JIMMA UNIVERSITY

COLLEGE OF HEALTH SCIENCE DEPARTMENT OF POPULATION AND FAMILY HEALTH

ASSESSMENT OF HOUSEHOLD FOOD INSECURITY AND ITS ASSOCIATION WITH NUTRITIONAL STATUS AMONG 6-59 MONTHS CHILDREN IN GAMBELLA TOWN, WESTERN ETHIOPIA

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ABSTRACT

Background: Food insecurity and malnutrition among children are common indeveloping countries including Ethiopia. Food insecurity is probably one of the determinant factors of malnutrition in children but results are inconclusive.

Objectives: The aim of this study was to assess the magnitude of household food insecurity and its association with the nutritional status of children in Gambella town.

Method:A community based cross-sectional study was conducted on children in April 2016,in Gambella town, west Ethiopia. The datawas collected from 284 households having children 6-59month by the face to face interview usingstructured. Anthropometric measurements were measured using standard procedures to determine nutritional status of children. Descriptive statistics, bivariate and multivariate logistic regression analysis were performed to determinethe association between food insecurity and nutritional status of children.

Result: The overall prevalence of household food insecurity was59.5% with 20.1%,23.6%, and 15.8% households were mildly,moderately, and severely food insecurity, respectively. Prevalence of stunting, underweight and wasting were 23.2%, 12.0% and 13.4% respectively.Household food insecurity was independentlyassociated with stunting but not with wasting and underweight.The odds of stunting is highly pronounced in those children who were from severely and moderately food insecure households (AOR =9.7, 95% CI: 3.75-25.08 vs. AOR =2.8, 95% CI: 1.14-7.21, respectively).

Conclusion and recommendation: The findings from this study suggest high prevalence of both household food insecurity and malnutrition among children in Gambella town.Household food insecurity wasassociated onlywith stunting. So that improving household food insecurity in Gambella town of Gamella region may be necessary but not sufficient to improve the nutritional status of young children in the town.An integrated strategy that improves the overall socio-economic wellbeing of families, maternal education,hygiene and sanitation practices will likely be more effective in improving child nutritional status in the town.

Key words: household food access, household food insecurity, nutritional status, children

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ABBREVIATIONS AND ACRONYMS

CSA: Central Statistical Agency

EDHS: Ethiopia Demographic and Health Survey

ELCSA: Latin America and Caribbean Food Security Scale

FANTA: Food and Nutrition Technical Assistan

FAO: Food and Agriculture Organization

FCS: Food Consumption Score

HAZ: Height for Age Z-Score

HDDS: HouseholdDietary Diversity Score

HDDS: Household Dietary Diversity Score

HFIAS: Household Food Insecurity Access Scale

IWI: International Wealth Index

MDGs: Millennium Development Goals

SAM: Severe Acute Malnutrition

SPSS: Statistical Package for Social Science

UNDP: United Nation Development Program

UNICEF: United Nation Children's Fund

USAID: United State Agency for International Development

WAZ: Weigh for Age Z-Score

WFP: World Food Program

WHO: World Health Organization

WHZ: Weigh for Height Z-Score

1. INTRODUCTION

1.1 Background

Nutrition is a fundamental pillar of human life, health and development across the entire life span(2).The nutritional status of preschool children is a key indicator to assess the nutritional and health status of a population, because children are the most vulnerable to nutritional imbalances; their physiology, growth and development are sensitive to both adequate food (food secure) and nutrition(3). It is an essential component of millennium development goals (MDGs) and Primary Health Care (4).

There are multiple determinants of malnutritionand food insecurityis being the major one among other.Food security has been defined by the FAO as "food security" is achieved when "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The absence of any component of the above, including cultural acceptability of food, and stability of food availability, access or utilization results in food insecurity (5). In order to achieve nutrition security, one needs to have access to appropriate care giving practices and to hygienic environments and adequate health care services, in addition to a diet that meets nutritional needs for a healthy and active life. Food security is therefore a prerequisite for nutrition security but is not sufficient to guarantee optimal nutritional status(6).

Even though there is no direct link between food insecurity and malnutrition, conducting nutrition and food security assessments together combines the strengths of each. Firstly, it improves interpretation (food security assessments provide some information about causes of malnutrition and proximity to nutritional decline, while anthropometric data can verify when a food security situation has deteriorated beyond a certain point). Secondly, it increases the likelihood of an appropriate response (nutrition data may provoke donors to act while the more in-depth food security assessment may indicate appropriate interventions)(7).

The complexity of food security makes it difficult to measure adequately because different dimensions of it do exist and researchers have tried over the years to capture as much as possible these different dimensions(8).

To address these difficulties, now a day simpler, rapid, accurate and cross-contextual indicators of food security have been developed over the past decade or so. Household Food Insecurity Access Scale (HFIAS)(9) is one of those indicators.The advantages ofthis

measurement are it includes quantitative, qualitative, psychological and social dimensions of food security as well as being cost effective tools for the measurement of food insecurity.

Anthropometric indicators commonly are used to measure malnutrition in a population of under five children. The nutritional consequences of food insecurity experience include underweight, stunting and wasting, and also overweight and obesity, depending on a broad range of contextual, economic and socio cultural factors(10).This study is to determine wither household food security status by using HFIAS and its association with nutritional status among preschool children by using Anthropometric indicators.

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1.2 Statement of the problem

Health and nutrition are indeed closely linked: disease contributes to malnutrition and malnutrition makes an individual more susceptible to disease and consequently more likely to die. Severe malnutrition especially increases the incidence, duration and severity of infectious disease. Death rates among children who are severely malnourished are about six times greater than among those who are healthy and well-nourished in the same population, and twenty to fifty times greater than the rate in rich and prosperous countries(11).

Ethiopia has one of the highest infant and child mortality rates in the world (1/10 babies born in Ethiopia does not survive to their 1stbirthday and 1/6 children dies before their 5thbirthday).As one might speculate, malnutrition is extremely prevalent among this same group of children in Ethiopia (under five years of age) (11).In our country the under-nutrition was associated with 24% of all child mortalities; 379,000 deaths in the period 2004 – 2009.Overall results in Ethiopia show that an estimated ETB 55.5 billion (US$ 4.7 billion) was lost in the year 2009 as a result of child under-nutrition. This is equivalent to 16.5% of GDP. On the other hand, the study estimates that Ethiopia could reduce losses by ETB 148 billion (US$ 12.5 billion) by 2025 if it reduces underweight rates to 5% and stunting to 10% in children under five years; alternatively, a reduction of the child under-nutrition rates to half of the current levels by the year 2025 could reduce losses by ETB 70.9 billion (US$ 6 billion)(12).

Globally, in 2011, nearly one in four children under-five years of age (165 million or 26 per cent) were stunted, 16 percent (estimated 101 million children under five years of age) underweight, 52 million children under five were moderately or severely wasted, and an estimated 43 millionchildren under-five were overweight (3).

At global level, there has been a decline in malnutrition levels from the 1990s; however, the levels in sub Saharan Africa have remained high (13)and (14). Close to 90 % of stunted (a long term measure of malnutrition) children in the world live in Africa and Asia, with the prevalence of stunting in Africa being 36 % in 2011 (15)

According to Mini MOHS 2014, the prevalence of stunting, wasting, underweight and over weight in Ethiopia was 40%, 8.7%, 25.2%, 1% and in Gambella, region it was found to be 22.5%, 14.9%, 18.5%, and 0.4%, respectively(16). GOAL and ACF completed two surveys in Gambella (Jikawo woreda) and Hareri (Hundene) woreda in July 2015. The

nutrition situation is classified as serious in Jikawo woredaof Gambella region with global acute malnutrition (GAM) of 11.7 per cent and severe acute malnutrition (SAM) of 2 per cent. The situation is normal in Hundene woreda(17)

Over the last 10 years, Ethiopia has achieved an overall reduction in poverty levels as well as food insecurity. Nonetheless, poverty and food insecurity remain a big challenge. Once study has been conducted in Ethiopia on food insecurity shows that Over 30% of the population is below the food poverty line, unable to afford the minimum caloric intake for a healthy and active life(18).At the same study from the above in Gambella region 35% of household are food energy deficient; 28% consumed less than acceptable diets; 30% of households consumed three or fewer out of seven food groups over a seven day period, and more than one in three Gambella spent less on food than is required to consume the minimum level of calories for a healthy, active life

In developed countries, household food insecurity has been associated with overweight and obesity among adults, particularly women, but not all studies have reported this relationship (19).There are fewer studies from developing countries among adults and children, and the results have been mixed: In Malaysia, household food insecurity was associated with obesity among rural women (20), while in Trinidad and Tobago, household food insecurity was associated with underweight among adults (21).

Now day rapid demographic, social and economic changes ongoing in many developing countries have led to increased urbanization and changes in food systems resulting in a global nutrition transition (22). In this global context, while large inequalities from the burden of under nutrition persist across regions, countries and communities, a concomitant increase in rates of overweight and obesity is witnessed, often in these same communities. The result is commonly referred to as the double burden of malnutrition; whereby both under nutrition and overweight co-exist (23)

However, the relationship between household food insecurity and nutritional status of adults and children, particularly in developing countries, is not well established.. But Ethiopia's approach to nutrition has been relief oriented and focused on food insecurity(24) even though Malnutrition is common in many food secure households in Ethiopia (Anon., 2009)

To be able to address the problem of malnutrition adequately, it is important that the context-specific risk factors for malnutrition are identified for appropriate interventions to be implemented. The risk factors of malnutrition are multifaceted and complex, and the relative

importance of each of the known risk factors of malnutrition including household food insecurity is likely to vary between settings. Food insecurity is probably one of the determinant factors of malnutrition in developing countries, but its role remains unclear. In particular, it is not known whether all children suffer from household food insecurity and at what extreme levels. Some studies have shown that in times of food insecurity, mothers are likely to reduce their own intakes to secure those of infants and small children (25)and(26)

Generally in Gambella Town, the magnitude of both food insecurity and child under nutrition is very high but not know them relationship clearly. To reach any conclusions about whether household food insecurity is independently associated with child malnutrition calls for further investigation.

2. LITERATURE REVIEW

2.1 Malnutrition

Malnutrition lowers the body's ability to resist infection by undermining the functioning of the main immune-response mechanism. This leads to longer, more severe and more frequent episodes of illness. Also it increases a child's risk of contracting respiratory infections, diarrhea, measles and other diseases that often kill children or permanently harm their physical, psychosocial and cognitive development (15).

