyaa 4 3.Guyyaa 5 4. Guyyaa 6 5. Guyyaa 7 6.Guyyaa 8 fi isaa oli	

404	Guyyaatti moodesii deebii meeqa jijjiirrata	1. 3 fi isaa gad 2. .4 -6 3. >6	
405	Amma laguu irra jirtaa?	1. Eyyee 2. Miti	
406	Ji'a tokkoo asitti dhukkubni busaa si qabeeraa?	1. Eyyee 2. Miti	
407	Ji'a tokkoo asitti rammoon garaa sitti mul'ateeraa?	1. Eyyee 2. Miti	
408	Ji'a tokkoo asitti kiniina raamoo garaa fudhateetaa?	1. Eyyee 2. Miti	
Part five anthropometric data			
501	Hojjaan kee meeqaa?	_____cm	
502	Ulfaatin kee meeqaa?	_____kg	
503	MUAC	_____cm	
601	Part six; hemoglobin test	_____g/dl	

Hirmaannaakeessaniifgalatoomaa!

አባሪ ሐ

ጅም ዩኒቨርሲቲ ጤና ኢንስቲትዩት

የሥነ ሕዝብ እና ቢዮሎጂ ጤና ትምህርት ክፍል ስነ ምግብ ዩኒት

አባሪ 3.1 የተሳታፊዎች መረጃ መስጫ እና ፈቃደኝነት መጠየቂያ አባሪ በአማርኛ

ጤና ይስጥልኝ ስሜ _____ እባላለሁ፣ ከጅም ዩኒቨርሲቲ ነገር የመጣሁት እናም አሁን ስለታዳጊ ሴቶች ላይ የደም ማነስ እና አጋላጭ መንገዶች ላይ መረጃ ለመስጠት ነው። ጥናቱ የሚካሄደው በቀለሙ ፈንቱ ከጅም ዩኒቨርሲቲ የጤና እንስሳት-የት የሥነ ሕዝብ እና የቤተሰብ ጤና ትምህርት ክፍል የሁለተኛ ዲግሪ መርሃ ግብር ተመራቂ ተማሪ ነው። ስለጥናቱ እና ለምን እንደተመረጡ አጠቃላይ መረጃ ልሰጥዎት ስለሆነ በጥሞና እንዲከታተሉኝ ፈቃደኛ ስለሆኑ አመሰግናለሁ።

የጥናቱ ርዕስ፣ ታዳጊ ሴቶች ላይ የደም ማነስ እና አጋላጭ መንገዶች በጅም ከተማ የሁለተኛ ደረጃ ትምህርት ቤቶች ላይ የሚካሄድ።

የጥናቱ አላማ፡ የጥናቱ ዓላማም በጅም ከተማ የሁለተኛ ደረጃ ትምህርት ቤት በታዳጊ ሴት ልጆች ላይ የደም ማነስ ምን እንደሚመስል ለማወቅ እና አጋላጭ መንገዶችን ለመለየት ነው። ከዚህ ጥናት የሚገኘው ወጤትም የከተማው ጤና ቢሮ በታዳጊ ሴት ልጆች ላይ የሚታየውን የደም ማነስ ለመከላከል እቅድ ለማወቅ ዕና ለመተግበር ያግዘዋል። ከዚህ ባለፈ ደግሞ ስነ ምግብ ሳይንስ የሁለተኛ ዲግሪ መመሪያ እንደ ማሞያ ጥናትም ይጠቅማል።

ጥናቱ የሚቆይበት ጊዜ እና ሂደት፡ እርስዎ የሚሰጡኝ መረጃ ለጥናቱ መሳካት በጣም አስፈላጊ ነው። ክብደት እና ቁመትሽንም እልካለሁ ከዚህ በተጨማሪም ከግራ የቀለበት ጣፕሽ ትንሽ ጠብታ ደም ወስጆ የደም ማነስ ምርመራ የማድረግልሽ ይሆናል። ይህ ሁሉ የሚሆነው ከሃዩ አሰክ ሰላሳ ደቂቃ ባለው ወስጥ ነው።

