

**JIMMA UNIVERSITY, INSTITUTE OF HEALTH, FACULTY OF PUBLIC
HEALTH, DEPARTMENT OF EPIDEMIOLOGY**



**PREVALENCE OF STUNTING AND ASSOCIATED FACTORS AMONG
UNDERFIVE CHILDREN IN COMMUNITY OF GILGEL GIBE FIELD
RESEARCH CENTER, SOUTH WEST ETHIOPIA: A COMMUNITY
BASED CROSS SECTIONAL STUDY**

BY: KENU FAYERA (BSc.)

**A THESIS TO BE SUBMITTED TO DEPARTMENT OF EPIDEMIOLOGY,
FACULTY OF PUBLIC HEALTH, INSTITUTE OF HEALTH JIMMA
UNIVERSITY; IN PARTIAL FULFILLMENT FOR THE REQUIREMENT
FOR MASTER OF PUBLIC HEALTH IN GENERAL PUBLIC HEALTH**

**JANUARY, 2023
JIMMA, ETHIOPIA**

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ABSTRACT

Background: Stunting reflects chronic under nutrition during the most critical periods of growth and development in early life. Eventhough there is an ongoing worldwide effort that focused on reduction of stunting related problem, the burden of stunting among under-five year children is still a major public health problem, especially in developing countries.

Objectives: This study was aimed to assess prevalence of stunting and associated factors among under-five year children in communities of Gilgel Gibe Field Research Center, South West, Ethiopia, 2022.

Methods: A community based cross-sectional study was conducted among 554 children of under-five year. A systematic random sampling technique was employed. An Interviewer administered structured questionnaires were used to collect data. Data were entered using Epi data version 3.1 and analyzed using SPSS version 25 and World Health Organization Anthro software version 3.2.2 to generate Z-score values. The results were summarized in the form of texts, figures and tables. Bivariate analysis was applied to select candidate variables for the final model. Multivariable logistic regression analysis was applied to identify factors significantly associated with stunting. Statistical significance was declared at $p < 0.05$ and 95% CI.

Result: - The overall magnitude of stunting was 195(35.2%), of which 105(53.8%) were female. The mean age of stunted children was 28.84 months (\pm SD 13.87). Children within age group 6-11 months (AOR; 3.86, 95%, CI 1.51-9.87), children whose mothers had completed primary education (AOR =0.48, 95% CI 0.30-0.78), children from a mother who is merchant(AOR =0.59, 95% CI 0.39-0.89) and time of breast feeding initiation after birth(AOR = 2.34, 95% CI 1.53–3.58) were significantly associated with stunting compared with counterpart.

Conclusion: Stunting was a highly prevalent problem in the study area with child's age, mother's education, mother's occupation, and time of imitating breast feed after birth were found to be associated factors of stunting. Therefore, this study recommends intervention focusing on encouraging maternal education, promoting immediate breast feeding after birth and child age specific attention.

Key Word: Prevalence, Gilgel Gibe Field Research Center, under five year children, Stunting,

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ABBREVIATIONS AND ACRONYMS

ANC	Antenatal Care
AOR	Adjusted Odd Ratio
ARI	Acute Respiratory Infection
BF	Breast Feeding
EBF	Exclusive Breast Feeding
EDHS	Ethiopian Demographic and Health Survey
HAZ	Height-for-Age Z score
HEW	Health Extension Worker
GGFRC	Gilgel Gibe Field Research Center
IYCF	Infant and Young Child Feeding
MEDHS	Mini Ethiopian Demographic Survey
NGO	Non-Governmental Organization
NNP	National Nutrition Programme
PEM	Protein Energy Malnutrition
PNC	Postnatal Care
SD	Standard Deviation
SNNPR	Southern Nations Nationalities and Peoples Region
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Fund
VAD	Vitamin A Deficiency
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Malnutrition and low diet comprise the common driver of the worldwide burden of health problems. It is the most important leading cause of health and welfare problems among infants and young children (1). Malnutrition refers to all deviation from adequate nutrition and can exist in two forms, over nutrition and under nutrition of Macronutrients and/or Micronutrients. Malnutrition is well-known in Ethiopia and can manifest as wasting (acute malnutrition), stunting (chronic malnutrition) and/or deficiencies of essential vitamins and mineral (2). Although the prevalence of stunting in the last ten years in Ethiopia has decreased a lot, still there is high rate of stunting the country experiences among under five children (3).

A Children whose height for age is below minus two standard deviations from the median of the reference population is considered as stunted, which is too short for their age(4,5). Stunting starts from pre-conception when an adolescent girl and who later becomes mother is under nourished and anemic, it worsens when infants' diets are poor, and when sanitation and hygiene are inadequate. Once it occurred, it is irreversible after the age of two years (4).

Stunting is a sign of chronic malnutrition, meaning long-term or accumulated nutritional deficiency resulting from deficient in adequate dietary intake over an extended period and/or repeated illness. It is a consequence of over long term exposed to inadequate nutrition and/or frequent attack to infection/disease, which is starting before birth. Stunting is an indication of severe, irreversible physical, physiological and cognitive damage caused by chronic malnutrition during a child's first 1,000 days or from the start of pregnancy until the age of two years(1,4,6).

In Ethiopia, stunting is one of the leading causes of health and wellbeing issues among under- five children(3). The prevalence of stunting in 2000, 2005, 2011, 2016 and 2019 in under-five Ethiopian children was reported to be 58%, 51%, 44%, 38.4%, and 37 respectively(3,7). Stunting affects many numbers of children worldwide and has short and long term health consequences including impaired neurocognitive development ,and a risk marker for non-communicable diseases and reduced productivity in later life (8,9).

1.2. Statement of the problem

There is an ongoing worldwide effort that focused on reduction of malnutrition related problem. However, the burden of malnutrition among under-five year children is still a major public health problem, especially in developing countries. Worldwide, malnutrition related factors contribute to about 45% of deaths in children under-five years of age (8). Childhood stunting is one of the most significant obstacles to human development affecting many children less than five year of age. Globally, an estimated 21.9 percent or 149 million children of age under five were affected by stunting in 2018. Asia and Africa bear the greatest share of all forms of malnutrition. In 2018, more than half of all stunted children under five year children lived in Asia (55%) or 81.7million and more than one third lived in Africa (39%) or 58.8 million. Among African regions ,East Africa accounts for a high proportion of stunted children 40.8%(24.0 million) (9).

Globally, at least one in every four children under five year is stunted and in developing countries, one in three and specifically in Africa among five children two of them are affected with stunting (1,9) which shows that stunting is still a high public health problem. In sub- Saharan Africa, the prevalence of stunting is declining but remains over 30%(8). Similarly, in Ghana (10)and in Tanzania (11) childhood stunting accounts for high proportion of malnutrition rate 18.4% and 35.5% respectively.

In Ethiopia, the stunting among among children were one of the most serious public health problems and the upper most in the world. Due to the presence of a high stunting rate in the country it causes a significant barrier to achieving better child health outcomes (12). The 2016 Ethiopian Demographic Health Survey and 2019 Ethiopian mini Demographic Health Survey estimate national nutritional status with stunting prevalence 38.4%(10376) and 37%(4937) respectively. The prevalence in urban and rural is 25.4%(1131) and 39.9%(9245) respectively with regional variations such as in Oromia 36.5%(4491), SNNPR 38.6%(2188), Afar 41.1%(98), Tigray 39.3%(691), Amhara Region 46.3%(2097) children under five years of age were stunted, with lowest levels in Addis Ababa 14.6%(216) and Gambella region 23.5%(23) (3,7).

In Oromia region prevalence of stunting among under five children were 35.6%(1974) of which 11.1% of them were severe stunted(7). Similarly, high prevalence of stunting shown from a

study conducted in different districts of the region. In Guto Gida district of East Wollega zone, in Hidabu Abote district of North Shewa Zone and in Holeta town indicated that 41.78%, 47.6% and 45.7% of under-five children were stunted respectively (12–14).

At the most immediate level, stunting is mainly caused by insufficient/poor diet and by repeated infection. Mainly at immediate level, it is affected by availability and accessibility of food, access to health care, water, sanitation and hygiene, and the way care is given for a child and mother. Poverty, lack/inadequate resources (both financial and human), and social, economic and political factors and others are among basic causes of stunting/malnutrition (2). Stunting can have an intergenerational effect in which a mother who is stunted may, in turn, give birth to a small baby, because the fetus's growth in the womb may have been restricted (2,13).

Ethiopia government developed several strategies and programs at policy and program level to decrease levels of malnutrition. National Nutrition Programme (NNP) primarily focused on the first 1000 days, National nutrition policy; national nutrition strategies were some of them. Similarly, the Federal Government of Ethiopia has been working to reduce stunting (to 26% by 2020) through different interventions (15) and ending of hunger, attaining food security, and better nutrition, and endorse sustainable agriculture by 2030 (16–18). Due to this effort, the country shows potential improvement in reducing childhood stunting in the past decades. Even though the level of under nutrition had been decreased in the country, the prevalence of stunting in under five children is still a major public health problem and makes the country with the highest burden of stunting in the world among less than five-year children (2,3).

Evidence from the 2019 mini Ethiopian Demographic Health Survey indicated that there is significant reduction in the prevalence of malnutrition in the country, which shows it is clearly progressing in the right direction. However, the prevalence of stunting is substantially higher than wasting and underweight. Yet, in Oromia region there was no significant reduction in the prevalence of stunting on contrary to wasting and underweight (7). This shows studies focusing on prevalence and factors associated with stunting are required which will in turn help in developing interventions to alleviate the problem.

Although the prevalence of stunting among children under the age of five is fairly well documented across the country, evidence on the prevalence and factors associated with stunting in the local context is limited. And, national estimates are also usually not a reflection of the local estimate of child malnutrition(19). Moreover, among those different studies conducted, there is inconsistency across studies regarding some factors associated with stunting (3,13,14,20–24),and those studies also recommended further studies should be done to see other independent associated factors (13,25–27). For this, more study that is comprehensive will be needed to assess prevalence and associated factors of stunting.

Even if there is cross sectional studies conducted with similar age groups, apart from its strength, the studies gave attention mainly to socio-demographic, dietary and health related factors (28). However, the study missed other potentially modifiable associated factors which might affect stunting, such as maternal characteristic and environmental factors. So that studies will be required, so as addressing the gaps in previous studies that used only some determinant variables at a time.

Comprehensive knowledge about the prevalence and associated factors of stunting in local context is vital (29) to reduce stunting rate, to develop prevention strategies and planning suitable for nutrition interventions to respond to local problems. Additionally, nutritional status can vary by background characteristics and also factors associated with under-nutrition are diverse and could potentially change from place to place and time (14). Despite this fact, no similar studies were done to determine prevalence of stunting and associated factors of stunting in the study area/setting. Therefore, this study was aimed to assess the prevalence and factors associated with stunting among under five children in community of Gilgel Gibe field research center, Southwest, Ethiopia.

1.3. Significance of the study

This study contributes in decreasing stunting by determining its prevalence and identifying associated factors, and recommending to the responsible body. Additionally, the study will help and provide evidence for different stakeholders who are working on child nutrition, understanding the extent and the causes of the problem and to plan appropriate and the most effective nutrition intervention.

Since this study was conducted at the community level, it helps in recognizing the risk factors associated with stunting and makes it indispensable to assess the problem at the community level, which can be helpful in designing appropriate strategies. This is also used as a reference for those who are willing to do another study on the similar topic in the same or other area. In addition the study was tried to identify significant risk factors of stunting which can support in targeting public health efforts to address the problem.

2. LITERATURE REVIEW

2.1. Overview

Malnutrition has an effect on all age groups across the entire life span, from conception, throughout the fetal period and into early infancy, intra uterine nutrition has a profound influence on growth, development, morbidity, and mortality. Health implications range from intrauterine brain damage and growth failure through reduced physical and mental capacity in childhood to enhance the burden of developing nutrition-related chronic diseases afterward in life (4).

Stunting is most likely to occur within the first 1000 days, the time starts from conception through the child's first two years of life. Stunting is related to poor/low cognitive and physical development and has a long-term consequence on intellectual performance, educational performance, future earnings, and risk of developing a non-communicable disease like obesity. These effects are often irreversible, even with improvements in nutrition after age of two years (2,4,13). Therefore, studying nutritional status of child serves as a means of assessing condition of health, survival of children and provides as in direct measurement of the quality of life of an entire population (30).