The UNICEF conceptual framework illustrates the individual level immediate causes of malnutrition, its underlying causes at the household and community level and the basic structural causes at the societal level (3). In this framework, household level food insecurity is on the causal pathway between poverty and inadequate dietary intake and malnutrition. Originally developed to explain the causes of childhood undernutrition, this framework has proven to be relevant in describing various forms of malnutrition as well as the intergenerational effects of poverty and poor nutrition.

The underlying causes of malnutrition are food security, care and healthy environment. Food security at the household and individual level is a necessary but not sufficient condition for adequate nutrition (27).

Child under nutrition continues to be a major public health problem in developing countries including Ethiopia. According to the Ethiopia Demographic and Health Survey In 2011, there is substantial regional variation of malnutrition in Ethiopia, with some of the poorest indicators found in the west part of the country. The estimated prevalence of chronic malnutrition, for example, in the Gmbella Region is 27. 3% (28).

2.2 Household food security

2.2.1 The nutrition transition, food insecurity and the double burden of Malnutrition

The developing world has achieved progress in aiming to meet the targets of reducing under nutrition set by the first Millennium Development Goal. These targets aim to halve the proportion of the population below the minimum level of dietary energy consumption and the prevalence of underweight in under five year old children. However, it is clear that there are stark differences across regions with a high prevalence of under nutrition remaining in South Asia and sub-Saharan Africa (29).

At the same time, rapid demographic, social and economic changes ongoing in many

developing countries have led to increased urbanization and changes in food systems resulting in a global nutrition transition. This transition refers to recent global shifts in dietary patterns towards higher intakes of saturated fats, sugars and refined foods, and lower intakes of fiber rich foods, driven by technological advances that have made energy dense, nutrient-poor foods cheaply available on global food markets (22).

In this global context, while large inequalities from the burden of under nutrition persist across regions, countries and communities, a concomitant increase in rates of overweight and obesity is witnessed, often in these same communities. The result iscommonly referred to as the double burden of malnutrition; whereby both under nutrition and overweight co-exist. Although apparently paradoxical, both under nutrition and overweight can emerge from the same root causes: poverty and food insecurity (23)

2.2.2 Nutritional outcomes associated with food insecurity along the nutrition transition

Measured alongside anthropometric, dietary and socio demographic data, experience of food insecurity can provide insight on vulnerabilities and can help in the planning of relevant interventions to target food insecurity populations in a timely manner. This section reviews the associations between food insecurity using experience-based scales and nutritional status outcomes in countries at different stages of the nutrition transition.

Wasting and underweight

Studies investigating the association between food insecurity and underweight or wasting yield mixed results. Most studies in low income countries show a positive association between increased severity of food insecurity and risk of underweight. A recent multi-country study found severe household food insecurity among under five year old children to be significantly associated with underweight and wasting in Bangladesh, and underweight in Ethiopia, while moderate food insecurity was associated with underweight among children in Vietnam (30).

Data from Colombia show that mild, moderate, and severe household food insecurity were associated with underweight in a positive, dose response relationship among preschool children(31),

Although household dietary diversity (used as a proxy for food insecurity) in Tanzania was associated with underweight among adolescents (32) an eight-country study which included

Tanzania along with Nepal, Pakistan, Bangladesh, India, Brazil, Peru, South Africa, showed no significant impact of household food insecurity on underweight among children 2-5 years of age (33).

Study done in rural communities of Saesie Tsaeda-Emba District, Tigray, Northern Ethiopia: Comparative study shows that Children from the food secure and food insecure households were 18.1% and 20.5%, underweight respectively. But, there was no statistically significant difference between the comparison groups(4).

Stunting

Studies assessing the association between household experiences of food insecurity and stunting give more homogeneous results. Children under 5 years of age had an increased risk of stunting in households with severe household food insecurity in Bangladesh and Ethiopia, and moderate food insecurity in Vietnam(30). Consistently, a multi-country study conducted in Tanzania, Nepal, Pakistan, Bangladesh, India, Brazil, Peru, and South Africa showed a positive, consistent association between food insecurity and stunting in all the countries with food insecurity shifting the distribution of children's height-for-age z scores toward lower values(33). Other studies conducted in Colombia and Brazil among preschool children (under 5 years) also showed a strong and positive association between food insecurity experience and stunting(34) and(35).

In Ethiopia, studied in rural communities of Saesie Tsaeda-Emba District, Tigray, Northern Ethiopia: Comparative study shows that there was statistically significant difference between the comparison groups in which the children from food insecure households were about 48% at higher risk to be stunted when compared to the children of food secure households(4)

Overweight/Obesity

Various possible mechanisms can explain the apparent paradox of food insecurity as a cause of overweight and obesity. Individuals and households can attempt to manage food insecurity in various ways including reductions in spending on education or health care, diversifying livelihood strategies, and making trade-offs in various aspects of living , such as choosing inexpensive, high energy foods (22), (36). In the context of globalized food markets where the relative cost of fatty foods, refined oils, and sugar is low compared to fruits, vegetables, and legumes, the prioritization of cost for food insecure families may result in excessive consumption of energy while having diets low in diversity and micronutrient content (22).

This is evident in studies that have investigated the effect of food insecurity on diet quality in various settings including low, middle and high income countries. These indicate that food insecure households consume significantly less animal products (meat, fish, and poultry) (37),(38) as well as fruits and vegetables(39)(37), and more staple cereal products than food secure households(37). A large body of literature largely emanating from the USA has shown mixed results regarding the association of food insecurity and overweight/obesity. Various studies have reported on the effect of household food insecurity on weight status in the USA and have shown that the strongest consistent links between food insecurity and obesity are amongst women, with growing evidence for an effect among adolescents, and contradictory results reported amongst children and men(40),(19). These highlight the need for longitudinal studies to assess the temporal relationships between food insecurity and weight status particularly in children and men. In addition, the fact that intra household differences may exist in resource allocation and food choices can be masked by a household level tool and makes the case for the need to assess individuals' rather households' experiences of food insecurity to better understand age and gender differences seen(41). This will be possible with the recently developed Food Insecurity Experience Scale (FIES) which aims to measure food security at the level of the individual(41).

Various studies that have investigated the association between food insecurity and overweight/obesity did not find any significant association. These include studies of Indian women of reproductive age in Malaysia (42), migrant farm workers on the US-Mexico border and two studies of Brazilian children; one on children less than 5 years of age (43).

This lack of consistency in results appears to derive from contextual differences affecting food insecurity (54) particularly the stage of the nutrition transition, differences in experiences of food insecurity within households(44) as well as age associated, gender specific, and life course effects of food insecurity. In fact a recent study from Brazil showed an intergenerational difference in the effect of household food insecurity on nutritional outcomes of under 5 yearold girls, adolescent girls and women; with household food insecurity leading to overweight and obesity in adolescents and adults respectively, but not in preschool aged girls (45).

2.3 Socio-demographic and economic factors

2.3.1 Wealth/income of the household

As acknowledged in many studies, an increase in household income/wealth is expected to

reduce child malnutrition (46); (27); (47). For example, Haider et al. (based on their study undertaken in Holetta woreda (district), Oromiya region) reported that child malnutrition (measured by stunting) is significantly lower in households with crossbred cows (ie better quality) than in those without. It was also shown that households with crossbred cows had a higher level of consumption of calories, protein and other nutrients. The higher consumption, they noted, was due to the higher income because of the ownership of crossbred cows. According to Christiaensen and Alderman (2004), sustained income growth of 2.5 per cent per adult over a fifteen-year period could be associated with a 3-6 per cent decline in chronic child malnutrition in Ethiopia. They argued, however, that income growth alone might not be sufficient to alleviate child malnutrition. Similarly, Glewwe et al. (2002) observed that, due to rapid economic growth in Vietnam since 1986, a dramatic decline in poverty and child stunting was achieved. Based on their empirical investigation, they concluded that growth in household income, although not very large, had a positive impact on child nutrition in Vietnam during the 1990s. They also noted that, over time, child stunting declined within each quintile even after adjustment for change in income was made, which suggests that there are other factors, in addition to income growth, which led to improvements in child nutrition.In 2010/11, the percentage of stunted children was only 29.7% in the richest quintile compared to 49.2% among children in the poorest quintile.

2.3.2 Household factors

A growing number of studies recognize the important role that household composition and parental levels of education play in shaping children's nutritional outcomes.

Household education

Various studies have concluded that parental education, especially mothers' education, is a key element in improving children's nutritional status(47). (27)Investigated the mechanisms through which education (schooling) results in better child nutrition and/or health. Specifically, Glewwe (ibid) identified three possible pathways: 1) direct lessons in nutrition and health in schools to future mothers; 2) gaining nutritional knowledge because of literacy and numeracy skills acquired in school; and 3) exposure to, and familiarity with, modern society through school which facilitates the use of modern medicines. The implication is that schooling is associated with child nutrition only if it can improve mothers' nutritional knowledge. Glewwe (1999) further suggested that such knowledge could be attained outside the classroom(47).

However, the impact of mothers' schooling on child nutrition is not only through nutritional knowledge. An educated mother is likely to have a higher income (which can directly affect her children's health and nutrition) and higher status and power in the household and community (which will put her in a better position to make decisions about her children's needs). The literature also notes that, particularly where the general level of education of the community is low, the level of education of female and male members of the household could be particularly important in indirectly influencing child nutritional status (48).

More specifically, Christiaensen and Alderman (2004) found that the effect of maternal education is about twice as important as that of paternal education. Moreover, they found that primary school completion of at least one adult female in a household results in a 6-11 per cent decline in stunting, while completion of primary school by at least one male adult reduces child stunting by only 2-8 per cent.

Household composition

The evidence on household composition and child malnutrition is mixed. Christiaensen and Alderman (2004) found that larger family size results in less stunting among children in Ethiopia. They arguethat economies of scale in time for childcare and expenditure can be enjoyed in large families and that children benefit from parents' accumulated experiences in care of young children. However, Desai's (1995) cross-country study found that the nutrition of a child aged between 6 and 36 months is likely to be negatively affected by the presence of a sibling aged 0-5 years as siblings of a similar age are likely to compete for parental resources. Having siblings of 6-12 years has a less clear effect, which is sometimes negative. The presence of siblings of 13-15 years has a positive effect on a child's nutritional status.

2.4 Access to services

2.4.1 Access to health services

Access to health services is the main determinant of whether the public is going to utilise the services. However, one also has to consider the quality and prices associated with the service, although they obviously have little relevance if access is limited (49). Access to health services is expected to influence nutritional status, as children without access to such services are more likely to be malnourished, reflected through weight loss which is associated with untreated diarrhoea and other infectious diseases.

2.4.2 Water and sanitation

A household's access to facilities is likely to be correlated with community characteristics. Households living in wealthier communities might have a relatively healthy environment, which implies better sanitation facilities, access to clean water and healthcare facilities(27). Water and sanitation play a particularly important role in child nutrition due to their impact on diarrheal diseases.