ሚሰጠውላቸው፡ ስምዎት ከመረጃው ጋር አይካተትም፤ የሰጡኝን መረጃ ሁሉ በሚስጥር እንደምጠብቅልዎ ቃል እገባለሁ።

መብትዎን በተመለከተ፡ በዚህ ጥናት ላይ ለመሳተፍ ሙሉ ብሙሉ በፈካደኝነት ላይ የተመሰረተ ነው። መሳተፍዎ ያለመሳተፍዎ መብትዎ ነው። ለመሳተፍ ወስነውም ቢሆን ጥናቱን አልፈልግም ብለው ካሰቡ በማንኛውም ሰዓት ጥናቱን ማቆረጥ ይችላሉ።

የተመራማሪው አድራሻ፡ ከጥናቱ ጋ የተያያዘ ማንኛውንም አይነት ጥያቄ በስልክ ወይም በ ኢሜል አድራሻዬ ማናገር ወይም ማግኘት ይችላሉ። ሞባይል ስልክ፡ 09 48 95 69 32

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ፈቃደኛ ስለሞሆንዎ ማሳዎቂያ ቅጽ

የተሳታፊዎችን መረጃ ቀጽ አንብቤው ወይም ተነቦለኝ በሚገባ ተረድቸዋለሁ። ስለ ጥናቱ ጥቅም ጉዳት አለማ ምሰጣሪዎን የመሳተፍ ሆነ ያለመሳተፍ እንዲሁም ችግር ያልገባኝ ነገር ቢኖር ጥናት አድራጊዎን እንደምጠይቅ እንዲሁም ልጄንም በጥንቱ መቀጠል ካልፈለገኝ የመተወ መብት ንንዳላት ያሰረዳኝን መሆኑን እና ልጄም በጥናቱ ወስጥ እንድትሳተፍ ፈቃደኛ መሆኔን በፊርማዬ አረጋግጣለሁ።

የወላጅ/ ያሳዳጊ/የተማሪ ስምና ፊርማ_____

የመረጃ ሰብሳቢው ስምና ፊርማ_____

አባሪ 3.2 የአማርኛ ትርጉም - መጠይቅ

ክፍል 1: የተሳተፉዎች አጠቃላይ ማህበራዊ እና ኢኮኖሚያዊ መረጃዎች

ተራ ቁጥር	ጥያቄ	መልስ	ምርመራ
1	ዕድሜ	_____	
2	የትምህርት ደረጃ(ክፍል)	<ol style="list-style-type: none"> 1. 9ኛ ክፍል 2. 10ኛ ክፍል 3. 11ኛ ክፍል 4. 12ኛ ክፍል 	
3	የትምህርት ቤቱ አይነት	<ol style="list-style-type: none"> 1. የመንግሥት ት/ቤት 2. የግል ት/ቤት 	
4	የትምህርት ቤቱ ስም	<ol style="list-style-type: none"> 1. ጅሬን ሁለተኛ ደረጃ ት/ቤት 2. ጅማ ፐሪፓራቶሪይ ት/ቤት 3. ኢልዳን ት/ቤት 4. ተስፋ ተዋህዶ ት/ቤት 5. ሰጦ ሰመሮ ሁለተኛ ደረጃ ት/ቤት 	
5	ብሄር	<ol style="list-style-type: none"> 1. አሮሞ 2. አማራ 3. ዳዉሮ 4. ጉራጌ 5. ከፋ 6. የም 7. ሌላ _____ 	
6	ሀይማኖት	<ol style="list-style-type: none"> 1. አረቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ ካለ ይገለፅ _____ 	
7	የአባት የትምህርት ሁኔታ	<ol style="list-style-type: none"> 1. ማንበብ እና መጻፍ ማይችል 2. ማንበብ እና መጻፍ የሚችል 3. አንደኛ ደረጃ(1-8) 4. ሁለተኛ ደረጃ(9-12) 5. ከ 12 በላይ 	
8	የእናት የትምህርት ሁኔታ	<ol style="list-style-type: none"> 1. ማንበብ እና መጻፍ ማይችል 2. ማንበብ እና መጻፍ የሚችል 3. አንደኛ ደረጃ(1-8) 4. ሁለተኛ ደረጃ(9-12) 5. ከ 12 በላይ 	
9	የቤተሰብ ብዛት	_____	
10	ባለፈው ዓመት ከክፍል ስንተኛ ደረጃ ይዘሽ ነው ያጠናቀቅሽው	_____ ደረጃ	
11	የጋብቻ ሁኔታ	<ol style="list-style-type: none"> 1. ያገባች 2. ያላገባች 	