2.2 Magnitude of the problem

Child malnutrition is an underlying cause for almost half (45%) of child deaths, particularly in low socio economic communities of developing countries (18). Globally in 2018, an estimated 149 million children under age five were stunted and 49 million children were wasted. In sub-Saharan Africa, the prevalence of stunting is declining but remains over 30% (9). In order to address malnutrition, several African countries have updated their national nutrition policies, strategies, and action plan (30).

The result of study done on malnutrition of under five children in Bangladesh shows that high prevalence of stunting and underweight, for instance 42% and 40% of under five children were stunted and under weighted respectively (31). Similarly, epidemiology of under nutrition and its determinants in children under five years done in Ghana shows that, the prevalence of stunting were 18.4% (10) and prevalence of stunting and severe stunting in Tanzania were 35.5% and 14.4% for children aged 0-23 months and 41.6% and 16.1% for children aged 0-59 months, respectively (11).

The magnitude of stunting in Ethiopia is one of the highest from sub-Saharan African countries (9). According to EDHS 2016, 38% of under five were stunted nationally, 25% in Urban and 41% in rural areas. There is regional variation in the prevalence of stunting in children. Stunting levels were above the national average in Tigray and Affar (46 percent each), SNNP (44 percent) and Amhara (42 percent), and relatively low in Gambella and Addis Ababa (22 and 23 percent, respectively) and 36.5% of under five children were stunted in Oromia (3).

According to cross sectional study conducted at pastoral community of Afar in 2017 indicated that the prevalence of stunting among under five was 24.8% (19), and also study conducted at Korahay zone of Somali region reveals that 31.9% of 6-59 months children were stunted (21). The finding of study done by Birhanu et al at Lasta woreda, north east Ethiopia show that 31.7% of under-five year children were stunted (25). Likewise study done by Teferi, et al. In south west Ethiopia among 6-59 months of children reveals that 33.3% of them was stunted (32) and in West Gojam Zone by Teshome. Bet al 43.2% (33).

According to study conducted in Guto Gida district of east Wollega zone and Hidabu Abote north shewa zone district of Oromia region state prevalence of stunting among children aged 6-59 months was 41.78% and 47.6% (12,13). Another studies which were conducted in Holeta and Adama town shows that magnitude of stunting among under-five children were 45.7% and 44.7% respectively (14,28). Similarly study conducted in west shoa shows that prevalence of stunting among under-five children was 40% (34).

2.3. Factors associated with stunting

2.3.1. Socio-demographic and economic factors associated with stunting

According to finding of case control study done in east Wollega zone, paternal education, paternal occupation, household family size, monthly household income, decision making on utilization of money and ownership of land/livestock were significantly associated with stunting (22). Similarly study conducted in the pastoralist community of Somalia revealed that marital status, maternal education, and lack of decision making, total number of children ever born, were significantly associated with stunting (27). The result of the study done on Machakel woreda, North west Ethiopia on factors associated with stunting shows that literacy of children's fathers and Decision

making on use money was associated with stunting with statistical significance of p-value 0.001 (24).

According to EDHIS 2016, the proportions of children who stunted were decline with increasing household wealth(3). The result of study done in rural children of Ethiopia, factors significantly associated with stunting were residing in household with poor economic status, household family size and residential place(region) (35).

A study done in Holeta town of Oromia region describes that determinant factors associated with stunting were being rural residents and living in a household with monthly income less than 750 birrs (14). Results from evidence of EDHS 2016 on the prevalence of malnutrition and associated factors among under-five children show that living in household's wealth index, family size and place of residence(region) were significantly associated with stunting (26). Likewise, Case-control study done in Mekelle city shows that Households which had two and above under-five children were higher in cases group as compared to the controls group (23). Unlike other studies, the finding of the systematic review and meta-analysis on stunting shows that no evidence of an association between income/wealth and stunting in Ethiopia (20).

In the study conducted at Lasta Woreda North East Ethiopia, living in a rural area and in poor wealth status households were major determinants of stunting(25), similarly, family monthly income of less than 750 birrs was significantly associated with stunting according to study done Hidabu Abote District of Oromia region(13). Finding from a study done at district of mesken, Gurage zone among children 24-59 months reveals that, stunting were more observed among children living in households with many under-five children, children from merchant mothers and farmers (29).

2.3.2. Child related characteristics factors associated with Stunting

According to EDHS 2016, stunting among under five-year children sharply increases between age 6 and 23 months, and peaks at age 24-35 months. Children who are smaller at birth were more likely to be stunted, than children who are normal or larger at birth(3). The result from Case-control study done in Mekelle city on risk factors of stunting reveals that birth weight of less than 2.5kg and attack

with frequent diarrheal episodes was found to be a risk factor for stunting (23). The result of the study conducted at the Pastoral community of Afar, Holeta town of Oromia and further analysis of EDHS 2016 shows that male children (being male) and age of the child were major significant factors associated with stunting (14,19,36). Similarly, stunting was found to be significantly associated with age of children, according to a study done among under five-year children in Rural Ethiopia (35).

The study conducted at kindo didaye woreda of Wolaita zone describes that, exposed to diarrheal diseases, being infected with acute respiratory infection and didn't take the recommended dose of vaccine for his/her age were significantly associated with stunting (37). Studies conducted at the Pastoral community of Afar, and at Guto Gida district reveals that children who did not have complete vaccines were 3.3 times and 1.73 times higher chance of developing stunting than fully immunized children respectively (12,19). According to results from case control study done in east wollega, stunting was significantly associated with sex of child (being male), birth interval, birth order and age of the child (22).

According to a cross-sectional study done at Genja district, Semen Bench Woreda (38), and systematic review (39), describes that diarrhea was significantly associated with stunting. Unlike other studies, a study conducted at the pastoral community of Korahay zone of Somali region on determining the prevalence and associated factors of stunting among 6-59 months, birth order of the child; preceding birth interval of the child didn't show significant association with stunting (21).

2.3.3. Maternal caring characteristics associated with stunting

The results from systemic review and meta-analysis done in Ethiopia shows that stunting was significantly associated with maternal optimal health care practice like antenatal care (ANC), Post-natal care (PNC) and family planning (20). Similarly study conducted in the pastoralist community of Somalia revealed that health status during pregnancy and maternal health care seeking during pregnancy were significantly associated with stunting (27). According to EDHS 2016, children whose mothers are thin (with a BMI of less than 18.5) and children whose mothers have no education had higher chance of being stunted (3). In a study conducted at Mekelle city on risk factors associated with stunting describes that mothers who didn't have formal education, with a height of less than

150cm, mothers with a BMI of less than 18.5 kg/m², have decision making on use of money were significantly associated with stunting than others (23). Similarly, according to different studies conducted in Ethiopia, mother with long stature were less likely associated with stunting (20,35,36).

The finding from a study conducted on prevalence and associated factors of Stunting among Children Aged 6-59 Months in Lasta Woreda describes that, children mother educational status were significantly associated with stunting (25). According to a study done at Hidabu Abote District, children from mothers who were not used family planning were found 2.54 times to be associated with stunting (13). The result of a study from Systematic Reviews done in Ethiopia among Under-five children shows that Parity of mother, Parental Education, Family Planning utilization, were significantly associated with stunting (39).

2.3.4. Environmental factors associated with stunting

The results from further analysis of EDHS 2016 on determinants of nutritional status shows that living in a household with non-improved toilet was significantly associated with stunting (36). An individual from families uses water for drinking from the un safe source was about seven times being stunted as related with those who used the safe source (21,24,36), un protected well as source water and availability of toilet facility showed significant relation with stunting (37).

In the finding of systemic review on prevalence and associated factors of malnutrition, treatment of water for use were significantly associated with stunting (39), but according to study done in Hidabu Abote District, time to obtain drinking water (round trip) were not significantly associated with stunting (13). According to study done in east wollega zone disposing waste in open field was significantly associated with stunting (22).

2.3.5. Dietary factors and/or feeding practice associated with stunting

In the result of a study done at Kindo Didaye woreda, Wolaita Zone on Determinants of Stunting, initiation of breastfeeding after one hour of child birth was about five times more likely to be stunted, children who ate animal source food were 49% less likely to be stunted, and the squeezed out of first breast milk showed a statistically significant association with stunting (37). According to a study

done in Lasta Woreda on Stunting and Associated Factors, feeding less than three times per a day and given left over food were significantly associated with stunting (25).

The results from studies done at south west Ethiopia and Hidabu Abote describes that fed butter as pre-lacteal feeding, started complementary feeding at less than six months or above six months were significantly associated with stunting (13,32). The finding from study done at mesken district of Gurage zone shows that children who breastfed for less than two years, exclusively breastfeed children for less than six months and greater than six months, children who bottle-fed and fed by hand were shows higher chance of being stunted than others (29). Compliant of diarrhea within 2 weeks of the study, duration of breastfeed, uses bottle/cup feeding and time of complementary feeding were significantly associated with stunting according to the result of study done in east wollega zone (22).

The result of study done in Pastoral Community of Korahay Zone, Somali Regional State describes that children fed first milk and bottle feeding had significant associations with stunting , but time for initiation of breast feeding, age of children before six months and after six months at which complementary food started before six months and after six months didn't show significant association with stunting (21). The result from Systematic Reviews done in Ethiopia among Under Five children shows that Deprivation of colostrum, Frequency of Breast feeding, were significantly associated with stunting (39) .

2.4. Conceptual Framework

In summary existing research has identified a number of associated factors contributing for development of stunting. Multiple and interrelated associated factors are involved in stunting development. Childhood Stunting: Context causes both underlying and basic cause, Proximal causes and Consequences framework developed by WHO is structured in different levels; 1. Proximate causes (i.e. Inadequate complementary feeding, breastfeeding, infection) 2. Context causes (Underlying and basic causes) (i.e. community and societal factors). The causes and context described by the framework represent the major contributors to child stunting and adverse health, developmental and economic consequences (40,41). The current study followed this conceptual framework to identify individual and community level risk factors associated with stunting based on the literature reviewed. For this study, the associated factors were grouped in five classes; namely, child characteristics related factors, maternal factors, socio-demographic and economic factors, environmental-related factors, dietary and/or feeding practice-related factors.

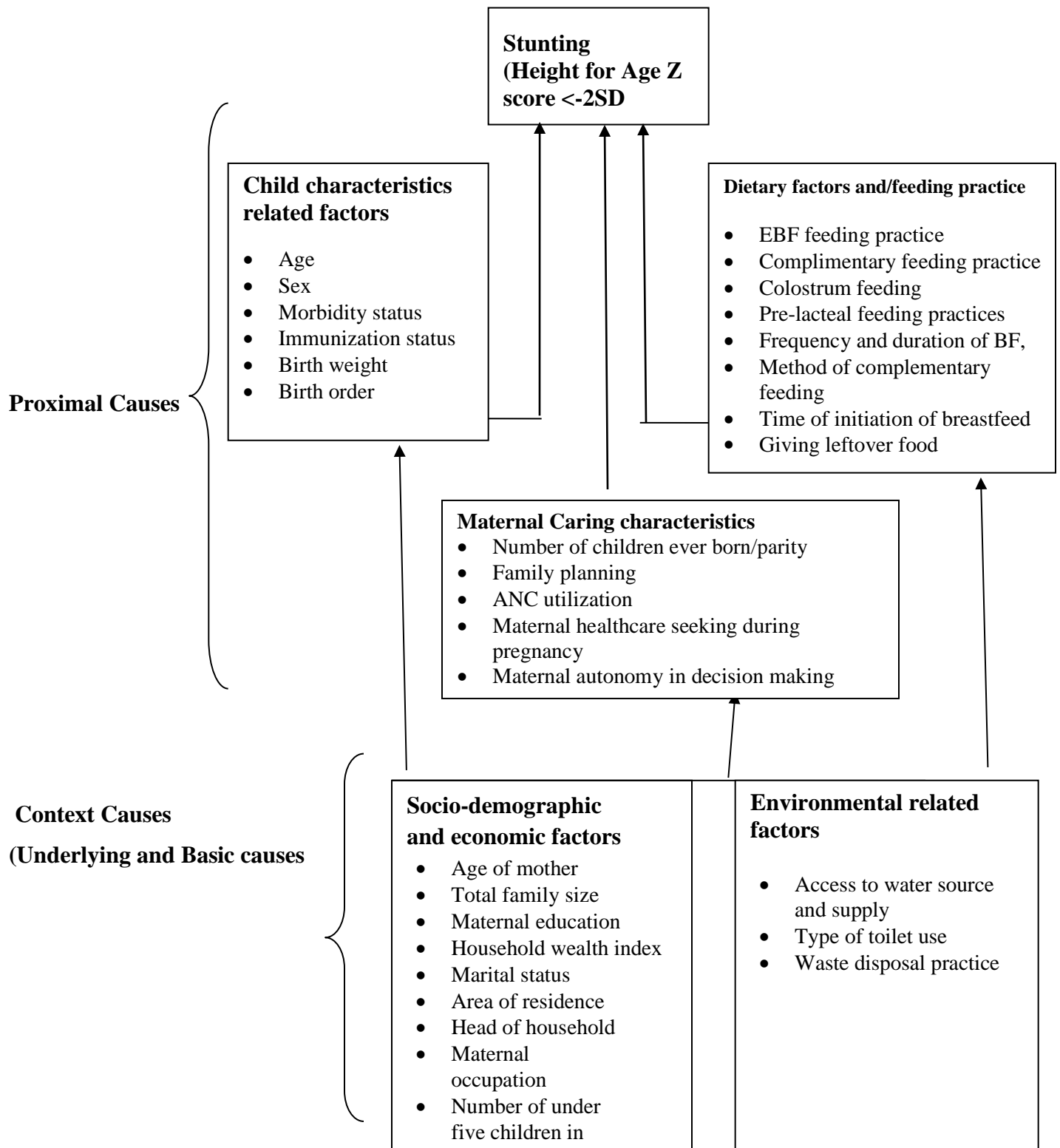


Figure 1 :Conceptual framework showing the relationships among the factors associated with stunting :Adapted from WHO childhood stunting conceptual framework based on reviewed literature(40).