2.5 Social and care environment

Research conducted in the pastoralist's community of Somalia revealed that pre-lactation practice, and mode of feeding were association with acute malnutrition(50). Moreover, study in mulago hospital of Kampala indicated lack of breast feeling and failure to complete immunization as a main predictors of acute malnutrition in children(51)

According to the study in Gondar to identify the risk factors of SAM, inappropriate infant and young child feeding practices were commonly seen in children with severe acute malnutrition. The identified inappropriate feeding practices were supplementation with pre lacteal feeds, lack of exclusive breastfeeding in the first six months of age, late initiation (at 12 months of age or beyond) of complementary diet, and bottle-feeding((52).

In summary, the literature review has helped us identify important factors that are associated with child malnutrition in developing countries, including factors related to household economic welfare, household composition and education levels, access to services (health, water and sanitation) and household food access provision. Drawing on the children sample of 285 six-59month-olds from Gambella Town of Gambella region, this paper will contribute a more household food insecurity and its association with malnutrition among 6-59months-old children in Gambella Town, as well as provide insights into their interactive impact and relative importance.

In addition, we identify two major gaps in the literature on child malnutrition in Ethiopia. First, while most nutritional studies focus on rural and poor household, we are looking at children live in urban this is important to know global nutrition transition association with nutritional status of child. This is one of the important and unique contributions of this study.

The second differ of this study is we usedHFIAS indicator to measure household food access, and it was occurred the same time and sample method with nutritional measurement for association purpose.

2.6 The food security and nutrition conceptual framework

There are multiple determinants of malnutrition. It is not a simple problem with a single and simple solution that causes malnutrition. Multiple and interrelated determinants are involved in why it develops. The conceptual frame work below shows this inter related factors associated with malnutrition. For this study, the conceptual framework is adapted from several similar frameworks, including the UNICEF framework on the causes of malnutrition, the livelihoods framework, and others that look specifically at food and nutrition security. As food security is multi-dimensional, there is no specific factor or outcome on the framework titled'food security'; rather, all factors and outcomes are considered when describing the food and nutrition security situation.

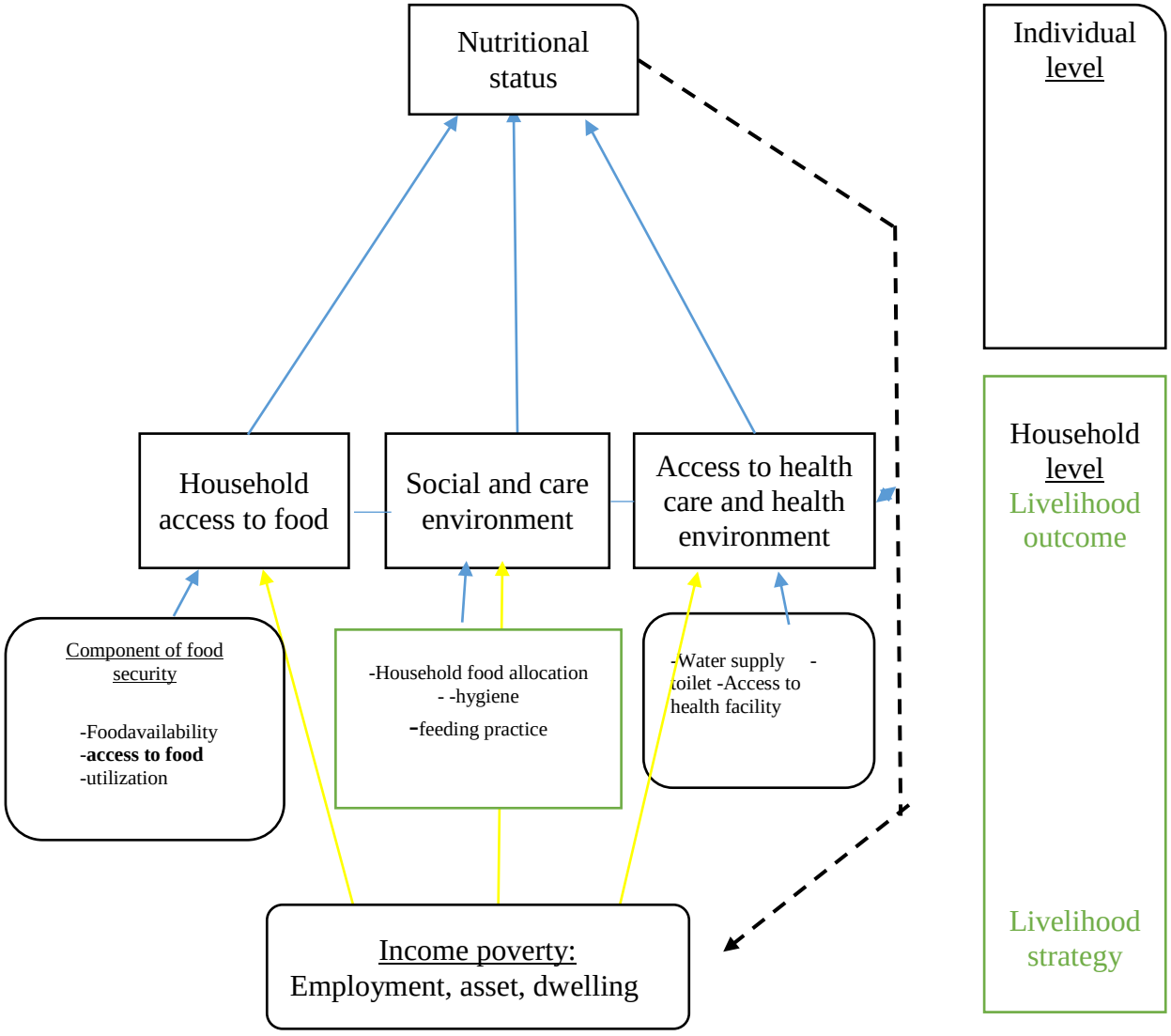

Figure 1: food security and nutrition conceptual framework (adapted from WFP)

2.7 Significance of the study

The persistent prevalence of chronic malnutrition in gambella is of particular concern that requires urgent attention and immediate action.To be able to address the problem adequately, it is important that the context-specific risk factors for malnutrition are identified for appropriate interventions to be implemented.The risk factors of malnutrition are multifaceted and complex, and the relative importance of each of the known risk factors of malnutrition including household food insecurity is likely to vary between settings.

Though there are reported cases of household food insecurity in gambella, its contribution to child malnutrition remains unclear.In particular, it is not known whether all children suffer from household food insecurity and at what extreme levels.

To reach any conclusions about whether household food insecurity is independently associated with child malnutrition calls for further investigation. The study was yield important insights about the magnitude of household food insecurity and its association with under- nutrition among preschool children in Gambella town, which can be used for priority setting and designing effective nutritional program in addressing the nutritional problems of the preschool children in the town and similar settings.More considerably, the study has important policy implications from a global health perspective in which it will help to evaluate the progress being made towards achieving the Millennium Development Goals in the study area. Finally, the study could be used as a stepping stone for further studies.

3. OBJECTIVES OF THE STUDY

3.1 General objective

- To assess the magnitude of household food insecurity and its association with nutritional status of children 6–59 months in Gambella town, south western Ethiopia

3.2 Specific objectives

- To assess nutritional status of children 6-59 months in Gambella town
- To determine the levels of household food insecurity among households having children 6–59 months in Gambella town
- To determine whether household food insecurity is associated with nutritional status of children 6-59 months in Gambella town.

4. MATERIALS AND METHOD

4.1 Study area and period

The study was conducted from March 29/2016 to April 23/2016 in Gambella Town, Western Ethiopia. Gambella Town is the capital of the Gambella regional state located at a distance of 768 kilo meter in the south west away from Addis Ababa. The town is located on the Geographical coordinates of 8°15′ North Latitude and 34°35′ East Longitude, and has an elevation of 526 meters above sea level having hot climatic condition at the temperature range of 27-36ºC. Gambella Town has been divided by five kebeles and the town harbors different ethnic groups. The majority of ethnic groups residing in the town are Nuire, Agnuhak, and others. However, there are also other ethnic groups including settlers from other parts of the country. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia, Gambella Town has a total population of 53,022, of whom 52.6% are men. The town has a total of 11,260 households with an average of 3.8 persons to a household. The town has one hospital, one health centers, two governmental junior clinics and 15 private clinics.The livelihood of the population is mainly dependent on government work and trade.

4.2 Study design

A community based cross-sectional study design was employed.

4.3 Population

4.3.1 Source population

All children 6-59months age residing in the Gambella town.

4.3.2 Study population

Sampled children 6-59months age residing in the Gambella Town during the study periodsandwho meet the inclusion criteria.

4.3.3 Study participant

Children 6-59month of age, mothers/caregiver's was the respondent on behalf of them.

4.4 Sampling unite

Household was used as a unit to drawn samples.

4.5 Sample size determination:

Sample size was calculated using a formula for single population proportion by considering the overall prevalence of stunting, underweight and wasting are 22.5%, 14.5%,and 18.4%, respectively for under-five children of Gambella region from Ethiopia mini Demographic and Health Survey 2014(16) , 5% margin of error and 95% confidence interval. The sample sizeswere obtained using the following formula and the largest figure was considered for the final sample size:

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}$$

Equation 1: Formula for calculating sample size

Where:

n= total sample size

z= confidence interval

p= prevalence of stunting, underweight and wasting for under-five children in Gambella Town

q= 1-p

d= margin of error

Equation 2: Formula for calculating sample size

(53)

Then, $\boldsymbol{n = \frac{1.96^2 * p(1-p)}{(0.05)^2} = 190.6, 230.7\ and\ 267.9}$ for stunting, underweight and wasting respectively.

From the CSA report, children 6-59months age constitute 14.25% of the urban population of Gambella region. The current total population of the town is 53,696 (projected from 2007 census), the numbers of children 6-59months age in the town were

$$\mathbf{14.25 \times 53696 = 7651.68 \sim 7652}$$

Since this number is small (<10,000), finite population correction is used to calculate the final sample size.

Where:

$$n = \frac{n_0}{\left(1 + \frac{n_0}{N}\right)}$$

n_o= 268

N= numbers of children 6-59months age in the town

N=7367

(54)

Equation 3: Formula for calculating population correction sample size determination

Then $\boldsymbol{n = \frac{268}{1+\frac{268}{7652}} = 258.94 \sim 259}$

Based on the correction formula the sample size reduced to 259, Additional 10% was added to take care of nonresponses and other unexpected events (e.g., damaged/incomplete questionnaire), and so the final sample size inflated to

$$\boldsymbol{259 + (259 \times 0.1) = 284.9 \sim 285}$$

4.6 Inclusion criteria

The inclusion criteria for this study is being a child aged between 6-59months, who dwelt in the townat least for six month, and one of the household member (either household head or caregiver) volunteer to give information.