		3. ሌላ_____	
12	የእናት እና የአባት ሽን ሁኔታ የቱ ይገልፀዋል	1. አባት እና እናት በህይወት ያሉ 2. አባት ብቻ በህይወት ያሉ 3. እናት ብቻ በህይወት ያሉ 4. እናትም አባትም በህይወት የሌሉ	
13	ልጅ አለሽ	1. አዎ 2. የለኝም	
14	የአባት ሽ ወይም የአሳዳጊ የሥራ ሁኔታ	1. የመንግስት ሰራተኛ 2. ነጋዴ 3. የቀን ሰራተኛ 4. በግል ስራ የተሰማራ 5. ሌላ ይገለፅ_____	
15	የእናት ሽ ወይም የአሳዳጊ ሽ የስራ ሁኔታ	1. የቤት እመቤት 2. ነጋዴ 3. የመንግስት ሰራተኛ 4. በግል ስራ የተሰማራ 5. የቀን ሰራተኛ 6. ሌላ ይገለፅ_____	
16	አሁን ከማን ጋር ነዉ ምትኖሪዉ	1. ከቤተሰቦቼ ጋር 2. ከ ዘመዶቼ ጋር 3. ከቤተሰብ ተለይቼ	

የቤት ዉስጥ ቁሳቁስ
ቤታችሁ ዉስጥ ከዚህ በታች ከተዘረዘሩት መካከል ምን ምን አላችሁ(አለን ከሆነ √ የለም ከሆነ ደግሞ X ምልክትን ይጠቀሙ)

		አለን	የለንም
117	የግል ቤት		
118	መኪና		
119	ሶፋ		
120	አንሶላ		
121	አልጋ/ ፍራሽ		
122	ብስክሌት		
123	ሞተር ሳይክል		
124	ቴሌቪዥን		
125	ዲቪዲ ማጫዎቻ		
126	ፍሪጅ		
127	ሰቶሽ		
128	ኤለክትሪክ ምጣድ		
129	ማጠበያ ማሽን		
130	ወንበርና ጠረጴዛ		
131	ሞባይል ስልክ		
132	የግድግዳ ስልክ		
133	ኮሙፒዩተር		
134	ቪዲዎ ካሜራ		
135	ዲጂታል ካሜራ		
136	ባጃጅ		
137	ቡታ ጋዝ		
138	የቤት እንስሳት		

139	ሬዲዮ/ ቴፕ ሪከርደር		
140	መደርደረያ/ ቡፌ		
141	ላም		
142	ለጥያቄ ቁጥር 141 መልስዎ አለን ከሆነ ስንት ላም አላችሁ	_____	
ክፍል ሁለት፤ ደም ማነስ እና ተያያዥ ጉዳዮች ያለዎትን እውቀት መለኪያ መጠይቅ			
201	ስለ ደም ማነስ ሰምተሽ ታወቁያለሽ	1. አዎ 2. የለም 3. አላውቅም	መልስሽ 2 ወይም 3 ከሆነ ወደ 301 ይለፉ
202	ለጥያቄ ቁጥር 201 መልስዎ አዎ ከሆነ አንድ ሰው የደም ማነስ መኖሩን እንዴት ማወቅ ትችያለሽ	1. የአቅም ማነስ/ድካም 2. ሰውነት መገርጣት(ቢጫ መሆን) 3. ጠፍር የማንኪያ አይነት ቅርፅ መሆን 4. ብዙውን ጊዜ መታመም 5. አላውቅም	
203	የደም ማነስ በህፃን ልጆች እና በታደጊ ልጆች ጤና ላይ የሚያስከትለው ተፅዕኖ ምንድን ነው	1. የአካልና የ አዕምሮ ዘገምተኛ መሆን 2. ሌላ_____ 3. አላውቅም	
204	የደም ማነስ መንስኤዎችን ታወቅያለሽ	1. የብረት እጥረት/በጣም ጥቂት መመገብ፣ ጭራሹን ያለመመገብ 2. ህመም/ እንፌክሽን(ትላትል እና ሌላ አንድ HIV AIDS) 3. በወር አበባ ጊዜ ከባድ የሆነ የደም መፍሰስ 4. አላውቅም	
205	የደም ማነስ በነፍሰ ጡር እናቶች ላይ የሚያስከትለውን ተፅዕኖ ታወቁያለሽ	1. በእርግዝና ወይም ከእርግዝና በቁላ ለሞት ሊያጋለጥ ይችላል 2. በወሊድ ጊዜ መቸገር 3. ሌላ---- 4. አላውቅም	
206	ለደም ማነስ መከላከያ መንገዶችን መጥቀስ ትችያለሽ	1. በብረት የበለፀገ ምግብ መመገብ 2. ከምግብ ጋር እና ከምግብ በቁላ በ ቫታሚን ሲ የበለፀገ ምግብ መመገብ 3. በሀኪም የታዘዘ ተጨማሪ አይረን መውሰድ 4. ሌላ መንስኤዎችን ማከም(ትላትል ወባ) 5. ያለማቋረጥ ጡት ማጥባት(ከ 6-23 ወር እድሜ ላሉ ሕፃናት) 6. አላውቅም	