3. OBJECTIVE

3.1. General Objective

To assess the prevalence of stunting and associated factors among under-five children in the community of Gilgel Gibe Field Research Center, Southwest Ethiopia, 2022.

3.2. Specific Objectives

- To assess the prevalence of stunting among under-five children in the community of Gilgel Gibe Field Research Center, Southwest, Ethiopia, 2022
- To identify factors associated with stunting among under-five children in the community of Gilgel Gibe Field Research Center, Southwest, Ethiopia, 2022

4. METHODS

4.1. Study area and Study period:

The study was conducted in community of Gilgel Gibe Field Research Center (GGFRC) Jimma zone, southwest Ethiopia. Gilgel Gibe Field Research Center is located at about 260 Kilometers to the Southwest of the capital (Addis Ababa) of Ethiopia. Gilgel Gibe Field Research Center was identified as Jimma University's field research center. The area covers within 10 kilometers radius from the reservoir of the Gilgel Gibe Hydroelectric Power Dam and currently the center consisting of eleven Kebeles (three urban and eight rural Kebeles). The Gilgel Gibe Field Research Center has begun in 2005 in ten kebeles, which are found in four districts surrounding the dam-Omo Nada, Nedi Gibe, Kersa and Sekoru)(42).

Currently the center has total population of 80,183, 36322(45.3%) are male, 43861 (54.7%) are female and 8217 of them were under five year children. Of total population 23092(28.8%) were urban and 57091 (71.2%) rural resident. The area has 15 functioning health institutions (3 health center and 11 health posts). The area is predominantly rural and the population relies primarily on subsistence farming. The study was conducted from May 28 to June 20, 2022.

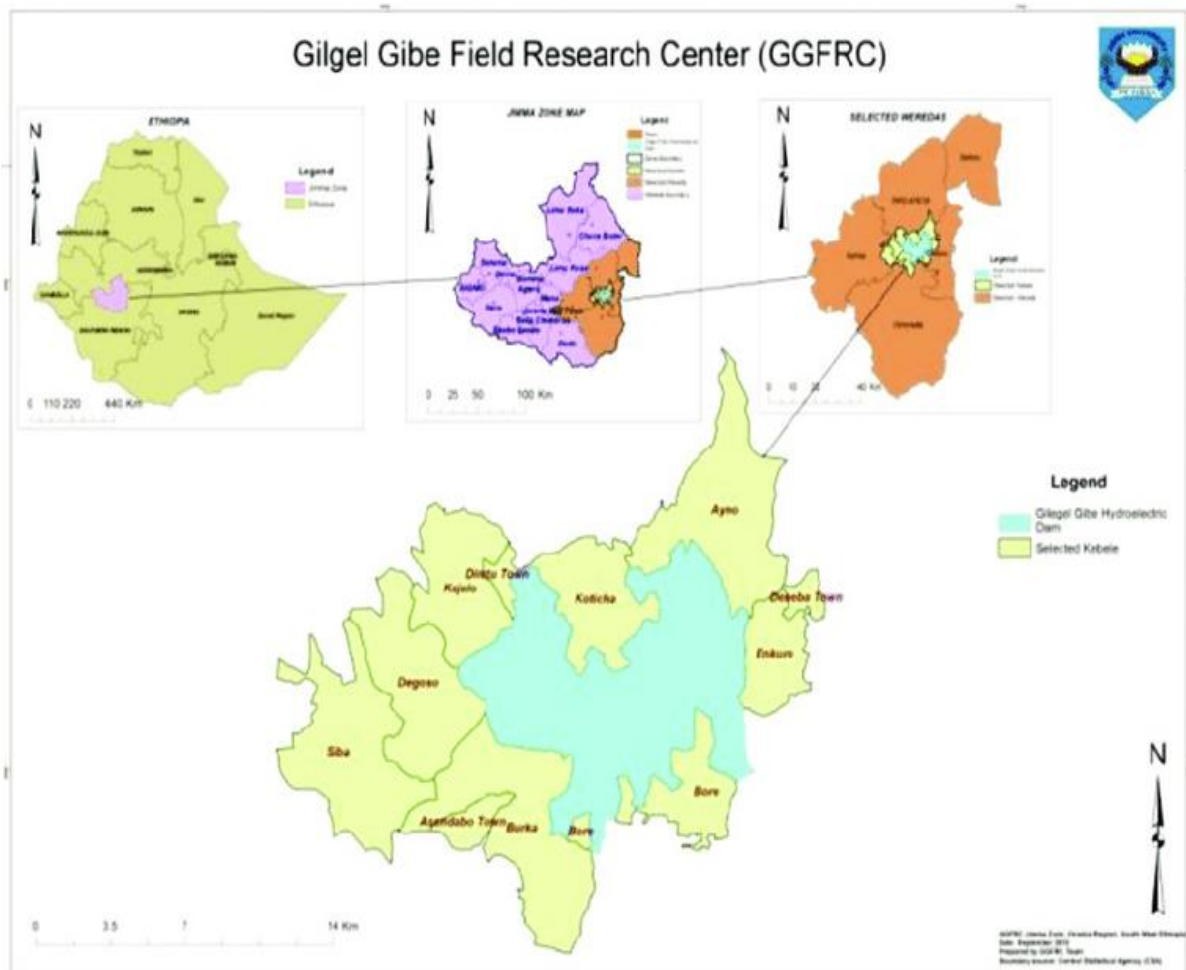


Figure 2: Location map of the study area; Gilgel Gibe Field Research Center, South West, Ethiopia(42)

4.2 Study design: The study design was a community based cross-sectional study

4.3 Population;

4.3.1. Source population: All under five-year children in community of Gilgel Gibe Field Research Center.

4.3.2. Study population: All under five children in the community of Gilgel Gibe Field Research Center in selected kebele

4.4. Sample size and Sampling technique/Sampling procedures

4.4.1 Sample size determination: Sample size was determined for both specific objectives separately by using STATCALC application of Epi Infoversion7.2 software.

1. For Specific objective one; to determine the prevalence of stunting

For the first objective sample, size was calculated using single population proportion formula based on the following assumption. The prevalence of stunting among under-five children(p), which is 40% are taken from study done in west shoa zone(34), Z-value of 1.96 at 95% confidence interval(CI) and margin of error(d) 4%.

The minimum sample size will calculated as

$$\text{follows } n = \frac{Z^2 \cdot p(1-p)}{d^2} \quad n=538$$

Z=1.96 at 95% confidence interval

d=margin of error

P =Prevalence of
stunting

n=total sample size

Since **n=538**, by adding 5% non-response rate; gave required minimum sample size **565**.

2. For specific objective two: to identify factors associated with stunting

Sample size for the second specific objective (to identify associated factors with stunting) was calculated by using two population proportion formulas with considering proportion of explanatory

variables of stunting. On the basis of proximate factors associated with stunting from previous study are considered and the respective sample size for each explanatory variable was calculated using the formula for comparisons of proportions(**Table1**)

Table 1: Sample size determination for factors associated with stunting in community of Gilgel Gibe field research center southwest, Ethiopia, 2022.

Determinants	P2	P1	OR	r	1-β (%)	α (%)	CI (%)	n	ntotal*	Reference
Squeeze out of first Breast milk	61.3	9.7	10.5	1	80	5	95	32	33.6	(24)
Wealth index(poor)	64.3	40.6	2.63	1	80	5	95	154	162	(25)
Vaccination status (Not vaccinated with recommended dose for his/her age)	69.6	88.1	0.32	1	80	5	95	174	183	(24)

N total*=sample size after adding 5% non-response rate

Whereas **P1**= the proportion of stunting among non-exposed, **P2**=the proportion of stunting among exposed, **OR**=odd ratio,**1-β**=power of study, ability to detect true difference if exist really= two-sided significance level, **CI**= confidence interval (95%) and **r** the ratio between exposed and non-exposed.

From both objectives, the first one provided maximum sample size, which is 565.

Therefore, the final sample size allocated for this study was **565**.

4.4.2: Sampling technique and procedures

From the eleven kebele of GGFRRC, five kebele were randomly selected by the lottery method. Participating households from the selected kebele were identified using the sampling frame of each kebele taken from HEWs. The sample size for each selected kebele was allocated proportionally. Households having study participants were selected by using a systematic random sampling technique. After obtaining a list of participant households, the interval (K value) was determined for each kebele by dividing the total eligible children in the kebele by the sample proportion. Mother-child pairs were selected by labelling each household that had a mother-child pair in each of the five selected kebele, and the first household was selected by a simple random sampling method. If a household had more than one eligible child, one child was chosen at random.

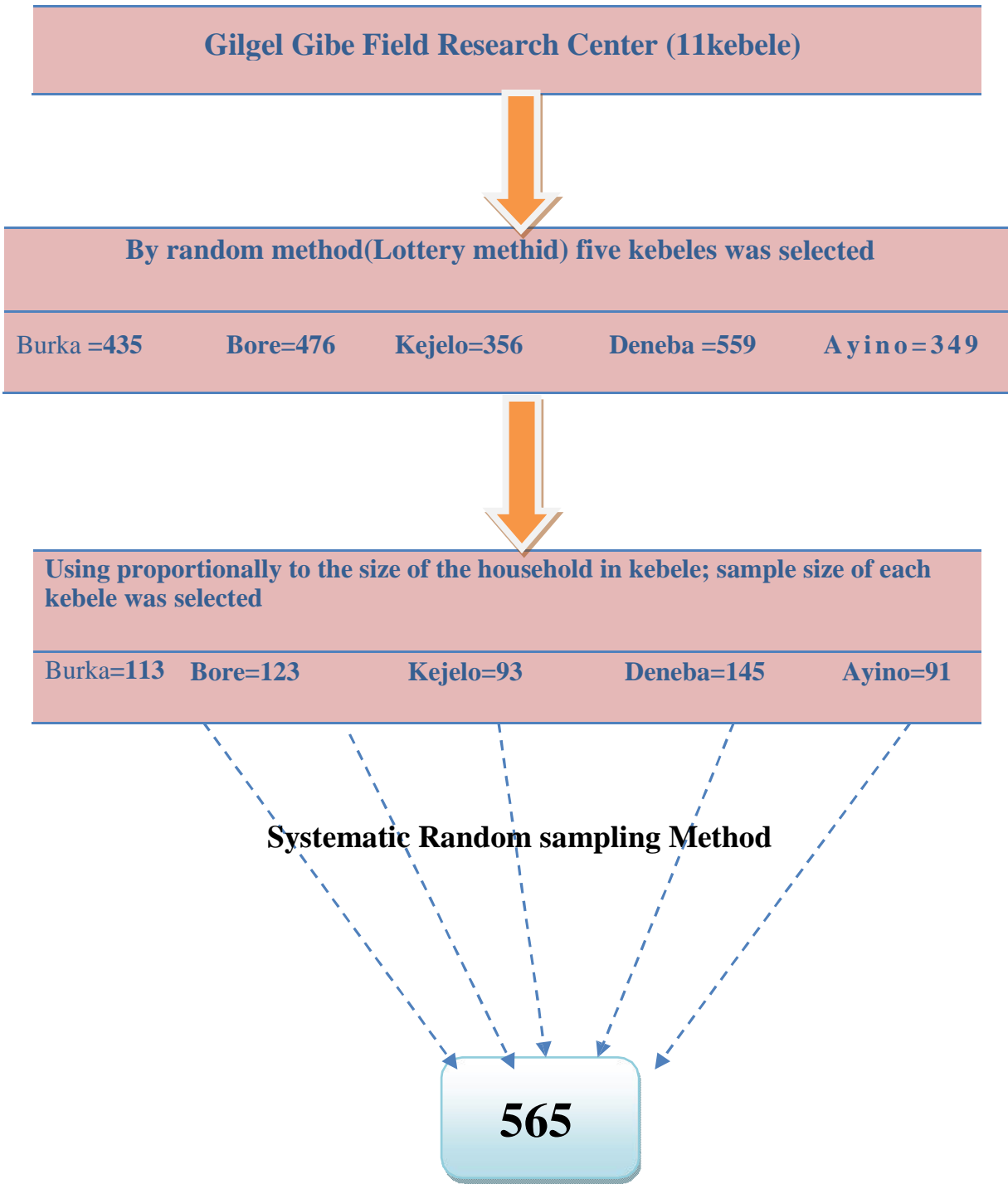


Figure 3: Schematic presentation of sampling procedure for the prevalence of stunting and association factors among under-five children in community of Gilgel Gibe Field Research Center, Southwest, Ethiopia, 2022.