4.7 Exclusion criteria

All 6-59months age children with severe illness and deformities which cause difficulty for anthropometric measurement during survey.

4.8 Sampling technique

Prior to data collection,censuswas conductedin the all kebeles of Gambella town to get lists of household having children age 6-59 months(census was done beside of polio champagne that carried out by gambella health office). During the census unique identification number was given to the household having children age 6-59 months, which was also written on the gate of their home in order to facilitate the process of sampling technique. Then, sampling frame was prepared using these unique identification numbers given to household having children age 6-59 months. Lastly, sample household having children age 6-59months proportional to the number of household having children age 6-59 months in each kebelewere drawn usingcomputer generated random number method by using spss version 21.0 software.

If more thanone children fulfilling inclusion criteria are found in the selection household one

was selected using lottery method. The next household that listed in the framwork and didn't included in the samplewas taken if the selected houseouse there was no children who fulfill inclusion criteria.

THHsh6-59- total households having children age 6-59 months

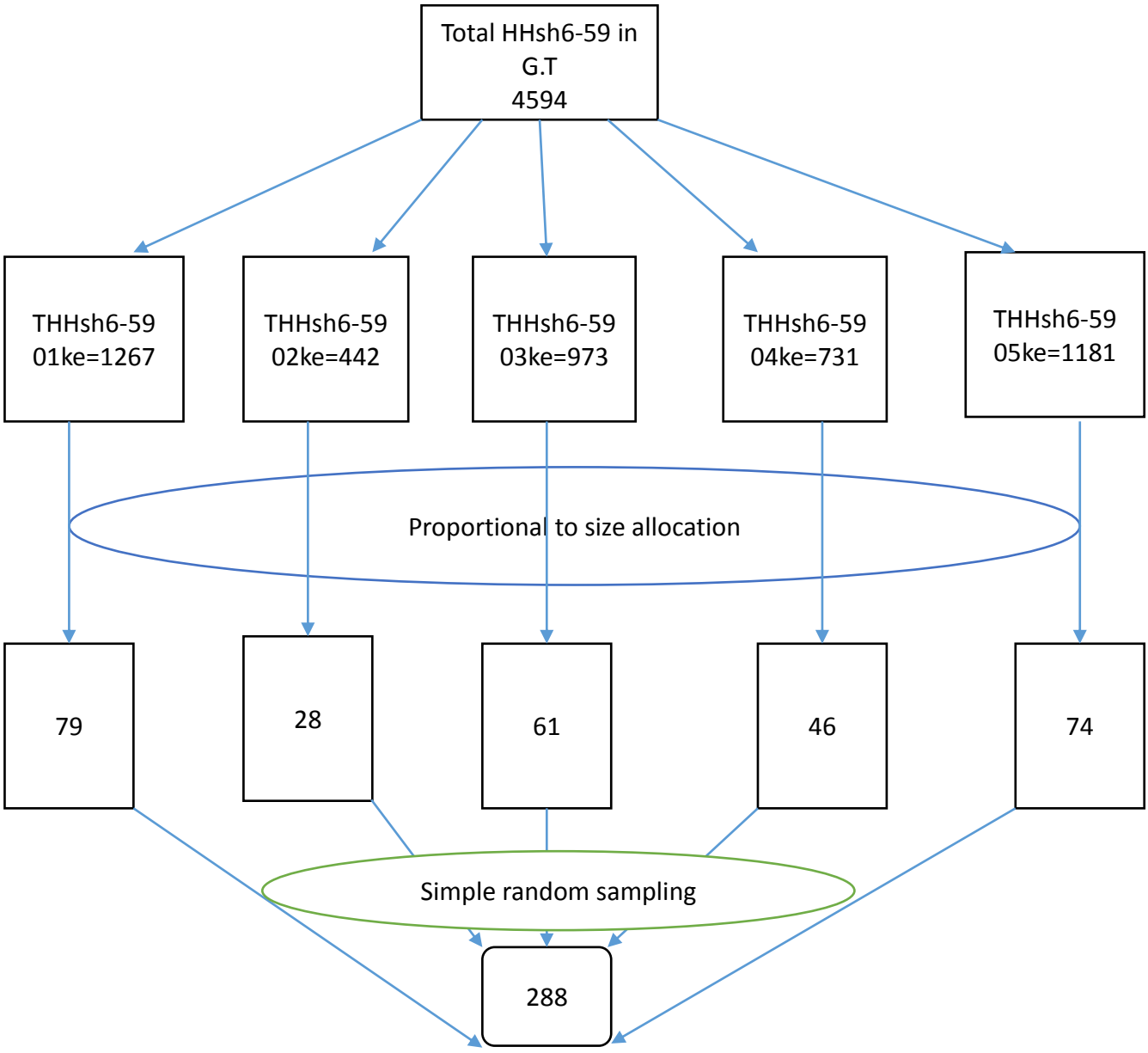

Figure 2: schematic presentation of sampling procedure

Note:- my sample go up from 285 to 288 because of fraction numbers,were changed in to the upper integer numbers, during stratified allocation at kebele level.

4.9 Data collection equipment and procedures

Anthropometric measurement

Anthropometric data such as body weight and height were collected using salter spring scale and infantometer for children age 6-24 months, and digital scale (seca) and portable stadiometer for children above 24 months age. Anthropometric measurements of children were measured based on the WHO standardized procedures. Weight and recumbent length/ height were taken according to WHO standardized techniques(55).The children were weighed to the nearest 100 g, the recumbent length of children below 24 months of age were measured to the nearest 0.1 cm. The child was placed on his/her back between the slanting sides. The head was placed so that it is against the top end. The knees were gently pushed down by a helper. For children aged 24–59 months, stature were measured in a standing position. The child should stand without shoes on a level floor. The legs were placed together, as also were been the heels. Children were assessed for the presence or absence of bilateral edema of the feet.

Validation of instruments, and measurements and random auditing was done on a daily basis by data collector's supervisor. Trained nurses did anthropometric measurements in the houses of the selected children during day time.

HFIAS measurement

Household food insecurity wasmeasured using the Household Food Insecurity Access Scale (HFIAS) that was developed by the Food and Nutrition Technical Assistance (FANTA) project(9). For Household Food Insecurity Access Scale (HFIAS) measurement, each of the questionswere asked with a recall period of four weeks (30 days).The respondent was first asked an occurrence question - that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence questionwas asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

International Wealth Index (IWI)

In addition, household economic status was measured using the International Wealth Index (IWI) which contains 12 assets measured by 20 indicators based on an earlier concept that was developed by Smits and Steendijk (56). This measurement is appropriate for urban and rural setting in low and meddle income countries. (Detail in the annexA part)

The International Wealth Index (IWI) measurementwas measured based on the 7 consumer durables (TV, refrigerator, phone, bicycle, car, a cheap utensil and an expensive utensil),3 housing characteristics (floor, toilet and number of sleeping rooms), and 2 public access (quality of water supply and electricity) by observing from selected household.

The consumer durables included in the construction of IWI were measured with two-category variables. These variables have value '1' if the household or one of its members owns the durable and value '0'if this is not the case. A similar two-category variable was used to indicate whether (1) or not (0) the household has access to electricity.

Quality of water supply, of floor material and of toilet facility were measured with three categories: (1) low quality, (2) middle quality, and (3) high quality. For the number of sleeping rooms also a three-category variable was used: (1) zero or one sleeping rooms, (2) two sleeping rooms, and (3) three or more sleeping rooms.Then all items asked were assessed for internal consistency and showed to be reliable with a cronbach's alpha value of 0.73 (>0.7 is considered as reliable). Based on the sum of IWI score rank ordered into Teri tiles to develop the wealth index. Addition of wealth index, IWI is used to measure poverty line (below $30^{th}$and 50^{th} percentile of IWI distribution is equal to the households, they earn below 1.25 and 2.00 dollar per day, respectively).

Information on important child characteristics, caring practices, environmental conditions and socio-graphic werecollected by face to face interview using pre-tested English questionnaires adapted from related literatures andthat was translated to Amharic.

The data was collected by five data collectors (urban health extension nurses) who were supervised by two Bachelor of Science degree public health working in Gambella town.The responsibilities of data collectors was measuring the anthropometric measurments of selected child and filling the questionnairesfrom the immediate caregivers of the child or/and the person who was responsible for meal preparation for the household. The supervisor provided all items necessary for data collection on each data collection day, checking filled questionnaire for completeness and consistency, and solving problems during data collection.

The principal investigator was making the overall supervision daily.

4.10 Data quality assurance

To insure the quality of data the questionnaires originally prepared in English was translated to Amharic and administered to respondents by local language speaking data collectors who were fluent in Amharic. The questionnaires were translated back to English to check for its conceptual equivalence.

Before conducting the main study, pre-test was done on 15 householdhaving children age 6-59months living in Itang town, which is located 38km far from Gambella town, that wasn't included in the main study.Finally, data collection tool was refined based on the findings from the pretesting.

To get reliable data and assure its quality, data collectors and supervisors were given a two days training. The training agenda was included survey purpose, sampling procedures, field procedures (random household selection, introduction, and systematic data collection), techniques in interviewing, and taking measurements (height and weight). This was aimed at pretesting of questionnaire and achieving high data precision and accuracy.

Anthropometric measurement was taken twice and the mean was taken for analysis, and a difference of 100 gram in weight and 0.1 cm in length was accepted as normal, and alsostandard procedures were followed.Every morning and prior to each measurement, the weight scale was calibrated with a standardweight and instruments were calibrated according to the manufacturer's recommendations.

Every day, all collected data were reviewed and checked for completeness and consistency by the supervisors. Data cleansing was done thoroughly using epiData version 3.1.

4.11 Data processing and analysis

Collected data were checked for completeness, consistency,and coded manually after which thedata wereentered into EpiData version 3.1. Then after data were exported to SPSS 21 for windows for further analysis.

First univariate analysis was conducted to explore frequency distribution, central tendency, variability (dispersion) and shape of the overall distribution of dependent variables.

Bivariate analysis was done to identify candidate variables formultivariable logistic regression model. All explanatory variables that were associated with the outcome variable at a p-value

of <0.25 were concedered candidates for multivariable logistic regression.Multi collinearity between different predictor variables was also checked using variable inflation factor (VIF) and Pearson correlation coefficient.Variance inflation factor (VIF>3) and Pearson correlation coefficient (r>0.6 or<−0.6) wereused to indicate the problem of multicollinearity among predictor variables themselves.After identifying predictor variables that had collinearity with specific predictor variable, they were excluded from the model and controlled for their potential confounding effect on specific predictor variable in multivariable logistic regression model using stepwise procedure. During each time, enter method of multivariable logistic regression model was used to identify the significant predictors at an Alpha level of 0.05.In multivariable analysis p values of less than 0.05 were considered statistically significant. The results were described as Odds Ratio and 95% CI.