207	በ ብረት የበለፀጉ እና በቀላሉ ወደ ሰውነታችን ሊዋሃዱ የሚችሉ ሊጠቅሱለን ይችላሉ	<ol style="list-style-type: none"> 1. የጉበት ስጋ፣የኩላሊት ስጋ እና የልብ ስጋን መመገብ 2. የበግ ፣ የፍየል እና የዶሮ ስጋን መመገብ 3. ባቁላ መሰል ጥራጥሬ(ባቁላ፣አተር፣ ሽንብራ እና አኩሪ አተር የመሳሰሉትን መመገብ 4. በቫይታሚን ሲ የበለፀጉ ፍራፍሬዎችን (ዱባ፣ ስፒናች) መመገብ 5. ቀይ ስጋን መመገብ 6. አላጠቅም 	
208	በሰውነታችን ውስጥ የብረትን (አይረን) ወሀደት እንዲጨምር የሚያግዙ ምግቦችን ያወቃሉ	<ol style="list-style-type: none"> 1. በቫይታሚን ሲ የበለፀጉ ምግቦች (ትኩስ ብረቱካን፣ ሎሚ) 2. ሌሎች 3. አላጠቅም 	
209	በሰውነታችን ውስጥ የብረትን(አይረን) ወሀደት እንዲቀንስ የሚያደርጉ ምግቦችን ያወቃሉ	<ol style="list-style-type: none"> 1. ቡና 2. ሻይ 3. ሌላ_____ 4. አላጠቅም 	

ክፍል ሶስት ፤ አሁን ደግሞ በ 24 ሰዓት ውስጥ (ቀንና ማታን ያጠቃልላል) የተመገቡትን የምግብ አይነት ይግለፁ ቤት ውስጥም ከቤት ውጪም የተመገቡትን ያጠቃልላል፤ አዎ ከሆነ 1 አይደለም ከሆነ 2ን ይጠቀሙ

301	በቀን ስንት ጊዜ ይመገባሉ	<ol style="list-style-type: none"> 1. አንድ ጊዜ 2. ሁለት ጊዜ 3. ሶስት ጊዜ 4. ከአራት ጊዜ በላይ 	
302	ጥራጥሬ እና ስራስር	ማንኛውም በቆሎ፣ጤፍ፣ፍዝ፣ዳጉሳ፣እንጀራ፣ዳቦ፣ገንፎ፣አጥሚት ፣ፓሰቲኒ፣በስኩት(ቤት ውስጥ የተዘጋጀ)፣ቂጣ ፣ቅንጨ፣ደንች፣ እነሰት(ቆሮ)	<ol style="list-style-type: none"> 1. አዎ 2. አይደለም
303	አረንጋይ ቅጠላ ቅጠሎች	ጥቁር ወይንም የሃበሻ ጎመን፣ቆሰጣ፣ ሰላጣ	<ol style="list-style-type: none"> 1. አዎ 2. አይደለም
304	በቫይታሚን A የበለፀጉ ምግቦችና ፍራፍሬዎች	ዱባ፣ካሮት፣ሰካር ድንች(ውስጡ ቢጫ የሆነ)፣በርበሬ፣የበሰለ ማንጎ፣የበሰለ ፓፓያ በጁስ መልክም ቢሆን	<ol style="list-style-type: none"> 1. አዎ 2. አይደለም
305	ሌላ ፍራፍሬዎችንና ሌላ ቅጠላ ቅጠሎች	ኮክ፣አሮካዶ ፣ቲማቲም፣ቀይሽንኩርት፣ነጭ ሽንኩርት እናም የመሳሰሉት	<ol style="list-style-type: none"> 1. አዎ 2. አይደለም