4.5. Data collection procedures (Instrument, data collection technique, personnel)

4.5.1. Data collection instruments

Data were collected using pretested structured questionnaire and anthropometric measurement. The questionnaire were adapted from Ethiopian Demographic and Health Survey (EDHS) and similar other studies(3,22,37).The questionnaire was initially adapted in English and translated into local language(Afan Oromo) by translator expertise to minimize information bias then back to English to assure its consistency(ANNEXII).

4.5.2. Data collection technique

Data were collected using a face-to-face interview and by anthropometric measurement of child. Information on important child characteristics, caring practices, socio-demographic characteristics, maternal characteristics and environmental conditions was collected from the immediate caregivers of the children

4.5.3. Data collection personnel

Four trained and experienced Gilgel Gibe Field Research Center field workers who are familiar with area and speak the local language collected the Data.

Anthropometric measurement: A UNICEF recommended measuring instruments of wooden board inserted with a tape calibrated was used to collect the anthropometric data from all children aged under five year(43). Before taking anthropometric data for children, the age of the child was estimated by using a birth certificate or immunization cards when possible and asking the mother in order to ensure the target population.

Height/length measurement: Length/height was measured without shoes, socks, hair/head scurf, and ornaments and positioning the subject at the Frankfurt plane by using wooden board inserted with a tape calibrated to read the nearest 0.1cm. Length of the child (0–23 months) was measured in a recumbent (lying) position using a horizontal wooden length board and movable headpiece. Height was measured in children over the age of two in a standing position to the nearest 0.1cm using a vertical wooden height board by placing the child on the measuring board and the child standing up right in the middle of the board with their heads held erect, eyes looking straight ahead (Frankfurt plane), and the line of sight perpendicular to the body. Anthropometric measurement

was taken twice and a difference 0.1cm in length/height was accepted as normal. However, repeated measurement was carried out up on significantly larger differences. The child's five contact points (head, shoulders, buttocks, knees and heels) were adjusted to touch the board. Height/length and age data was used to calculate z-scores of the nutritional indicators in comparison to the median of reference population using the WHO Anthro software Version 3.2.2.

A simplified and updated Ethiopian wealth index equity tool measured wealth index. The tool has an 84.2% agreement and 0.755 kappa statistics with the full EDHS(2016) wealth index measurement tool(44). Accordingly, the wealth index of the household was classified into five quintiles (quintile 1-5). Those in the 1st and 2nd quintiles (poorest 40%), those in the 3rd quintiles (middle 20%), and those in the 4th and 5th quintiles (richest 40%).

4.6. Variables of the Study

4.6.1. Dependent Variable

- ✓ Stunting (Height for age < -2SD)

4.6.2. Independent Variables

Socio-demographic and economic factors

- ✓ Maternal age
- ✓ Area of residence
- ✓ Marital status
- ✓ Maternal education
- ✓ Maternal Occupation
- ✓ Head of the house hold
- ✓ Family size
- ✓ Household wealth index
- ✓ Number of under five children in household

Child characteristics factors

- ✓ Age
- ✓ Sex
- ✓ Birth order and birth weight

- ✓ Birth interval
- ✓ Immunization status
- ✓ Morbidity status

Maternal characteristics factors

- ✓ Number of children ever born
- ✓ ANC visits
- ✓ Family planning utilization
- ✓ Maternal health care seeking during pregnancy
- ✓ Maternal autonomy in decision-making

Environmental related factors

- ✓ Access to water source and supply
- ✓ Waste disposal practice
- ✓ Type of toilet

Dietary factors and/or feeding practice factors

- ✓ EBF breastfeeding
- ✓ Colostrum feeding
- ✓ Pre-lacteal feeding practices
- ✓ Complementary feeding practice
- ✓ Frequency and duration of breast feeding
- ✓ Method of complementary feeding
- ✓ Time of initiation of breastfeed
- ✓ Giving leftover food

4.7. Exclusion criteria

Children who are critically ill and with known chronic illnesses like TB, HIV and congenital abnormality that can affect the feeding pattern of the child were excluded. Because these chronic illnesses are associated with malnutrition due to the pathophysiologic changes, they cause to infection. In addition, those children not living in the area for more than 6 months were excluded. This is because some factors like dwelling area and access to health facilities can be associated with stunting. In addition, those children who are physically disabled were excluded, since it is difficult to take anthropometric measurement.

4.8. Operational definitions

Stunting: - Children whose height-for-age Z-score is below-2 SD from the median of reference population are considered short for their age (stunted).

Fully Immunized: - Children who had received vaccination against tuberculosis (BCG), three doses each of the DPT, PCV and polio vaccines, two-dose of Rota, one dose of IPV and a measles vaccination by the age of 12 months.

Currently on vaccination: -children who are on received a vaccination are according to the schedule because of their age.

Not fully vaccinated: -Children who had not received all dose of recommended vaccine by the age of 12 months.

Pre-lacteal feeding: - Children gave something other than breast milk during the first 3 days of life.

Duration of breast feeding: -The number of months one child breast feeding

Access to water source—safe water source within close distance; not taking more than 30 minutes.

Complementary feeding: - the child receives both breast milk or a breast milk substitute and solid (semi-solid or soft) foods.

Colostrum feeding: Practice of feeding the child first breast milk

Morbidity status of the child—morbidity status in the last 2 weeks before the study period (fever, cough, diarrhea)

Health care-seeking behavior—health care-seeking behavior by the caregiver of the child within 24 hours of the onset of symptoms

Wealth Index-Household wealth was assessed by constructing an index using principal components analysis. The first component, which explains most of the variance in the observed set of variables, is expected to reflect an unobserved dimension, and in the given model 'wealth'. The

regression scores from the first component were used to create an index that was divided into five equal categories and then grouped as the highest(rich), medium, and lowest(poor) wealth index categories.

Vaccination status—either vaccinated or not, if possible looking at vaccination card or asking the mother (caregiver)

The optimal frequency of breast feeding—greater than or equal 8 times per day breast feeding of the child is considered optimal

The optimal frequency of complementary feeding— feeding a child more than 3-4 times a day with additional food is considered optimal.

Anthropometrics: measurement of the human body e.g. height,

Critically ill: a child who has chronic disease like TB, CHF, DM and HIV/AIDS

Family size: refers to total number of people living in a house during study period

Maternal Health care seeking during pregnancy: utilization of maternal health care service (Antenatal care, delivery and postnatal care)

Maternal autonomy: mother who can decide on health care spending alone or with her husband. If the decision of health care spending is controlled by others (husband only or other people), it is considered as non-autonomous

Head of household: is a person with either sex, who is considered the head of other member of that household.

Type of toilet: any type of latrine household uses (Private pit/wooden slab, Private slab/ Cement slab, Shared latrine/wooden slab, Shared VIP latrine)

Waste disposal practice: practice of disposing household waste in open field disposal, in a pit, Composting and burning.

Giving leftover food: practice of giving remains of a meal after someone has finished eating

4.9. Data Processing and Analysis

Data were coded, checked, and cleaned before being entered into Epidata version 3.1 and exported to SPSS Window version 25.0 for analysis. To define the outcome variable, anthropometric data was converted into Z-Score by using WHO Anthro software. Household wealth index was analyzed by principal component analysis (PCA). Descriptive analysis was used to describe the percentage and number of distributions of the respondents by socio demographic characteristics and other relevant variables in the study. The association between stunting and explanatory variables was assessed first by bivariate logistic regression. In bivariate logistic regression, the variables with P-value < 0.25 was candidate to multiple logistic regression. Multiple logistic regressions were done for controlling possible confounders. Adjusted odds ratio (AOR) along with 95% confidence interval was estimated to assess the strength of association and a P value < 0.05 was considered to declare the statistical significance in the multivariate analysis. Goodness of fit of the final model was checked using Hosmer-Lemshow test of goodness of fit and Multicollinearity was checked using Variance Inflation Factor (VIF).

4.10. Data Quality Control:

Data quality were assured before data collection, during data collection and after data collection

Before data collection: to assure the quality of data, a pre-tested data collection instrument was prepared. Training were given for data collectors and supervisors for two days on the objective and methodology of the research, data collection and interviewing approach, anthropometric measurements and the ethical consideration during data collection. Prior to actual data collection period, pretest was conducted by incorporating supervisors on 5 % of sample size in kebele, which will not include in the main study. Based on pretest result important modification was made.

During data collection: Regular follow up was held by one supervisors and principal investigator. Accordingly, the collected data was checked for completeness and consistency on daily basis. Standard procedures were followed to measure anthropometric measurements and this was assured regularly on a daily basis

During data entry and analysis: the collected information was rechecked for its completeness and consistence by supervisors and the principal investigator before transferring in to computer software.

4.11. Ethical consideration:

Before the study begins ethical clearance was obtained from the ethical review committee of Jimma University. Official permission was secured from the research center office. The study subjects were informed about the objective and purpose of the study and verbal consent was obtained from parents and participants. Confidentiality of the information was assured and collected secretly. Mothers/care givers who have children with Stunting were linked with the nearest health facilities. Covid 19 Control and Prevention protocol was followed to minimize risk of transmission.

4.12. Dissemination of the results:

The findings of this study will be presented to the Jimma University department of Epidemiology. In addition, the findings will be described to the health department of the woreda and zone. It will be published in peer-reviewed journals for further utilization.

5. RESULT

5.1 Demographic and socio-economic characteristics

Out of 565 children with their mother, a total of 554 actually participated in the study with response rate of 98.1%. Among the respondents, 432(78%) were Oromo in ethnic group and 434(78.3%) were Muslim religious follower. Majority of the respondents 521(94%) were married and 487(87.9%) of the households were male headed, and 250(41.7%) of mothers had cannot read and write. Of the total children's fathers, 324(58.7%) were farmers and 116(20.9%) were primary in education level while 194(35%) were had no education. Of the total number of households, 224 (40.4%) were classified as having low economic status (poor).

Mean family size was 5.71 persons (\pm SD 2.07) while 264(47.7%) of the households had more than six family size and nearly half of the households 260 (49.9%) in the study area had only one under-five child while the rest 294(53.3%) had two or more under five children. Majority of them were from rural areas 412 (74.4%) while the remaining 142(25.6%) of the children were living in urban areas. Nearly half, 254(45.8%) of the decision on use of money was made mainly by both husband and spouse. Majority of mothers 445(80.3%) participated in decision-making about her and her child health care either independently or jointly with their husband (**Table 2**).