Anthropometric data was analyzed in WHO Anthro software. Anthropometric measurements such as height, weight, sex and age of children 6–59 months were converted into z-scores using the 2006 WHO standard growth curves. Before performing the anthropometric calculations for weight-for-height (WH), height-forage (HA), and weight-for-age (WA), the data were cleaned and the outliers werechecked and they were less than 2.5 with 95% CI (it is acceptable level with deferent literatures).

4.12 Study variables

4.13.1 Dependent variable

- Nutritional status of children
    - Underweight (WAZ<−2 SD)
    - Wasting (WHZ<−2 SD)
    - Stunting (HAZ<−2 SD)
    - Overweight (WHZ>+2SD)

4.13.2 Independent variables

Socio-demographic and economic factors

- Household wealth index (income)
- Age of child
- Educational status of mother
- Educational status of mother
- Head of family
- Family size
- Place of residence

- Occupation of mother
- Occupation of fathers
- Number of children under 5 years of age in the household
- Marital status of mother

Household food access

- Household food security status

Health service and sanitation access

- Access to water supply and sanitation
- Type of toilets
- Access to health facility

.**Child caring practice**

- Hygiene
- Health care seeking
- Feeding practice
- Household food allocation

4.13 Standard definition

Malnutrition: Underweight, wasting, and stunting among children were defined as WAZ, WHZ, and HAZ less than -2 SD and overweight greater than +2WHZ in the 2006 WHO growth standard(10).

4.14 Operational definitions

Household food insecurity: In this analysis, household food insecurity was assessed using the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project. The HFIAS tool consists of nine questions that are believed to capture all three core domains that reflect a household's inadequate access to food. Each question has four response options—never, rarely, sometimes, or often which were coded in order of increasing frequency from 0 to 3.

A household was classified as:

Food secure household which experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely.

A mildly food insecure (access) household which worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions (running out of food,

going to bed hungry, or going a whole day and night without eating).

A moderately food insecure household which sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions.

A severely food insecure household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure(9).

Poverty line: below the 30 percentile of the IWI distribution was considered as under poverty(similar with they earn below 1.25 dollar per capital per day)(56).

Household: "people who live together and share food from a common pot"

Kinds of foods you preferred: we mean foods that food secure people eat that food insecure people cannot afford to eat.

Lack of resources: we mean not having money or the ability to grow or trade for the food.

A limited variety of foods: we want to mean an undesired monotonous diet for an extended period of days.

That you really did not want to eatwe would like to know whether the household had to eat food that it considered to be undesirable or socially unacceptable.

Meal we mean the major eating occasions (not including snacks).

Fewer meals in a day is understood relative to the local norm, which you can help us define. (How many meals a day do food secure people in this population usually eat during this time of year?)So less than three time a day was fewer meal in this study area.

No food to eat we mean that the food was not available in the household and could not be accessed by the household's usual means (e.g. through purchase, from the garden or field, from storage, etc.).

Water supply: - ***High quality*** is bottled water orwater piped into dwelling or premises;

- ***Middle quality*** is public tap, protected well, tanker truck, etc;

- ***Low quality*** is unprotected well, borehole, spring, surface water, etc

Toilet facility: - ***High quality*** is any kind of private flush toilet;

- ***Middle quality*** is public toilet, improved pit latrine, etc.

- ***Low quality*** is traditional pit latrine, hanging toilet, or no toilet facility

Floor quality: - ***High quality*** is finished floor with parquet, carpet, tiles, ceramic etc.

- ***Middle quality*** is cement, concrete, raw wood, etc.
- ***Low quality*** is none, earth, dung etc

Cheap utensils that is based on the information on any cheap (roughly under 50 US Dollar) item that is present in the data.Household owning one or more cheap utensils get value 'one' and other household's value 'zero' on this indicator.

Expensive utensilsrespect to the possession of expensive (roughly over 300 US Dollar) items, like having a washer, dryer, computer, motorbike, motorboat, airconditioner, orgenerator.

4.15 Ethical consideration

Ethical clearance letterwas obtained from Jimma University College of health sciences IRC.

Permission letter to conduct the research was obtained from Gambella regional health bureau. During data collection the participants were informed the purpose of the study with their full right to say "no" (opt out), and it was clearly stated that their decision of "no" by no means affect any of their right to health provisions intended for child. The interviewer discussed the issue of confidentiality and obtained verbal consent before the actual interview was launched. For this purpose, a one page consent form was attached as cover page to each questionnaire. In addition, the name of the participants was not written in the questionnaire. By doing so, the issue of confidentiality was addressed.

Duringdata collection those children with acute malnutrition but didn'tget appropriate care and treatment were referred to the health facilities.

4.16 Dissemination plan

The finding of this study will be disseminated through

- Presentation of the findings to Jimma University, College of health sciences.
- Submission of the written document to JU, Gambella regional health bureau, and other stake holders.
- All attempts will be made to publish the result of the study on national or international journal.

5. Result

5.1 Socio-demographic characteristics

From the total 288 sampled households, three of them were refused to participate in the study making the response rate 98.9%. One child had missing age and height measurement. The final analysis was based on 284 study subjects. The mean (SD) ages for food insecure HH and food secure HH groups were 31.66 (±4.2) and 32.47 (±4.2) respectively.Proportions of children their sex were almost 50% each. Nearly half of the children, 132 (46.5%) were in the age group of 36-59 months. Nuer constitute majority of the ethnic group, 78 (27.5%) followed by Agnua, 74 (26.1%). One hundred (35.2%), 55(19.4%), 52(18.3%) and 36(12.7%) were Protestant,Catholic, Orthodox and Muslims, respectively. Half of mothers/caregiver attended primary education and the rest half of 143 (50.3%) had no formal education out of which, 107(74.8%) were lived in food insecurity households and 36(25.2%) food secure respectively. From the total of 284mothers/caregiverthe forty four (15%) were without lived their husband. one hundred eighteen (41.5%) mothers/caregivers were house wife followed by governmental employee, 77 (27.1%). The mean family size was 5.7 with the standard deviation of $\pm$ 1.8. Ninety two (32.4%) households had family members with more than one under five children.

All under poverty line household, thoseearn below 1.25$ per capital per day were found in food insecure household. Total of 93(32.7%) the high economical level households out of which 78(83.9%) were food secure. In comparison to food secure households, households with food insecurity have less access to high quality drinking water and latrine facility.

Table 1: Socio-demographic and economic characteristics of householdhavingchildage6-59monthsstratifiedbyhouseholdfood insecurity statusinGambellaTown,2016

Characteristics		Food insecure (N=169)Numb(%)	Food secure(N=115)Numb(%)	Total(% from total)
child sex	Male	77(55.0)	63(45.0)	140(49.3)
	Female	92(63.9)	52(36.1)	144(50.7)
Age of a child	6-23 months	58(59.2)	40(40.8)	98(34.5)
	24-35 months	33(61.1)	21(38.9)	54(19.0)
	36-59 months	78(59.1)	54(40.9)	132(46.5)
	Mean(SD)	31.66	32.47	31.99
Education (mother)	No formal education	107(74.8)	36(25.2)	143(50.4)
	Formal education	62(44.0)	79(56.0)	141(49.6)
Marital status (mother)	Living as married	137(54.6)	114(45.4)	251(88.4)
	Not married	32(97.0)	1(3.0)	33(11.6)
Occupation(mother)	Housewife only	84(71.2)	34(28.8)	118(41.5)
	Employed	85(51.2)	81(48.8)	166(58.5)
Education (father)	No formal education	55(58.5)	39(41.5)	94(33.1)
	Formal education	114(60.0)	76(40.0)	190(66.9)
Religion	Protestant	58(58.0)	42(42.0)	100(35.2)
	Orthodox	31(59.6)	21(40.4)	52(18.3)
	Catholic	40(72.7)	15(27.3)	55(19.4)
	Muslim	9(25.0)	27(75.0)	36(12.7)
	Other	31(75.6)	10(24.4)	41(14.4)
Ethnicity	Nuer	56(71.8)	22(28.2)	78(27.5)
	Agnewa	54(73.0)	20(27.0)	74(26.1)
	Tigre	12(41.4)	17(58.6)	29(10.2)
	Oromo	14(40.0)	21(60.0)	35(12.3)
	Amhara	11(40.7)	16(59.3)	27(9.5)
	Others	22(53.7)	19(46.3)	41(14.4)
No. family mebr.		5.76	5.69	5.73
latrine	No	96(99.0)	1(1.0)	97(34.2)
	Yes	73(39.0)	114(61.0)	187(65.8)
Water quality	Low quality	21(100.0)	0(.0)	21(7.4)
	Medium quality	28(100.0)	0(.0)	28(9.9)
	High quality	120(51.1)	115(48.9)	235(82.7)
Economic status	Low	93(98.9)	1(1.1)	94(33.1)
	Middle	61(62.9)	36(37.1)	97(34.2)
	High	15(16.1)	78(83.9)	93(32.7)
Poverty level	Under poverty (<1.25$)	40(100.0)	0(.0)	40(14.1)
	Above poverty (>1.25$)	129(52.9)	115(47.1)	244(85.9)

5.2 Child caring practices and preventive health environments

Table 2 presents the variables used as proxy for child care practices for the full sample and stratified by household food insecurity status.In 130 (45.8%) households, Diets were given for child first even though the foods to be eaten were small during meal but its frequency is decreased with an increase in food insecurity level. In food insecure household during the meals size small and the meals number few condition, 44 (38.5%) and 33 (30.0%) households had a practice to give the food for their child the best portion and only, respectively.