306	የአረጋገ ስጋ	ኩላሊት ፣ ጉብት፣ ልብ እና ሌሎችም	1. አዎ 2. አይደለም
307	እርጥብ ስጋ፣ አሳ እና የባህር ላይ ምግቦች	የአሳማ ስጋ፣ የብሬ ስጋ፣ የፍየል ስጋ ፣ የደሮ ስጋ ፣ የአዕዋፍ ስጋ ፣ አሳ እና የአሳ ምግቦች ሰርዲን	1. አዎ 2. አይደለም
308	እንቁላል	እንቁላል	1. አዎ 2. አይደለም
309	ጥራጥሬ እና የለጧዝ ምርት	በቁላ፣ ሽንብራ፣ ለጧዝ ፣ ምስር ፣ አሽቁ፣ አደንጎሬ፣ ቦለቁ፣ ሺሮ ወጥ	1. አዎ 2. አይደለም
310	ወተት እና የወተት ተዋዕያ	ወተት፣ እርጎ፣ አይብ ፣ አጎት፣ አሬራ	1. አዎ 2. አይደለም
311	ዘይት እና ቅቤ	ዘይት ፣ ቅቤ (ምግብ ለማብሰያ የተጠቀምንባቸዉ)	1. አዎ 2. አይደለም
312	ጣፋች ምግቦች	ቸኮሌት፣ ኩኪስ ፣ ኬክ፣ ከረሚላ ፣ ስካር፣ ማር ፣ ለስላሳ መጠጥ ኮካ፣ ሚርንዳ፣ ጣፋጭ ምግቦች	1. አዎ 2. አይደለም
313	አብዛኛዉን ጊዜ ከምግብ በሁላ ቡና ወይም ሻይ ትጠጫለሽ	1. አዎ 2. አይደለም	
314	ለጥያቄ ቁጥር 313 መልስሽ አዎ ከሆነ በየቀኑ ትጠጫለሽ	1. አዎ 2. አይደለም 3. አላዉቅም	
315	መቼ መቼ ነዉ ቡና ወይም ሻይ ምጠችዉ	1. ከምግብ በፊት ሁለት ሰዓት ወይም ከዛ በላይ 2. ከምግብ በፊት 3. በምግብ ሰዓት 4. ከምግብ በኋላ 5. ከምግብ በኋላ ሁለት ሰዓት ወይም ከዛ በለይ 6. አላዉቅም	
ክፍል አራት፣ ጤና ነክ ጉዳዮች			
401	የወር አበባ ማየት ጀምረሻል	1. ጀምረያለሁ 2. አልጀመርሁም	
402	ለመጀመሪያ ጊዜ የወር አበባ ስታይ ዕድሜሽ ስንት ነበር	_____	
403	የወር አበባሽ ለስንት ቀን ይቆያል(ይፈሳል)	_____	
404	የወር አበባ በምታይበት ጊዜ ሞዴስሽን በቀን ስነት ጊዜ ትቀይራለሽ	_____	
405	አሁን ላይ የወር አበባ ላይ ነሽ	1. አዎ 2. አይደለም	

406	ባለፈው አንድ ወር ውስጥ በወባ ታመሽ ነበር	1. አዎ 2. አይደለም	
407	ባለፈው አንድ ወር ውስጥ በሆድ ትላትል ታመሽ ነበር	1. አዎ 2. አይደለም	
408	ባለፈው አንድ ወር ውስጥ የትላትል መከላከያ መድሃኒት ወስደሻል	1. አዎ 2. አይደለም	
ክፍል አምስት፣ አንተሮፖሞተሪክ			
501	ቁመት በ ሴነቲ ሜትር	_____ሴ.ሜ	
502	ክብደት በ ኪሎግራም	_____ኪ.ግ	
503	MUAC	_____ሴ.ሜ	
ክፍል ስድስት፣ የሄምግሎቢን መጠን ልኬት			
601	ሄምግሎቢን (Hemoglobin)	_____ግ/ዲ.ሊ.	

አመሰግናለሁ