Table 2: Demographics and Socio-economic characteristics among under five children in community of Gilgel Gibe Field Research Center, South West Ethiopia, 2022 (n=554)

Variable=554	Category	Frequency (N)	Percent (%)
Area of residence	Rural	412	74.4
	Urban	142	25.6
Ethnicity of respondents	Oromo	432	78.0
	Dawuro	66	11.9
	Yem	42	7.6
	Others	14	2.5
Religion of respondents	Muslim	434	78.3
	Orthodox	85	15.3
	Other	35	6.4
Marital status of mother	Married	521	94.0
	Divorced	16	2.9
	Widowed	8	1.4
	Others	9	1.6
Mother's/care giver's age	\leq 20 years	16	2.9

	21-35 years	399	72.0
	≥ 36 years	139	25.1
Children of under five year in the household	1	260	46.9
	≥ 2	294	53.1
Total family size	≤ 3	77	13.9
	4-5	213	38.4
	≥ 6	264	47.7
Head of the Household	Husband	487	87.9
	Wife	67	13.1
Educational status of mothers	cannot read & write	231	41.6
	Primary (1-8)	129	23.3
	Secondary (9-12)	154	27.8
	Informal education	29	5.2
	Technical/vocational training	6	1.1
	University degree/diploma	5	0.9
Husband's educational status	cannot read & write	194	35.0
	Informal education	42	7.6
	Primary (1-8)	116	20.9
	Secondary (9-12)	188	33.9
	Technical/vocational training	1	0.2
	University degree/diploma	7	1.3
	Others	6	1.1
Occupation of mother	House wife only	259	46.8
	Merchant/Trade	238	43.0
	Farmer	43	7.8
	Daily laborer	8	1.4
	Government employee	6	1.1
Occupation of husband	Farmer	325	58.7
	Government employee	50	9.0
	Merchant/Trade	103	18.6
	Private Organization employee	39	7.0
	Daily laborer	24	4.3
Wealth Index	Poor	224	40.4
	Middle	102	18.4
	Rich	228	41.2
Decision making on the money earn to be used	Mainly Spouse	91	16.4
	Mainly Husband	176	31.8
	Only husband	33	6.0
	Both jointly	254	45.8
Autonomy in decision-making about child health care	Yes	445	80.3
	No	109	19.7

5.2. Child characteristics and dietary factors and feeding practice

As it is depicted in Table 3, 153(27.6%) of the study participants were in 12-23 months age group with the mean age of 28.69 months (\pm SD 13.80). According to this study, 280(50.5%) were male and concerning birth order of the child, 87(15.7%) of the children were first birth order while 288(52%) were had birth order at least a fourth. Nearly two third, 363(65.5%) of the children visited health facility for illness care; whereas 466(84.1%) of the children received any type of vaccine and of them 389(83.5%) children were fully immunized. Among the children, 98(17.7%) had diarrhea during two weeks of period prior to data collection. One hundred twenty two (22%) of the children had fever before 2 weeks of the study period, likewise 30(5.4%) of the children had ARI.

Breast feeding was universal in the study area were all children 554(100%) were breastfed ever, of them 344(62.1%) children were started breast feeding within the first one hour. Children who receive Colostrum were 415(74.9%) whereas about 31(5.6%) breastfeed children received pre-lacteal foods/fluids. Nearly one third of respondents 189(34.1%) started complementary feeding at the aged of less than 6 months. Mean duration of exclusive breastfed was 5.31 (\pm SD 1.25) months. Concerning the method of feeding, mother who used bottle to feed their children were 289 (52.2%) and 131 (23.6%) used cup to feed their children (**Table 3**).

Table 3: Child characteristics, dietary factors and feeding practice among under five children in community of Gilgel Gibe Field Research Center, South West Ethiopia, 2022 (n=554)

Variable, N=554	Category	Frequency (N)	Percent (%)
Child's sex	Male	280	50.5
	Female	274	49.5
Child's age in months	≤ 5	9	1.6
	6 to 11	36	6.5
	12 to 23	153	27.6
	24 to 35	165	29.8
	36 to 47	98	17.7
	48 to 59	93	16.8
Birth order of child	First	87	15.7
	2 to 3	179	32.3
	4 and above	288	52.0
Type of birth	Single	550	99.3
	Multiple/twin	4	0.7
Vaccine received	Yes	466	84.1
	No	88	15.9

Vaccination status	on vaccination	44	9.4
	Fully vaccinated	389	83.5
	Incomplete	56	12.1
Time of initiating breast feeding after birth	Immediately	344	62.1
	Hours	191	34.5
	Days	19	3.4
Child receive pre-lactation food/fluid	Yes	31	5.6
	No	523	94.4
Squeezed out and throw the first milk	Yes	139	25.1
	No	415	74.9
Months on exclusive breast feeding	< 6 months	189	34.1
	>=6 months	365	65.9
Method of feeding child when give complimentary feeding	Bottle	289	52.2
	Cup	131	23.6
	Spoon	73	13.2
Diarrhea during last 2 weeks	Yes	98	17.7
	No	452	81.6
Fever at any time the last two weeks	Yes	122	22.0
	No	428	77.8
ARI during last 2 weeks	Yes	30	5.4
	No	520	93.9
Giving leftover food for the child	Yes	169	30.5
	No	385	69.5
Practiced washing of the child	Yes	533	96.6
	No	21	3.8
Took child to health institution for treatment	Yes	363	65.5
	No	191	34.5

5.3. Maternal characteristics and Environmental factors

Majority of the mothers 494(89.2%) had antenatal care visits, of them 363(73.5%) attended two to three times visits antenatal care during most recent pregnancy. Three hundred thirty-eight (61.0%) mothers were in the age of <20years during their first delivery. Majority of mothers 491(88.6) seeking health care during pregnancy. Most of children's mother 410(74.0%) know about family planning, of them 245(59.7%) ever used it whereas 79(47.9%) of mothers uses injectable method (Depo-Provera)

With regard to the treatment of water at household level, 70(12.6%) of households had treat water in any ways to make it safer whereas 20 (3.6%) are required to travel around 30 minutes on foot to fetch

water. Most of the house hold 319 (57.6%) throw the waste disposal in open field, followed by in pit 150(27.1%) and burning 69(12.5%) (Table 4).

Table 4: Maternal characteristics and Environmental factors among under five children in community of Gilgel Gibe Field Research Center, South West Ethiopia, 2022 (n=554)

Variable=554	Category	Frequency(N)	Percent (%)
Age at first birth	≤ 20	338	61.0
	>21	216	39.0
Total number of children ever born	≤ 3	277	50.0
	4 to 5	142	25.6
	≥6	135	24.4
Maternal health care seeking	Yes	491	88.6
	No	63	11.4
Maternal health care service	ANC	368	74.9
	Delivery	108	21.9
	PNC	14	2.9
Visit health facility for ANC	Yes	494	89.2
	No	60	10.8
Frequency of visiting health facility for ANC	1 st visit	41	8.2
	2 to 3 visit	363	73.5
	4 and above visit	90	18.2
Family planning	Yes	410	74.0
	No	144	26.0
Ever used family planning methods	Yes	245	59.7
	No	165	40.3
Which method have you ever used	Pills	41	24.8
	Depo-Provera	79	47.9
	Implant	41	24.4
Treat water at household level	Yes	70	12.6
	No	454	87.4
Dispose garbage	Open field disposal	319	57.6
	In a pit	150	27.1
	Burning	69	12.5
	Others	16	2.8

5.4 Magnitude of stunting among under five children

The prevalence of stunting among children of under five in the study area was 195 (35.2 %), (95% CI: 31.3-39.1). The mean age of stunted children was 28.84 months (\pm SD 13.87), of this 8(4.1%) with the age group 6-11, 41(21%) were in age group 12-23, 57(29.2%) were in the age group 24-35, 39(20% were in the age group of 36-47 and 50(25.9%) were with the age group of 48-59 month.

Out of 280 male children 90(32.1%) of them were stunted while among 274 female children 105(38.3%) of them were stunted (**Figure 5**).

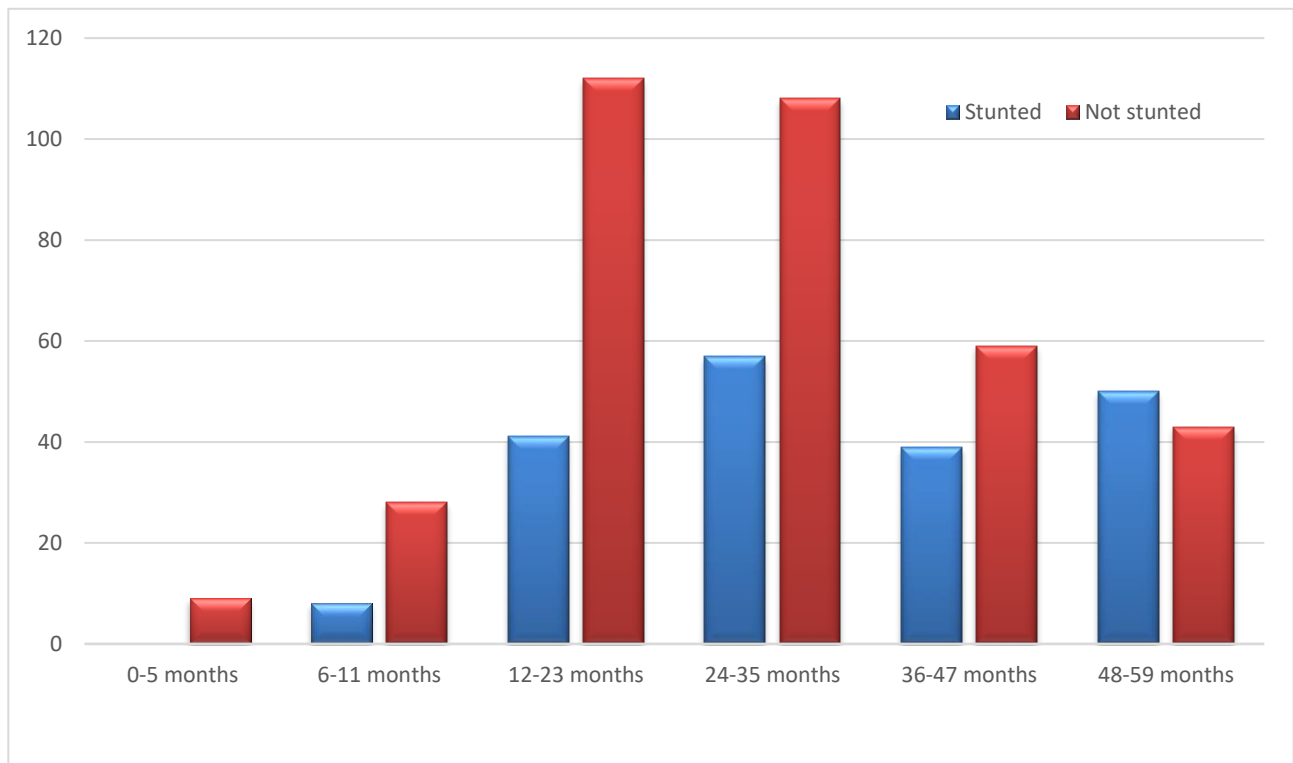


Figure 4. Prevalence of stunting with age groups among under five children in community of Gilgel Gibe Field Research Center, South West Ethiopia, 2022)

5.5 Factor associated with stunting among under five children

In bivariate logistic regression analysis, factors that shows a p-value of less than 0.25 were age of child, sex of the child, mother’s occupation, time of initiating breast feeding, colostrum feed, educational status of the mother, birth order of the child, wealth index, and they were inserted into multivariable logistic regression model.

In multivariable logistic regression analysis factors that were significantly associated with stunting were age of the child, time of initiating breast feeding, educational status of the mother and mother's occupation were identified as factors associated with stunting among under five children in the study area.

Child's age was one of the risk factors which were significantly associated with stunting in the study area. Comparing with children 48-59 months, children within age group 6-11 months had 3.86 times higher risk of being stunted (AOR;3.86, 95%,CI 1.51-9.87). The result also indicated that, children age group 12-23 months were 3.32 higher risk of being stunted than children age 48-59 months (AOR:3.32,95%CI;1.86-.5.92). Likewise, the time breastfeeding initiated after birth were among the predictors for stunting in this study. Chances of being stunted have increased by 2.34 among children who started breastfeeding after an hour compared with children who started breastfeeding immediately (AOR = 2.34; 95% CI: 1.53, 3.58).

The odds of stunting among children whose mother had finished primary education were 0.48 (AOR =0.48, 95% CI 0.30-0.78) times lower than children whose mother was cannot read and write. Similarly the odds of stunting among children from merchant/traders mother were 0.59(AOR =0.59% CI 0.39-0.89) times lower compared with children from housewife mother. (Table5).