Table 2: Child caring practices and preventive health environment stratified by household food insecurity status among household having child age 6-59months in Gambella Town,2016

Characteristics		Food secure Numb (%)	Food insecure Numb (%)	Total (% from total)
Health services	Usually home treatment	0 (.0)	51 (100.0)	51 (18.0)
	Taking to traditional healers	0 (.0)	2 (100.0)	2 (0.7)
	Taking to health institution	115 (49.8)	116 (50.2)	231 (81.3)
Sick child feeding practice	Preventing from giving food	1 (7.1)	13 (92.9)	14 (4.9)
	No change	12 (13.5)	77 (86.5)	89 (31.3)
	Providing additional food	102 (56.4)	79 (43.6)	181 (63.7)
Breast feeding duration	<1year	31 (26.1)	88 (73.9)	119 (41.9)
	>=1year	84 (50.9)	81 (49.1)	165 (58.1)
Health care seeking behaviors'	After 24 hours	3 (3.7)	79 (96.3)	82 (28.9)
	Within 24 hours	41 (43.2)	54 (56.8)	95 (33.5)
	Immediately	71 (66.4)	36 (33.6)	107 (37.7)
Intra household food allocation practices (child's dished with)	Along with husband	6 (25.0)	18 (75.0)	24 (8.5)
	After husband	8 (20.5)	31 (79.5)	39 (13.7)
	After husband and mother	13 (14.3)	78 (85.7)	91 (32.0)
	Before all	88 (67.7)	42 (32.3)	130 (45.8)
Intra household food allocation practice (during meals smalls)	Share equally	0 (.0)	41 (100.0)	41 (37.6)
	Shared b/n mother & children	0 (.0)	7 (100.0)	7 (5.5)
	Given to the husband only	0 (.0)	17 (100.0)	17 (15.6)
	Given to the children only	0 (0)	44 (100.0)	44 (38.5)
Intra household food allocation practice (during meals few)	Share equally	0 (0)	58 (100.0)	58 (53.2)
	Given to the husband	0 (.0)	10 (100.0)	10 (9.2)
	Shared b/n mother & children	0 (.0)	6 (100.0)	6 (5.5)
	Shared b/n husband & childre	0 (.0)	2 (100.0)	2 (1.8)
	Giving to children	0 (.0)	33 (100.0)	33 (30.3)

Household food security status is significantly associated with providing additional food giving practices when the child was ill, and the high percent was found in food secure

households.More than tow third of household on sample had a practice totaking or giving health service within 24 hours during their child was ill.Over one-third 44 (38.5%) from the total of food insecure households the adult members used coping mechanism by reducing their meals number for the children when the meals was small in the house.

5.3 Prevalence of household food insecurity

More than half of the households in our sample (59.5%) were food insecure. Of these food insecure households, 20%, 23.6% and 15.8% were experiencing mild, moderate and severe food insecurity, respectively.

Table 3: Anthropometry stratified by household food insecurity status among 6-59months children in Gambella Town, 2016

Nutrition induces	Household food security status				
	Total (N=284)	Foodsecure 115(40.5%)	Mildly FI 57(20.1%)	Moderately FI 67(23.6%)	Severely FI 45(15.8%)
Age (m) (mean)	31.99 ± 13.11	32.47$_a$	32.97$_a$	31.38$_a$	30.44$_a$
Weight (kg) (mean)	12.61± 2.75	12.94$_a$	12.86$_a$	12.23$_a$	11.98$_a$
Height (cm) (mean)	89.22± 10.28	91.13$_a$	90.41$_{a,b}$	87.57$_{a,b}$	85.28$_b$
WHZ(mean)	-.13± 1.36	-.30$_a$	-.09$_a$	-.06$_a$	.15$_a$
HAZ(mean)	-.71± 1.28	-.29$_a$	-.50$_a$	-1.14$_b$	-1.41$_b$
WAZ(mean)	-.47± 1.03	-.35$_a$	-.33$_a$	-.64$_a$	-.68$_a$
Stunting (<-2HAZ) N(%)	66 (23.2)	9$_a$ (13.6)	10$_{a,b}$ (15.2)	21$_b$ (31.8)	26$_c$ (39.4)
Wasting(<-2WAZ)N(%)	38 (13.4)	20$_a$ (52.6)	7$_a$ (18.4)	6$_a$ (15.8)	5$_a$ (13.2)
Underweight(<-2WHZ) N(%)	34 (12.0)	13$_a$ (38.2)	5$_a$ (14.7)	11$_a$ (32.4)	5$_a$ (14.7)
Overweight//obese (>+2WHZ) N(%)	10 (3.5)	7$_a$ (70.0)	2$_a$ (20.0)	1$_a$ (10.0)	0 (.0)

Note: Values in the same row and subtable not sharing the same subscript are significantly different at p< .05 in the two-sided test of equality for column proportions. Cells with no subscript are not included in the test. Tests assume equal variances.

5.4 Anthropometry of children

The overall prevalence of stunting, underweight and wasting were 23.2%, 12.0% and 13.4% respectively.In contrary, prevalence of overweight was 3.5% as measured by WHZ.

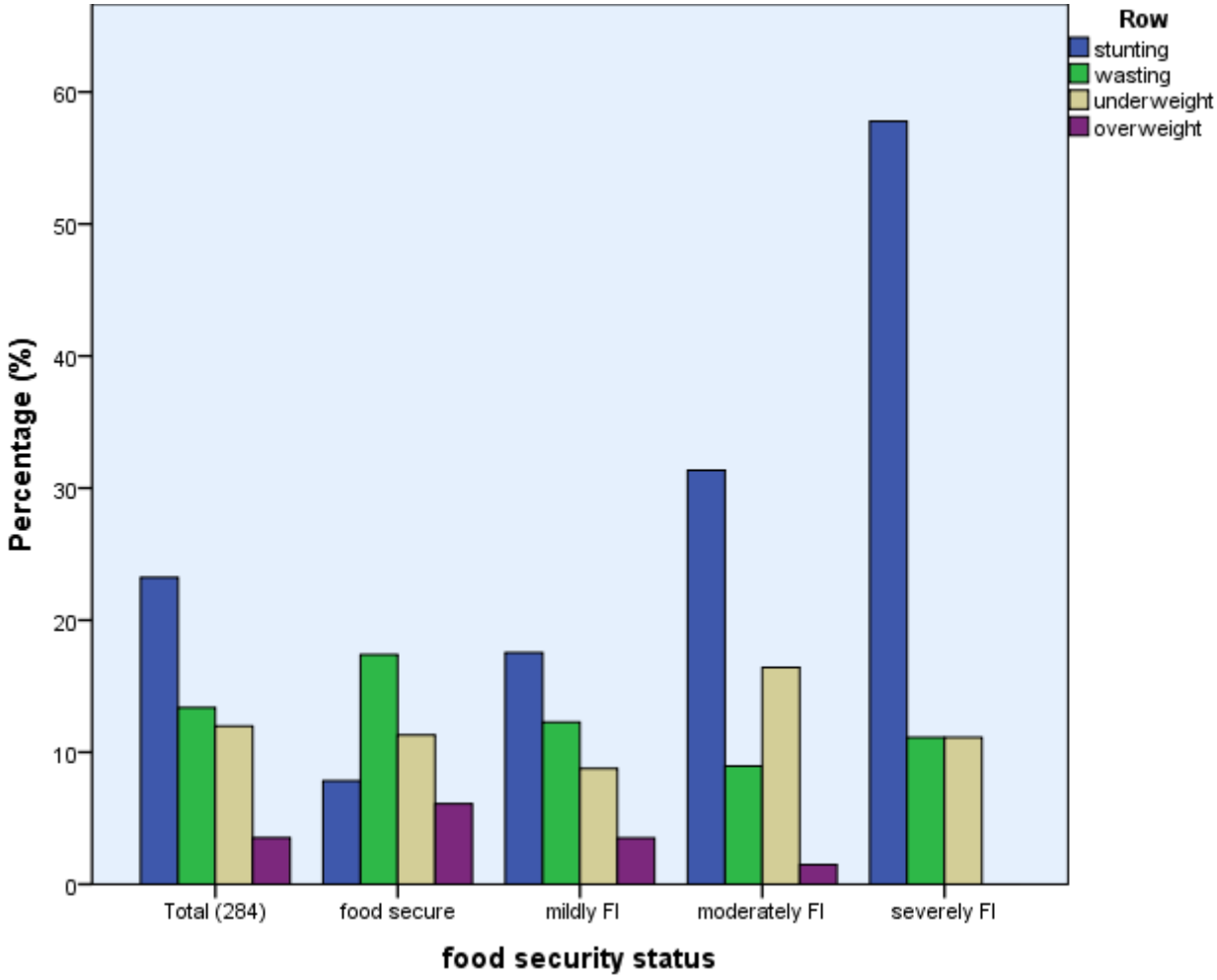

Figure 3: Proportion of children 6-59monthsstunted, wasted, and underweight stratified by whether a household is food insecurity or food secure and total

Overweight/obesity was reported in 10 (3.5%)children from which 3 (30%) were from food insecure household. Similarly wasting was reported in 38(13.4%) of the children, of these 18 were lived in food insecure household. Of 34 (12.0%) children who were underweight, 21(61.7%) were from food insecure household.

To look at the association between household food insecurity and nutritional status, bivariate analyses were done to identify candidate covariates for the multivariable model at p-value <0.25. Then after, we adjusted household food insecurity for all candidate covariates using multivariable logistic regression model to determine the association between household food insecurity and nutritional status of preschool children in Gambella Town. Accordingly,

household food insecurity, duration of breast feeding for a child, household economic status, maternal education and the quality of drinking water were significantly associated with stunting among study subject (Table 4). On bivariate analyses, wasting and underweight had p-value of greater than 0.25 and thus, their associations with household mild, moderate and sever food insecure were declared not significant (p=.38, .27 & .32 and p=.61, .32 &.98, respectively).

Table 4: Relationship between stuntingandcharacteristic of children (6-59) in Gambella Town, 2016

Characteristics		Chronic malnutrition		Crude Odds Ratio (95%CI)	Adjusted Odds Ratio (95%CI) [p-value]
		Normal (N=218)Numb (%)	Stunting (N=66) Numb (%)		
Education (mother)	No formal education	94(65.7)	49(34.3)	3.80(2.05, 7.02)	2.58 (1.27, 5.20)
	Formal education	124(87.9)	17(12.1)	Reference	Reference
Latrine	No	58(59.8)	39(40.2)	3.98 (2.24, 7.08)	1.45(.57,3.67)
	Yes	160(85.6)	27(14.4)	Reference	Reference
Sick child feeding practice	Others	62(60.2)	41(39.8)	4.12 (2.31, 7.35)	2.32(.76,7.06)
	Providing additional food	156(86.2)	25(13.8)	Reference	Reference
Breast feeding duration	<1year	74 (62.2)	45 (37.8)	4.17 (2.31, 7.51)	3.0(1.56, 5.78)
	>=1year	144 (87.3)	21 (12.7)	Reference	Reference
Child seek health	After 24 hours	48(58.5)	34(41.5)	3.76(2.10,6.71)	.94(.30,2.96)
	Within 24 hours	170(84.2)	32(15.8)	Reference	Reference
Marital status (mother)	Not married	201(80.1)	50(19.9)	5.65(2.86,11.17)	1.89(.52,6.82)
	Married/living married	17(51.5)	16(48.5)	Reference	Reference
Drinking water quality	Low quality	7(33.3)	14(66.7)	10.05 (3.81, 26.52)	4.51 (1.28, 15.74)
	Medium quality	15(53.6)	13(46.4)	4.35 (1.92, 9.87)	2.31 (.95, 5.59)
	High quality	196(83.4)	39(16.6)	Reference	Reference
Food security status	Food secure	106(92.2)	9(7.8)	Reference	Reference
	Mildly food insecurity	47(82.5)	10(17.5)	2.50 (.95, 6.57)	1.81 (.66, 4.97)
	Moderately food insecurity	46(68.7)	21(31.3)	5.37 (2.28, 12.63)	2.92 (1.17, 7.30)
	severely food insecurity	19(42.2)	26(57.8)	16.11 (6.54, 39.70)	9.78 (3.80, 25.15)
Food security (two cat)	Food insecure	112(66.3)	57(33.7)	5.99 (2.82, 12.70)	2.88 (1.26, 6.60)
	Food secure	106(92.2)	9(7.8)	Reference	Reference
Economic status	Low	51(54.3)	43(45.7)	10.35(4.33,24.74)	4.24 (1.48, 12.09)
	Middle	81(83.5)	16(16.5)	2.42(.94,6.20)	2.11 (.78, 5.65)
	High	89(92.5)	7(7.5)	Reference	Reference

In logistic multiple regression analysis, household food insecurity remained independent predictor significantly associated with stunting. Children from food insecure households were

2.89 more likely to be stunted as compared to those children from food secure households. More specifically, when we look at the association between household food security status and stunting by the degree of severity of food insecurity, the odds of stunting is highly pronounced in those children who were from severely and moderately food insecure households (AOR =9.7, 95% CI : 3.75-25.08 vs. AOR =2.8, 95% CI : 1.14-7.21, respectively).

Children who were living in households that had low quality of drinking water were 4.5 more likely to be stunted compared to children who were living in households with high quality of drinking water (AOR=4.5; 95% CI: 1.28-15.74). Those children who were breastfed for less than one year were 3 times more likely to be stunted compared to those children who were breastfed for one year and above (AOR=3; 95% CI=1.56-5.78).

Low socio economic status of the household was significantly associated with child stunting. The odds of being stunted among children from low socioeconomic status is 4.2 times higher compared to those children from high socioeconomic status households (AOR = 4.2, with 95% CI =1.48, 12.09).In addition, educational status of mothers was significantly associated with stunting among their children. Children frommothers who had no formal educationwere2.6more likely to bestuntedcompared to their counterparts (AOR = 4.6, with 95% CI =1.27, 5.20).

6. Discussion

This study revealed that 23.2%, 12.0% and 13.4% of children were stunted, underweight and wasted, respectively. Only 3.5% of children were overweight/obese. The current findings are lower than the findings from 2011 EDHS for Gambella region showing stunting, wasting, and underweight were 27.3%, 12.5%, and 20.7%, respectively (28).On the other hand, these findings are somewhat similar to the findings from Mini EDHS 2014 for Gambella region where stunting, wasting, underweight were 22.5%, 14.9%, and 18.5%, respectively (16).However, the overweight/obesity prevalence of 3.5% was higher compared to the findings from both 2011EDHS and 2014 Mini EDHS findings in the Gambella region (0.7% and 0.4%, respectively). The higher and lower prevalence of overweight/obesity and underweight in this study as compared to the findings from EDHS could be explained by the differences' in study setting as the EDHS findings included rural population while this study was undertaken on urban population alone.Evidence shows, rapid demographic, social and economic changes ongoing in many developing countries have led to increased urbanization and changes in food systems resulting in a global nutrition transition. where recent global shifts in dietary patterns towards higher intakes of saturated fats, sugars and refined foods, and lower intakes of fiber rich foods, driven by technological advances that have made energy dense, nutrient-poor foods cheaply available on global food marketswhich could have increased overweight/obesity and reduced underweights(22).In this global context, while large inequalities from the burden of under nutrition persist across regions, countries and communities, a concomitant increase in rates of overweight and obesity is witnessed, often in these same communities(23).

In this study household food insecurity was significantly associated with stunting where children from food insecure household in general and those severely and moderately food insecure households had more odds of being stunted. The specific mechanisms by which food insecurity leads to child malnutrition are not clear.Based on these findings, it can be inferred that children's nutritional status in Gambella town is strongly and positively related to both household socioeconomic status and food security. Any situation that limits real incomes of families and in the accessibility of food can be expected to result in a substantial faltered growth and hence, could end in stunting. This study was conducted in the urban

setting where most households procure their food supplies through purchases. It is thus understandable that households which produce a major share of the food they consume may be less subject to insecurity than households which depend almost entirely on purchased food. This perhaps partly explains the close links of food insecurity and stunting among children in the study area. Other studies have reported that household level poverty rather than food insecurity is predictive of malnutrition among children (35). Although our study did not measure poverty directly, the significant associations between international wealth index (a proxy for household's socio economic status) and child stunting, suggests that poverty may be a major determining factor of nutritional status of children in Gambella Town.This result is similar with study was done tgray region of Ethiopia shows that there was statistically significant difference between the comparison groups in which the children from food insecure households were about 48% at higher risk to be stunted when compared to the children of food secure households(4).Other similar study was conducted on children under 5 years of age had an increased risk of stunting in households with severe household food insecurity in Bangladesh and Ethiopia, and moderate food insecurity in Vietnam(30).Many study findings showed significant association between household food insecurity and adverse child growth outcomes((33)(34) and(35)).However, few studies show that there were no significant associations between food insecurity and stunting(1)

Stunting was also significantly associated with household socioeconomic status in multivariable analysis. Children from households found in the low level of socio-economic status were at increased odds of being stunted compared to those found in high socioeconomic status households. The finding from this study is similar to the finding reported by other studies in Holetta district, Oromiya region in central Ethiopia where child malnutrition (measured by stunting) is significantly lower in households with crossbred cows (ie better quality) than in those without (47).

The other variable that was found to be independently associated with stunting in this study was maternal educational status. Children frommothers/caregiverswho hadno formal education hadsignificantly higher odds to be stunted to their counterparts. This finding is supported by finding from other studies conducted byChristiaensen and Alderman (2004) that showed the effect of maternal education is about twice as important as that of paternal education. Moreover, this study demonstrated thatpresence of at least one adult female completing primary school in a household results in a 6-11 per cent decline in stunting, while completion of primary school by at least one male adult reduces child stunting by only 2-8

per cent(47).

Furthermore, duration of breast-feeding beyond 12 months is significantly associated with child stunting. Evidences show that the early child detachment from breast-feeding significantly affects the health andnutritional status of the child through reduction of care and exposing the child to early weaning, which in turn increases the risk of diarrheal diseases and nutritional deficiencies(35). Supporting this fact, the present study revealed that the longer the duration of breast feeding the lesser the odds being stunted.Similar study undertaken in the tgray region shows children who were breastfed for the longer duration hadless odd to be stunted(4)

The current study demonstratedhousehold drinking waterwas significantly associated with stunting in children where children from households with low quality of drinking water had higher odds of being stunted. This finding was supported by other study result that water and sanitation play a particularly important role in child nutrition due to their impact on diarrheal diseasesand consecutive loss of appetite and growth faltering(27).

In this study is that underweight and wastingwerenot associated with household food insecurity.This result was not expected, because of the substantial evidence that a household's access to food are among the key determinants of nutritional status of children (3). Nevertheless, this lack of association might be explained by several factors. In line with our analytical pathways, many studies suggest that the influence of food supply and access on nutritional status of children can be confounded by other key determinants of child nutrition, such as maternal knowledge on child nutrition and caring practices, maternal nutritional status, intra household food allocation and utilization, access to health services, and healthful environment like hygiene and sanitation (47; 12; 27; 3; 4). However, Amaha et al (4)reported similar finding where underweight and wasting in children had no association with household food insecurity.

The other outcome variable of in this study the overweight was not associated with household food insecurity.Despite the low prevalence of excessive weight, with regard to weight-for-height it was observed that the mean values of this index were high (in table 3), regardless of the food insecurity situation. However, these values were higher in the group living with food security, and food insecurity did not have any influence on this index.Considering international studies that assessed the relationship between food insecurity and nutritional status, it is observed that the results are not similar when considering the development stage

of the location of the study. Therefore, in high income countries, most studies relates food insecurity with overweight/obesity, since in these places the frequency of excessive weight among children is twice as high as the one found in developing countries, so problems related to nutritional deficit are rare(37),(38),(39),(37).

Research on the relationship between household food insecurity and nutritional status of children has produced mixed results, whereas some studies have reported a positive association between household food insecurity and childhood growth indicators such as weight gain (36; 23).Others have found negative association with weight and height gains among children (32). One recent study from Nepal reported that household food insecurity level was not significantly associated with stunting, underweight, or anemia among children less than two years of age after controlling for socioeconomic status, maternal height, education, and infant feeding practice.

Limitationand strength

The current analysis also did not assess the time of year that the survey was implemented to account for potential seasonal patterns of food insecurity (and possibly nutritional status, particularly wasting).

Because of the cross-sectional nature of the study, itis impossible to establish a temporal relationship and (thus, causality) between food security status and nutritional status of study subjects. In addition, some important variables such as maternal nutritional status or knowledge of child nutrition, morbidity among children and dietary intake that may also contribute to the nutritional outcomes of interest were not included in this study.

Another limitation of this study is that the data on household food security condition and child caring practices were reported by the caregivers. So the recall bias was also possible and may explain the high prevalence of household food insecurity and other independent variables.

Despite these limitations, our results have shed more light on the association between household food insecurity and the nutritional status of children aged from 6 to 59 months in Gambell Town. Community based study was also one of the strength of this study.

7. Conclusion and recommendations

7.1 Conclusion

This study demonstrated that stunting, underweight and wasting were prevalent among preschool children in Gambella Town. The study also revealed emerging prevalence of overweight and/or obesity among study subjects. In this study, household food insecurity is significantly associated with stunting, but not with underweight and wasting among children studied. Overall it was observed that household food insecurity, water quality, mother educational status, breast feeding durationand soci-economic status of household were found to be significantly associated with stunting childhoodamong study subjects.

7.2 Recommendation

Regional health bureau in collaboration with other stakeholders should make nutritional behavior change communication on young child feeding practices, hygiene and sanitation practicesfor children in Gambella town.

The regional government along with other stakeholders should give due emphasis toan integrated strategy that improves the overall socio-economic wellbeing of families and strengthening nutritional activities through community based nutrition programs (CBN) that contribute to reduction of food insecurity and consumption of unbalanced nutrients.