Table 5: Bivariate and multivariable logistic regression analysis of factors associated with stunting among under five children in community of Gilgel Gibe Field Research Center, South West Ethiopia, 2022)

Variable	Not Stunted	Stunted	COR (95% CI)	AOR (95% CI)	P-Value
Mother's Education					
Cannot read & write	151(42.1%)	80(41.03%)	1	1	
Primary (1-8)	68(18.9%)	61(31.3%)	0.59(0.38-0.91)	0.48(0.30-0.78)	0.003
Secondary (9-12)	112(31.2%)	42(21.5%)	1.41(0.90-2.20)	1.06(0.64-1.77)	0.815
Informal education	21(5.8%)	8(4.10%)	1.39(0.59-3.28)	1.11(0.45-2.79)	0.817
Technical training	4(1.11%)	2(1.02%)	1.06(0.19-5.91)	0.84(0.13-5.49)	0.854
University degree/diploma	3(0.82%)	2(1.02%)	0.79(0.13-4.79)	0.25(0.02-3.06)	0.278
Occupation of mother					
House wife only	187(52.1%)	72(36.9%)	1	1	
Merchant/Trade	135(37.6%)	103(52.8%)	0.51(0.35-0.73)	0.59(0.39-0.89)	0.012
Farmer	27(7.5%)	16(8.21%)	0.65(0.33-1.28)	0.65(0.31-1.35)	0.247
Daily laborer	7(1.9%)	1(0.513%)	2.69(0.33-22.29)	7.10(0.50-100.7)	0.147

Government employee	3(0.8%)	3(1.54%)	0.38(0.08-1.95)	0.39(0.07-2.08)	0.270
Sex of child					
Male	190(52.9%)	90(46.2%)	1.31(0.93-1.86)		
Female	169(47.1%)	105(53.8%)	1	1	
Age of child					
0 to 5 months	9(2.51%)	0(0%)			0.999
6 to 11 months	28(7.8%)	8(4.1%)	4.07(1.67-9.86)	3.86(1.51-9.87)	0.005
12 to 23 months	112(31.2%)	41(21.0%)	3.18(1.84-5.46)	3.32(1.86-5.92)	0.000
24 to 35 months	108(30.1%)	57(29.2%)	2.20(1.31-3.70)	2.17(1.25-3.77)	0.006
36 to 47 months	59(16.4%)	39(20.0%)	1.76(0.99-3.12)	1.69(0.91-3.13)	0.093
48 to 59 months	43(11.9%)	50(25.6%)	1	1	
Time of breast feeding initiation					
Immediately	200(55.7%)	144(73.8%)	1	1	
Hours (less than 24hrs)	148(41.1%)	43(22.1%)	2.49(1.66-7.20)	2.34(1.53-3.58)	0.000
Days	11(3.2%)	8(4.2%)	0.99(0.39-2.52)	0.96(0.36-2.57)	0.949
Colostrum feeding					
Yes	83(23.2%)	56(8.4%)	1	1	
No	276(76.8%)	139(91.6%)	1.34(0.90-1.99)	1.47(0.95-2.31)	0.085
Wealth Index					
Poor	159(44.3%)	65(33.3%)	1.91(1.29-2.82)		
Medium	72(20.1%)	30(15.4%)	1.87(1.14-3.09)		
Rich	128(35.6%)	100(51.3%)	1	1	

6. DISCUSSION

This study tried to assess the prevalence of stunting and associated factors among under-five children. Based on the findings, the prevalence of stunting in the study area was 35.2 % (95% CI: 31.3-39.1). The finding was almost in line with results reported in Oromia region figure of mini EDHS 2019 (35.4%)(7), study conducted in Somali Region Dollo Ado 34.4%(27) and Southwest Ethiopia bench shek 33.3%(32). However, the prevalence of stunting in the study area was lower than study conducted in central Ethiopia, Adama town(44.4%)(28), West Shoa(40%)(34), Holeta town(45.7%)(14) and evidence from EDHS 2016 (38.3%) (26). Besides the result was relatively higher in comparison with studies reported in Ghana(18.1%)(10), Afar 24.8%(19), Southwest Ethiopia Genja district (23%)(38), Ethiopia Somali region figure of mini EDHS 2019(30%)(7). This variation might be due to differences in geographic characteristics of the study areas(27), study period, age difference of the participants, study setting and socio-economic characteristics of the participants, (25,28,34,45–48), difference in child feeding habit in rural and urban settings(45,47).

The result of this study shows that odd of being stunted was higher for children 6-11 and 23-23 months as compared to children 48-59 months. It indicated that children within age groups 6-11 months and 12-23 months were 3.86 and 3.32 more likely to be stunted. This association was supported by other studies conducted in Zambia(49), Rwanda(50) and Ghana(10). In the same way the finding of studies conducted in Afar (19), Holeta town(14) and EDHS 2016 further analysis(36) shows that age of child had a significant association with stunting. This might be due to the fact that at this age category, children whose age increase, physiological demand or food conception increase as a result those children if not well feed based on their age, growth become to suppressed (51). Another explanation for the increased risk of stunting in older children may be related to the mother's poor nutritional status during pregnancy, inappropriate infant and young child feeding practices, and other related factors that needed to be addressed starting at conception, continuing through a mother's pregnancy, and ending at age two, which was the most crucial time in a child's development. After a child reaches above two years of age, stunting is irreversible(2,4,52).

This study had also shown that, children whose mothers have attended primary education had reduced likelihood of stunting as compared to illiterate mothers. This is consistent with study done in Adama town(28), Zambia(49), Rwanda(50), Holeta town(14) and EDHS 2016 further analysis(36), they

shows significant association of maternal education with stunting. This might be due to the fact that educated women are more likely to be aware of nutrition, hygiene, and health care, which can greatly improve the nutritional status of their children(45,47,53).

The occupational status of mother also has a significant role in a child's stunting. Children from mothers who were merchant had lower risk of being stunted compared to children from housewife mothers. This finding is supported by another studies conducted in Korahay zone of Somali region (21) and with results from Dabat health and demographic surveillance system(54). This is because of the positive effect of maternal occupation(being merchant) in enhancing child nutritional status, mainly through improving household income, food security status, and utilization of health services(45).

Stunting is found to be associated with the time of initiation of breastfeeding after birth, in this study. Children who started breastfeeding immediately after birth whose mothers began breastfeeding suffered less from stunting. This result was in agreement with the other study conducted in Wolayita zone(37) ,pastoralist community of Northeast Ethiopia(55) and WHO recommendations(56). This may be because early breastfeeding leads to increased secretion and production of breast milk that will provide the baby with sufficient nutrients, such as colostrum(56,57). Another reason may be due to early initiation resulted in increased production of milk,but late initiation of breastfeeding was associated with decreased newborn-mother bonding and then inadequate maternal breast milk secretion (37).

7. LIMITATION OF THE STUDY

- Some variables that need good memory were vulnerable for recall bias though it was tried to minimized.

8. CONCLUSION

The result of this study described that the prevalence of stunting, among under five children was relatively high. Stunting continued to be a substantial burden in under five children in community of Gilgel Gibe Field Research Center. There was significant association observed between ages of child, time imitating breastfeeding after birth. Maternal educational status and occupation of mothers were strongly associated with stunting. Therefore, it implies that measures focusing on encouraging mother's education, early breast feeding initiation and child's age specific feeding may ultimately reduce the prevalence of stunting

9. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are forwarded:

For the Community

- Considering child age and their food requirement while feeding the child is recommended
- Encouraging and strengthening maternal education, as it is the vital tool to bring good health seeking behavior.

For health sectors

- Need to implement nutrition interventions to effectively address stunting burden with participation of stakeholders and community at large.
- Need to give education on immediate breast feeding after birth especially its importance for optimal growth of children in the community.
- Health extension workers (HEWs) should strengthen giving education to promote breast feeding imitation early in the community that will have substantial effect in reducing stunting
- Need to give nutrition education for the community about maternal and child nutrition to accelerate prevention of stunting by focusing the most critical periods of child development.

For Researchers

- As the current study was unable to determine the cause-and-effect relationships between independent variables and the outcome variable, additional cohort studies should be conducted to clearly identify other determinant factors and also by including additional factors that were not included in this study.

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ANNEXES

Annex 1. Information Sheet and Consent form

Title of study: Prevalence and factors associated with stunting among under-five children in community of Gilgel Gibe Field Research Center, SW, Ethiopia.

Principal Investigator: Kenu Fayera, phone No: +251919905266 or Email address: Keetimk@gmail.com

Section I. Information sheet

01. Name of the study area _____

02. Questionnaire identification no. _____

INTRODUCTION: Good morning/afternoon? My name is _____. In this Study which is undertaken by Jimma University, you and me would have a short discussion of about 20-30 minutes only and I am asking you to help us. Before we go to our discussion, I will request you to listen carefully to what I am going to read to you about the purpose and general condition of the study and you will tell me whether you agree or disagree to participate in this study at the end.

The purpose of this study is to identify and determine factors associated with stunting. The study are conducted through interviews. I would like to assure you that privacy will be maintained strictly throughout. A code number will identify every participant and no name will be used. Your responses to any of the questions will not be given to anyone else and no reports of the study will ever identify you. If a report of results is published, only information about the total group will appear.

The interview is voluntary and your participation / non-participation, or refusal to respond or stop responding to the questions will have no effect now or in the future on services that you or any member of your family may receive from the service providers. Are you willing to participate in this study?

1. Yes.

2. No

Thank you!!!

NB: 1. If the study subjects agree to participate in the study, go to consent form

2. No need of enforcing the clients to be included in the study

Annex II: Consent Form

Dear Sir/madam;

My Name is _____, I am Master's Degree students in Jimma University. I am conducting thesis on the assessment on determinant of stunting in community of Gilgel Gibe field research center.

The information that you will give me is very useful for the surrounding community including you. I assure you that the information you will give me will be kept confidentially. There is no any harm to you by giving this information except the time you will expend for the interview. The interview will take about 20-30 minute and you have a full right to participate or refuse or to withdraw in the meantime, but your participation is highly valuable for the success of our research objectives. Therefore, I politely request your cooperation to participate in this interview.

Are you willing to continue with the interview? Yes_____ No_____

Signature of the interviewer certifying that informed consent has been given verbally by respondent _____.

001. Questionnaire identification number / _____ /

002. Interviewer code _____ Name _____

003. Date of interview _____

004. Name of the Residence area _____

Checked by supervisor; Name _____, Signature _____

Annex II: English Version Questionnaire

Instruction: The questionnaire is divided into five parts. So, circle the letter of choice for multiple questions and write the answer for others in space provided to it.

Instruction for Interviewer

1. Collect data from the mother of the child (immediate care giver of the child)
2. Check for completeness of the questionnaire before ending the interview with the respondent
3. Perform Anthropometric measurement after you completed the interview
4. Adhere to the standard procedures

Name of data collector _____ Date __/__/__ Sign _____

No	Question	Response	Skip to/Remark
	PART ONE: SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTS OF RESPONDENTS		
101	Area of residence	1.Rural 2.Urban	
102	What is mother`s/care giver`s age?	_____ in years	
103	What is your ethnicity?	1. Oromo 2. Dawuro 3. Yem 4. Amhara 5.Others(specify)_____	
104	What is your religion?	1. Muslim 2. Orthodox 3. Protestant 4. Catholic 5.Others(specify)_____	
105	What is your marital status?	1. Married 2. Divorced 3. Widowed 4. Single 5. other (specify)_____	

106	Who is the head of the Household?	<ol style="list-style-type: none"> 1. My husband 2. My self 3. Other (specify)_____ 	
107	Total family size(How many person live in the HH?)	_____ in number	
108	How many children<5year live in the HH?	_____ in number	
109	What is your educational status?	<ol style="list-style-type: none"> 1. Cannot read & write 2. Informal education 3. Primary(1-8) 4. Secondary(9-12) 5. Technical/vocational training 6. University degree/diploma 7. other(specify)_____ 	
110	What is your husband's educational status?	<ol style="list-style-type: none"> 1. Cannot read & write 2. Informal education 3. Primary(1-8) 4. Secondary(9-12) 5. Technical/vocational training 6. University degree/diploma 7. other(specify)_____ 	
111	Occupation of mother (More than one answer is possible)	<ol style="list-style-type: none"> 1. House wife only 2. Mercant/trade 3. Farmer 4 Private Organization employee 5. Government employee 6. Daily laborer 7. Other(specify)_____ 	
112	Occupation of husband (More than one answer is possible)	<ol style="list-style-type: none"> 1. Farmer 2. Government employee 3. Merchant/Trade 4. Private Organization employee 5. Daily laborer 6. Other(specify) 	

113	Who decides on the money you earn to be used?	1. mainly Spouse 2. mainly Husband 3. Only husband 4. Both jointly	
114	Do you have some control and power (autonomy) in decision-making?	1. Yes 2. No 99. Do not know/not sure	

HOUSEHOLD WEALTH INDEX QUESTIONNAIRES

S.N	Question	Options	Remarks
Q1	Does your household have electricity?	1. Yes 2. No	
Q2	Does your household have a radio?	1. Yes 2. No	
Q3	Does your household have a television?	1. Yes 2. No	
Q4	Does your household have a refrigerator?	1. Yes 2. No	
Q5	Does your household have an electric mitad?	1. Yes 2. No	
Q6	Does your household have a table?	1. Yes 2. No	
Q7	Does your household have a chair?	1. Yes 2. No	
Q8	Does your household have a bed with a cotton/sponge/spring mattress?	1. Yes 2. No	
Q9	Does any member of this household have a bank account?	1. Yes 2. No	
Q10	What is the main source of drinking water for members of your household?	1. Piped to yard/plot 2. Others(specify)_____	

Q11	What kind of toilet facility do members of your household usually use?	1. Pit latrine without slab/open pit 2. No facility/bush/field 3. Others(specify)_____	
Q12	What type of fuel does your household mainly use for cooking?	1. Electricity 2. Wood 3. Others (specify)_____	
Q13	What is the main material of the floor in your household?	1. Earth/sand 2. Others (specify)_____	
Q14	What is the main material of the exterior walls in your household?	1. Bamboo with mud 2. Others (specify)_____	
Q15	What is the main material of the roof in your household?	1. Metal/corrugated iron 2. Others (specify)_____	
	PART TWO: CHILD CHARACTERSTICS		
201	Child's sex (NAME)?	1. Male 2. Female	
202	Child's age	_____ Months	
203	Birth order	_____th	
204	Had your child weighed at birth?	1. Yes	If
205	How much was the weight?	2. No _____ in Grams (card/recall?)	no,skipto206

206	Type of birth	1. Single 2. Multiple/Twin/	
207	Did the child ever receive any vaccine?	1. Yes 2. No	If no, skip to 209

208	Vaccine received (See card, if no card available ask them to recall) (More than one answer is possible)	1.BCG only(See scar) 2.Pentavelent(No of dose____) 3.PCV(No of dose____) 4.Rota(No of dose____) 5.Measle(No of dose____) 6.IPV(No of dose____) 7.OPV(No of dose____)	
209	Did the child have diarrhea during last 2 weeks?	1. Yes 2. No 99.Do not know/not sure	If no,skipto211
210	If yes to Q 209, How was the average Frequency of diarrhea per day?	1. Once 2. Twice 3. 3-5times 4. >5times	
211	Has the child been ill with fever at any time the last two weeks	1. Yes 2. No 99.Don't know/not sure	
212	Did the child have ARI during last 2 weeks?	1. Yes 2. No 99.Do not know/not sure	
	PART THREE: DIETARY FACTORS AND /OR FEEDING PRACTICE		

301	Had you ever breast fed the child (NAME)?	1. Yes 2. No	If yes, skip to 303
302	If no to Q 301, reason for not Breast feeding?	Reason _____	

303	How long after birth did you initiated breast feeding of the child?	1. Immediately 2. Hours (If less than 24 hours ,record hour) 3. Days 99.Don't know/not sure/	
304	Did you give the child pre-lactation Food/fluid?	1. Yes 2. No	If no,skipto306
305	If yes to Q 304, what did you gave him (her)?	1. Water 2. Butter 3. Milk 4.other(Specify)_____	
306	Had you squeezed out and throw the first Milk(colostrum)?	1. Yes 2. No	

307	Are you still breastfeeding the child?	1. Yes 2. No	If no,skipto315
308	How many times in the last 24hours was the Child breastfed?	_____ Times	

309	Do you breast feed in the night?	1. Yes 2. No	
310	Did you give the child additional food or Fluid other than breast milk in the past48 hours?	1. Yes 2. No	
311	If yes, what ingredients you gave? (More than one answer is possible)	1. Cow's milk 2. Butter 3. Sugar solution. 4. Formula milk. 5. Axmiet/Bula 6. Other(specify)_____	
312	How many times in 24 hours?	_____ times	
33	At what age did you start feeding other Additional food?	_____ in Months	
314	What have you used to feed the child when you start to give complimentary feeding?	1. Bottle 2. Cup 3. Spoon 4. Other(specify)_____	
315	How many months did you breast-feed the Child?	_____ months 99. Don't know v/not sure/	
316	For how many months did you exclusively Breast-fed the child?	_____ Months 99. Don't know v/not sure/	
317	Who is usually taking care of the baby During complementary feeding?	1. Mother 3. Grandmother 4. Housemaid 5. Other(specify)_____	
318	Do you give leftover food for your child?	1. yes 2. no	
319	If the child had history of illness like diarrheal disease, fever or ARIs, has the Child feeding practice changed?	1. Yes 2. No	If no, skipto321

320	If yes to Q 319, How was the practice of feeding changed?	1. preventing from breast 2. preventing from giving food 3. Providing additional food 4. Other (specify)	
321	Had you practiced washing of the child	1. Yes 2. No	If No, skip to 323
322	If yes to Q 321, how frequent do you wash your child?	1. Daily 2. Weekly 3. Other (Specify) —	
323	How did you usually treat your child when get sick?	1. Usually home treatment 2. Taking to traditional healers 3. Taking to Health institution 4. Other (Specify) —	
324	Have you ever took your child to health Institution for treatment when he/she was sick?	1. Yes 2. No	If no, skip to 401
325	If yes to Q 324, within how many times you took the child to health institution after the onset of symptoms?	1. Immediately 2. Within 24 hours 3. After 24 hours 99. Don't know/not sure	
	PART FOUR : MATERNAL CHARACTERSTICS		
401	Age at first birth (age when the index child was born)	_Years	
404	Age when the youngest child was born	Years	
405	Total number of children ever born?	in number	
406	Did you seeking health care during pregnancy	1. Yes 2. No	If no skip to 408

407	If yes for which maternal health care service seeking for?	1.ANC 2.Delivery 3.PNC 4.Other (specify)	
408	Did you visit health facility for ANC for the Child under study	1. Yes 2. No	If no skip to 411
409	At what months of the pregnancy you started ANC?	At months _____ 99.Don'tknow/not sure	
410	How frequent visited health facility for ANC During the pregnancy?	_____ times	
411	Did you attend PNC service after delivery of your child?	1.Yes 2.No	
412	Do you know about family planning?	1. Yes 2. No	If no skip to 501
413	Have you ever used family planning methods	1. Yes 2. No	If no ,skip to 501
414	Which method have you ever used? (More than one answer is possible)	1. Pills 2. Depo-Provera 3. implant 4. condom 5. other (Specify _____)	
415	Do you use it now?	1. Yes 2. No	
	PART FIVE: ENVIRONMENTAL FACTORS		
501	How long does it take you to go and come back to fetch water?	In minutes _____	

502	Do you treat water in any way to make it safer at household level?	1. Yes 2. No	
503	How do you dispose garbage?	1. Open field disposal. 2. In a pit 3. Common pit 4. Composting 5. Burning 6. Other (specify)	

Anthropometrical measurement

Instruction for the interviewer

It is very critical to adhere strictly to the standard measurement procedures

Measure Length/height to the nearest 0.1 cm

Child Length/height in centimeters_____

Annex II; Afan Oromo Version Questionnaires

Waraqaa Gaafii

Waraqaan gaaffii kun kan qophaa'e ragaa sadarkaa sirna nyaata ijoolle fi dhimmoota murteessaa isaa ta'an sadarkaa mana manatti funaanuuf, Giddugala Qorannoo Gilgel Gibe, Kibba lixaa, Itoophiyaa, 2022.

Waliigaltee

Seensa

Maqaan koo _____ jedhama. Ani kan hojjachaa jiru ragaa qorannaa

Yunivarsiitii Jimma, dipartimentii epidimolojii waliin ta'uun mata duree "Sadarkaa sirna nyaata ijoollee fi dhimmoota murteessaa isaa ta'an" irratti gaggeefamuuf oolu funaanuu dha. Maqaan keessan guca kana irrattii hin barreefamu, akkasumas ragaa naa kennitan walin qabsifamees itti hin fayyadamamu. Gaafiin isin deebisuu hin barbanne yoo jirate dhiisun mirga keessan ta'ee yeroo barbaadanis gaafiif fi deebii gaggeesinu dhaabuu ni dandeessu. Gaafii fi deebii kana xumuruuf daqiiqa 30 ta'u ni fudhata.

Haa ta'u malee, gaafilee hundaaf deebiin sirrii ta'e kaayyoo qorannaa kanaaf baaay'ee barbachisa dha. Kanaaf qorannoo kana keessatti akka hirmaatan kabajaan isin gaafadha. Hirmaachuudhaaf fedhii qabduu? Eeyyen _____ Lakki _____

Mallattoo gaafataa, Namni gaafatamu kun waliigaltee isaa jechaan ibsu isaa mirkaneessuuf

001. Lakkoofsa waraqaa gaafii / _____ / _____ /

002. Maqaa nama gaafatuu _____ Mallattoo _____

003. Guyyaa gaafii fi deebii _____

To'ataa hordofe; Maqaa _____, Mallattoo _____

Qajeelfama: Gaafin kun kutaa afur qaba. Kanaafuu gaafii filannootif qubee(lakkoofsa) deebii ta'etti marsii,kan biraatif bakka duwwaa isaaf kennametti guutii.

Ibsa namoota odeeffannoo funananiif

1. Odeeffannoon kan fudhatamu ykn kan funaanamu haadha mucaa ykn nama mucaa kunuunsa jiru irraayyi..
2. Gaafii hunda isaa guuttee xumuruu mirkaneefadhu itoo nama odeeffannoo siif kennu waliin gargar hin bahin.
3. Erga gaafii odeeffannoo xumurteen booda safarri qaama mucaa/daa'imaag gaggeessii.
4. Safarriin qaama mucaa/daa'imaag akkaata istandarditiin ta'uu qaba.

Maqaa nama odeeffannoo funaanuu _____ guyyaa __/__/__mallattoo _____

Lak k.	Gaafii	Deebii	Darbu/ibsa
	KUTAA 1:GAAFII WAA'EE HAWASUMMAA FI DINAGDEE		
101	Bakka jireenyaa	1.Baaddiyyaa 2.Magaalaa	
102	Umuriin haadha/kunuunsituu hagami dha?	_____waggaadhan	
103	Sabni keessan maalidha?	1. Oromoo 2. Dawuroo 3. Yem 4. Amharaa 5. kan biraa(ibsi)_____	
104	Amantaan keessan maalidha?	1. Muslima 2. Orthodoxsii 3. Protestantii 4. Katholikii 5. kan biraa(ibsi)_____	

105	Haallii gaa'ila keessani maalidha?	1. waliin jiru 2. wal hiikan 3. irraa du'e 4. Kophaa 5. kan bira(ibsi)	
106	Abban manaa eenyudha?	4. Abba manaa 5. Haadha manaa 6. kan bira(Ibsi)_____	
107	Baay'ina maatii mana keessa jiraatu?	_____lakkoofsan	
108	Baay'ina ijoollee waggaa shanii gadii mana keessa jiran?	_____lakkoofsan	
109	Sadarkaan barnoota keessan maalidha?	1. Dubbisuu fi barreessu hin danda'u 2. barnoota idileen alaa 3. sadarkaa 1ffaa(1-8) 4. sadarkaa 2ffaa (9-12) 5.leenjii teknikaa 6. digrii//diploma university 7.kan bira(ibsi)_____	
110	Sadarkaan barnoota abba warraa keessani maalidha?	1. Dubbisuu fi barreessu hin danda'u 2. barnoota idileen alaa 3. sadarkaa 1ffaa(1-8) 4. sadarkaa 2ffaa (9-12) 5.leenjii teknikaa 6. digrii/diploma university 7 .kan bira(ibsi)_____	

111	Hojiin keessan maalidha (deebin tokko ol ni danda'ama)	1. haadha mana qofa 2. qonnan bulaa 3. daldalaa 4. Hojjattu jarmiyaa dhuunfaa 5. hojjattu mootummaa 6. hojjataa guyyaa 7. kan bira(ibsi)_____	
112	Hojiin abbaa mana keessani maalidha (deebin tokko ol ni danda'ama)	1. qonnan bulaa 2. daldalaa 3. Hojjataa jarmiyaa dhuunfaa 4. hojjataa mootummaa 5. hojjataa guyyaa 6. kan bira(ibsi)_____	
113	Maallaqa argatan itti fayyadama isaa eenyutu murteessa?	1. caalman haadha manaa 2. caalman abba manaa 3. abba manaa qofa 4. lachuu waliin	
114	Dhimma mana keessa irraatti murtoo kennuu ni dandeessuu?	1. eeyyen 2. lakkii 3. hin beekuu/hin yaadadhu	
GAAFII WAA'EE QABEENYAA			
S.N	Gaaffii	deebii	ibsa
Q1	Ibsaa qabduu?	3. eeyyen 4. lakii	
Q2	Raadiyoonii qabduu?	3. eeyyen 4. lakki	

Q3	Televijiinii qabduu ?	3. eeyyen 4. lakki	
Q4	Dillaleessaa qabduu?	3. eeyyen 4. lakki	
Q5	Eelee ibsaadhan hojjatu qabduu?	3. Eeyyen 4. lakki	
Q6	Minjaala mana keessa qabduu?	3. eeyyen 4. lakkii	
Q7	Teessoo mana keessaa qabduu?	3. eeyyen 4. lakki	
Q8	Siree sponjii/shiboo irraa hojjatame qabduu?	3. eeeyyen 4. lakki	
Q9	Miseensa maatii keessan keessan kan herregaa baankii qabu jiraa?	3. eeyyen 4. lakki	
Q10	Maddi bishaan dhugaatiif fayyadamtanii maalidha?	3. boonbaa 4. kan bira(ibsi)_____	
Q11	Mana fincaanii gosa kam fayyadamtu?	4. Boollaa fincaanii manni itti ijaarame/bolla fincaanii ijaarsa hin qabne 5. Bosona keessatti/dirree 6. Kanbira (ibsi)_____	
Q12	Nyaata bilcheesuf maaf fayyadamtuu?	4. Ibsaa 5. Mukaa 6. Kan biraa (ibsi)_____	
Q13	Manni keessan lafti isaa maal irraa hojjatame ?	3. Biyyoo/dhagaa 4. Kan bira (ibsi)_____	
Q14	Manni keessan bakkeen isaa maal irraa hojjatame?	3. Leemmanii fi dhoqqee 4. Kan biraa (ibsi)_____	

Q15	Manni keessan maal irraa ijaamee/hojjatamee?	3. qorqoroo 4. kan bira ibsi)_____	
	KUTAA 2FFAA: HAALA MUCAA		
201	Saalli mucaa(maqaa) maalidha?	1. dhiiraa 2. dhalaa	
202	Umurii isaa/ishee meeqa?	ji'an	
203	Mucaa(Maqaa) meeqaffattii deessan?	ffaa	
204	Yammuu dhalatu/ttu ulfaatinni isaa/ishee	1. eeyyen	Yoo lakki ta'e,
	madalameera?	2. lakki	206 tti darbi
205	Hangam ulfaata ture?	giraaman (card/recall?)	
206	Gosa dhaloota	1. baaqee/kopha 2. Lakkuu	
207	Mucaan keessan talaalamee/tte beekaa/tti?	1. eeyyen 2. lakkii	Yoo lakkii ta'e, 209 tti darbi

208	<p>Gosa talaallii fudhate/tte (kardii ilaalii,yoo kaardin hin jiraane akka waaman/ibsan taasisi)</p> <p>(deebin tokko oli ni danda'ama)</p>	<p>1.BCG qofa(godaanisa irree mucaan irra ilaali)</p> <p>2.Pentavelent(yeroo meeqa fudhate/tte____)</p> <p>3.PCV(yeroo meeqa fudhate/tte____)</p> <p>4.Rota(yeroo meeqa fudhate/tte____)</p> <p>5.Gifira (yeroo meeqa fudhate/tte____)</p> <p>6.IPV(yeroo meeqa fudhate/tte____)</p> <p>7.OPV(yeroo meeqa fudhate/tte____)</p>	
209	<p>Mucaan garaa kaasa ni qaba/di turee torbee lamaan darban keessa?</p>	<p>1. eeyyen</p> <p>2. lakkii</p> <p>99.hin beeku/hin yaadadhu</p>	<p>Yoo lakki ta'e , 211tti darbi</p>
210	<p>Yoo eeyyen ta'e gaaffii 209, guyyattii yeroo meeqa kaasa ture?</p>	<p>1. altokko</p> <p>2. al lamaa</p> <p>3. yeroo 3-5</p> <p>4. yeroo shanii ol</p>	
211	<p>Torbee lamaan darban keessa gubaa qaaman dukkubsatee/tte turee?</p>	<p>1. eeyyen</p> <p>2. lakkii</p> <p>99.hin beeku/hin yaadadhu</p>	
212	<p>Mucaan dhukkuba rakkoo hafuura baafanna qaba/di turee torbee lamaan darban keessa?</p>	<p>1. eeyyen</p> <p>2. lakkii</p> <p>99.hin beeku/hin yaadadhu</p>	

	KUTAA 3FFAA: HAALA		
	QABIINSA/NYAATA MUCAA		
301	Mucaa(maqaa) keessan harma hoosiftu?	1. eeyyen 2. lakki	Yoo eeyyen ta'e, 303 tti darbi
302	Yoo gaaffii 301 lakki ta'e, maalif harma hoosisuu dhiifte?	Sababa isaa _____	
303	Mucaa erga dhalate/tee(maqaa) hammam turtanii harma kennitaniif ?	1. akkuma dhalaten/tten 2. sa'a-----booda 3. guyyaa-----booda 99.hin beeku/hinyaadhu	
304	Akkuma deessanin nyaanni /dhagala'aan/ mucaaf (Maqaa) keenitan jira?	1. eeyyen 2. lakkii	Yoo lakki ta'e ,306 tti darbi
305	Yoo gaaffii 304 eeyyen ta'e, maal kennitanif ture ?	1. bishaan 2. dhadhaa 3. aannaan 4.kan bira(ibsi) _____	
306	Hanan harma kan calqabaa eelmitanii ni-gatu?	1. eeyyen 2. lakkii	

307	Hanga hammati(yeroo amma) harmaa hosisaa jirtu?	1. eeyyen 2. lakki	Yoo lakki ta'e, 315 tti darbi
308	Sa'aa 24 darbeetti yeroo meeqa hosistan?	_____yeroodhaan	
309	Halkan ni-hosiistu?	1. eeyyen 2. lakki	

310	Mucaan (Maqaa) nyaata bira/dhangala'aa sa'aa 24 darbee keessatti fudhateera/tti?	1. eeyyen 2. lakki	
311	Yoo fudhate, nyaata akkami? (Deebiin toko ol ni-danda'ama)	1. aannan sa'aa 2. dhadhaa 3. sukkaara bulbulame. 4. aannan bittaa(formula) 5. Bula	
312	Sa'aa 24 tti yeoo meeqa fudhate/tte?	6 .kan bira(ibsi)_____ yeroodhan	
313	Umurii meeqatti nyaata bira (dabalataa) laachuufi eegaltan?	_____ ji'an	
314	Mucaa (Maqaa) nyaachisuuf meesha akkamitti gargaaramtu??	1. buttulee(qaruuraa) 2. siinii 3. maankaa	
315	Hanga umurii meeqatti harma hoosistan?	4 .kan bira(Ibsi)_____ ji'an	
316	Harma qofa hanga umurii meeqatti hoosistan?	99.hin beeku/hin yaadadhu ji'aan 99.hin beeku/hin yaadadhu	
317	Mucaa (Maqaa) nyaata nyaachisuu yeroo heddu eenyuttu hordofa?	1. haadha 2.oboleetti 3. akkawoo 4. hojjatuu manaa	
318	Nyaata namni biraa nyaate irraa hafee mucaadhaf ni kennituu?	5.kan bira(ibsi)_____ 1.eeyyen 2.lakkii	
319	Yeroo dhukkuba haali mucaa (Maqaa) itti nyaachiftan ni jijiramaa?	1. eeyyen 2. lakki	Yoo lakki ta'e,321 tti

320	Yoo eeyyen ta'e gaaffin 319, Haali nyaachisu akkamitti jijirama?	1. Harma hoosisu dhabbun 2. Nyaata kennufi dhabbun 3. Nyaata dabaltaa kennun 4. Kan biraa (Ibsi)	
321	Mucaa qaama isaa/ishee dhiqxanii beektu?	1. eeyyen 2. lakkii	Yoo lakki ta'e, 323 tti darbi
322	Yoo eeyyen ta'e gaaffii 321, Yeroo meeqati mucaa dhiqtu?	1. guyyaa guyyaadhan 2. torbee torbetti 3. kan bira(ibsi)	
323	Yeroo mucaan dhukkubsatu/ttu hakamitti yaalchiftu??	1. Yeroo heddu manumatti 2. Yaaltoota aadaa biratti 3. Dhabba fayyaa geessun 4. kan biraa (Ibsi)	
324	Kanan durra yaalidhaaf dhabba fayyaa geesitanii beektuu?	1. eeyyen 2. lakkii	Yoo lakki ta'e, 401tti darbi
325	Yoo eeyyen ta'e gaaffii 324'f, yeroo hamamitti gara dhaabbata fayyaa geessitu erga mallatton dhukkubaa irratti mul'ate?	1. yeroo mul'ate 2. sa'a 24 keessatti 3. sa'atti 24 booda 99. hin beeku/hin yaadadhu	
	KUTAA 4FFAA:WAA'EE HAADHAA		
401	Umurii mucaa isa jalqabaa itti deessan	_waggaadhan	
404	Umurii mucaa isa dhumaa itti deessan	waggaadhan	
405	Baayyina ijoollee deesse?	lakkoofsan	
406	Yeroo ulfaa gara dhaabbile fayyaa dhaqxanii beektu?	1.Yes 2.No	Yoo lakki ta'e gara 408 darbi

407	yoo eeyyen ta'e gaaffii 406'f tajaajila kam barbaacha dhaqan?	1.tajaajila ANC 2.tajaajila da'umsaa 3.tajaajila PNC 4.kan bira(ibsi)	
408	Dhaabata fayyaa qorannaa dahumsa duraa tiif ni deemtu turee?	1. eeyyen 2.lakki	Yoo lakki ta'e gara 411 darbi
409	Garaatti baattanii ji'a meeqaffaatti qorannaa dahumsaa duraa tiif dhaaba fayyaa deemuu eegaltan	_____ji'an 99. hin beeku/hin yaadadhu	
410	Yeroo meeqa tajaajila da'uumsan duraatiif dhaaba fayyaa deemtaniittu?	_____times 99.hin be :ku/ hinyaadadhu	
411	Erga mucaa deessani booda tajaajila daa'umsa boodaf gara dhaabbile fayyaa dhaqxanii beektu?	1.eeyyen 2.lakki	
412	Wa'ee karoora matii beektu?	1. eeyyen 2. Lakki	Yoo lakki ta'e, 501 tti darbi
413	Toftalee karoora matiitti fayyadamtan beektu?	1. eeyye 2. Lakki	Yoo lakki ta'e gara 501 darbi
414	Toftaa kamitti fayyadamtani beektu?	1. Kininii/pills 2. Dipo 3. 'implant' 4. Kondomiii 5. kan biraa (Ibsi)_____	
415	Yeroo hamma itti fayyadamaa jirtu?	1. Eye 2. Lakki	
	KUTAA 5FFAA: HAALA NAANNOO		
501	Yammu bishaan waraabdan,deemanii deebi'uuf yeroo hammamii isinitti fudhata?	daqiiqadhaan_____	

502	Bishaan itti fayyadamtan qulqulleessuuf yaaliin gootan jiraa?	1. eeyyeni 2. lakkii	
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503	Haalli kosii gogaa itti gattan akkam?	1. bakkeetti 2. bollaatti dhuunfatti 3. boollaa walinitti 4. komposti gochuu 5. gubuu 6. kan bira(ibsi)_____	
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Safarii qaama mucaa/daa'ima

Dheerina mucaa/daa'ima seentimeetiraan _____