Gambella regional agricultural and rural development bureau should work in collaboration with other stakeholders to develop locally available crops to strengthen household food security and improve dietary quality.

Future studies with longitudinal design, which track these conditions over time, would be better suited for understanding and exploring the temporal nature of the relationship between food security status and nutritional outcomes.

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ANNEXES

Annex A. International Wealth Index

Since the late 1990s, wealth indices have becomewidely used instruments for measure economic status of households in low and middle income countries. Hundreds of research papers have appeared in which wealth indices were used for studying variation in health, mortality, poverty, education, work and other outcomes in almost all countries of the developing world (e.g. Gwatkin et al., 2007; Howe et al., 2008; Filmer & Scott, 2012; Falkinham & Namazie, 2002).

Wealth indices are considered effective indicators of long-term socio-economic position, living standard or material well-being of households (Filmer & Pritchett, 1999, 2001; Sahn & Stifel, 2000, 2003; McKenzie, 2005; Howe et al., 2008). They often perform as well or better than expenditure data in explaining variation in education, child mortality, nutrition, fertility and health care use (Filmer & Pritchett, 2001; Bollen et al., 2002; Sahn & Stiefel, 2003; McKenzie, 2005; Filmer & Scott, 2012).

Important reasons for the success of these indices are their ease of computation, intuitive appeal, and their wide availability in household surveys for developing countries like the Demographic and Health Surveys (DHS) and UNICEF MICS surveys. Also the fact thatthe required data can be more reliably measured than those needed for computing income or expenditure measures, the most obvious alternatives, has contributed to their success (Sahn & Stifel, 2003; McKenzie, 2005; Filmer & Scott, 2012).

In spite of these positive properties, wealth indices suffer from one great disadvantage: they are not comparable among countries and time points (McKenzie, 2005; Gwatkin et al., 2007). For each survey usually a separate wealth index is constructed on the basis of the assets available in the survey data. Such a separate index is tailored completely towards the specific wealth distribution in the survey year in the country on which it is based. This means that it is a valid indicator of wealth differences in that specific country-year combination, but -- as the wealth distributions in other country-year combinations generally will be different – cannot be used to study wealth differences in other countries and years.

The scores on survey-specific wealth indices are therefore interpreted as relative wealth levels (Rutstein & Johnson, 2004; Gwatkin et al., 2007). In most applications the wealth distribution is divided into quintiles, with the lowest 20 percent of the population defined as the poor and the upper20 percent as the rich. For analyzing within country inequalities in education, health, or other outcomes, comparing the lowest and highest wealth quintiles does indeed make sense. However, cross-national or cross-temporal comparisons of groups with similar levels ofwealth or poverty are not possible with these relative measures, as the average wealth level of the wealth quintiles differs among countries and years. To solve this problem, a general wealth index is needed that uses the same criteria for rating households independent of country or year.

The International Wealth Index (IWI) is such a general wealth index. Whereas other wealth indices are constructed on the basis of data from one or a restricted number of household surveys, IWI based on data derived from 165 household surveys, held between 1996 and 2011 in 97 low and middle is income countries. Together these surveys included information on 2.1 million households, covering all regions of the developing world.

Using this broad database, IWI was constructed in the same way as most other wealth indices. Information on households' possession of consumer durables, access to basic services and housing characteristics was entered into a principal component analysis (PCA), from which the asset weights of the first component were derived. These asset weights were subsequently brought together into the IWI formula, which constitutes the basic instrument for providing households with an IWI value.

(a) Welfare measurement

The Pearson correlations between national IWI values for the last available year and the HDI and its components are presented in Table 4. The figures make clear that there are very strong positive correlations with all of the indices. The correlation withHDI is strongest, with a value of .899, but also the correlation with life expectancy is with .841 impressive. IWI and national income are correlated somewhat weaker with .788. The

correlations with the educational indicators are with .720 and .658 weakest, but nevertheless still substantial. The correlations of IWI with HDI, health and education are all stronger than those of national income with these indicators.

Table 4. Pearson correlations of IWI with HDI and its components

	IWI	Life exp	GNIc	Exp. edu	Mean edu
Life expectancy[a]	.841				
GNIc[a]	.788	.672			
Exp. years of education[a]	.720	.651	.682		
Mean years of education[b]	.658	.559	.538	.728	
HDI[b]	.899	.870	.835	.833	.808

[a]N=87 [b]N=85

The finding that IWI is more strongly correlated with human development, health and education than national income is important. It suggests that IWI is a broader index than GNIc and represents more than only the economic situation of households. There are two likely reasons for this difference. First, IWI does not necessarily rise when the income of the rich increases, as per capita income does. The reason for this is that the questions on ownership of consumer durables used for constructing IWI are yes/no questions; in most surveys the households were asked whether they owned at least oneitem of the durable. A household owning two or more TV's or cars therefore counts the same for IWI as a household owning one TV or car. This is not the case with per capita income, for which the prices of all TV's and cars are added up. Compared to per capita income, IWI thus gives a country a lower value in situations of inequality.

Second, a household's IWI value to a certain extent depends on the provision of public goods -- like supply of water and electricity -- in the area where the household lives and does therefore not completely depend on the household's income. The increase in household's welfare due to the access to public services is thus better captured by IWI thanby per capita income. The fact that also HDI is less sensitive to inequality and better captures access topublic goods than national income (Stanton, 2006) may to a certain extent explain the high correlation between IWI and HDI.

(b) Poverty measurement

A second important test of the usefulness of IWI involves its performance in measuring poverty. To assess this performance, we have defined the 20th, 30th, 40th, 50thand 60thpercentiles of the IWI distribution as IWI poverty lines. Table 5 presentsPearson correlations between the national percentages of people with an IWI value below these lines and the Poverty Headcount Ratios (PHR) at $1.25 and $2.00 a day (PPP). Again we see strong correlations, all above .8, which makes clear that IWI-based poverty measures perform well in comparison with these established measures. The lines differ not very much in the strength of the correlations, but the IWI poverty line at the 30thpercentile is most strongly correlated with the PHR at $1.25 a day and the line at the 50thpercentile most strongly with the PHR at $2.00 a day. When using IWI for poverty measurement, these percentiles therefore seem to be usable IWI poverty lines. We call them the IWI-30 and IWI-50 poverty lines.

Table 5. Pearson correlations of IWI-based poverty lines with headcount ratios (N=76)

	Headcount 1.25$	Headcount 2.00$
IWI-20 Poverty line	.845	.839
IWI-30 Poverty line	**.875**	.886
IWI-40 Poverty line	.874	.906
IWI-50 Poverty line	.860	**.914**
IWI-60 Poverty line	.835	.906

In Panels G and H of Figure 2 the associationsbetween these IWI poverty lines and the headcount ratios are displayed graphically. There are a few deviations from linearity, mostly due to countries with more households underneath the IWI poverty lines than underneath the headcount-based lines. In those countries thus being above a dollar based poverty line does not always mean being able to buy enough assets to cross the IWI-based lines. However, the deviations are small and in particular the correlation of .914 between the IWI-50 and the PHR at $2.00 is impressive.

Appendix A. Information on datasets used and average national IWI values

Code	Country	Year	Source	N	IWI value
AFG	Afghanistan	2010	DHS	21986	32.9
AGO	Angola	2011	DHS	8028	33.4
AGO	Angola	2000	MICS2	6244	20.2
ARM	Armenia	2005	DHS	6562	78.1
ARM	Armenia	2010	DHS	6653	77.2
AZE	Azerbaijan	2000	MICS2	5859	56.6
AZE	Azerbaijan	2006	DHS	7123	67.1
BDI	Burundi	2005	MICS3	8150	10.6
BDI	Burundi	2010	DHS	8517	15.8
BEN	Benin	2001	DHS	5718	26.5
BEN	Benin	2006	DHS	17330	28.7
BFA	Burkina Faso	1998	DHS	4741	15.6
BFA	Burkina Faso	2003	DHS	9042	19.4
BGD	Bangladesh	2006	MICS3	62127	25.0
BGD	Bangladesh	2007	DHS	10381	24.8
BLZ	Belize	2006	MICS3	1821	71.2
BOL	Bolivia	2003	DHS	19100	48.2
BOL	Bolivia	2008	DHS	19300	54.6
BRA	Brazil	1996	DHS	13151	66.7
BRA	Brazil	2000	IPUMS	50301	67.7
BTN	Buthan	2010	MICS4	14670	56.1
CAF	Central African Republic CAR	2006	MICS3	11655	15.8
CHL	Chili	2002	IPUMS	41016	83.5
CHN	China	2003	WHS	3962	72.5
CHN	China	2004	CHNS	4044	64.1
CIV	Cote d'Ivoire	1999	DHS	2101	31.0
CIV	Cote d'Ivoire	2006	MICS3	7514	41.6
CMR	Cameroon	1998	DHS	4618	26.6
CMR	Cameroon	2004	DHS	10358	27.2
COD	Congo Democratic Republic	2007	DHS	8748	19.4
COD	Congo Democratic Republic	2010	MICS4	11258	15.7
COL	Colombia	2005	DHS	37211	72.6
COL	Colombia	2010	DHS	51415	76.9
COM	Comoros	1996	DHS	2163	25.4
COM	Comoros	2003	WHS	1640	37.7
CRI	Costa Rica	2000	IPUMS	28705	68.0
DOM	Dominican Republic	1996	DHS	8772	56.4
DOM	Dominican Republic	2002	DHS	26886	65.0
DOM	Dominican Republic	2007	DHS	32076	72.4
DZA	Algeria	2002	PAPFAM	8228	76.8
ECU	Ecuador	2000	SIMPOC	14055	61.8
EGY	Egypt	2000	DHS	16869	74.4
EGY	Egypt	2003	DHS	20128	80.4
EGY	Egypt	2005	DHS	21810	78.3
EGY	Egypt	2008	DHS	18838	77.7
ETH	Ethiopia	2005	DHS	13607	11.5
ETH	Ethiopia	2011	DHS	16612	15.3
GAB	Gabon	2000	DHS	6068	45.4
GEO	Georgia	2003	WHS	2723	71.3
GEO	Georgia	2005	MICS3	11883	64.7
GHA	Ghana	1998	DHS	5964	25.7
GHA	Ghana	2006	MICS3	5909	35.1
GHA	Ghana	2008	DHS	11669	43.0
GIN	Guinea	2005	DHS	6172	16.9
GMB	Gambia	2000	MICS2	4489	35.4
GMB	Gambia	2006	MICS3	5978	42.8
GNB	Guinea Bissau	2006	MICS3	4993	31.8
GTM	Guatemala	1999	DHS	5434	44.4
GTM	Guatemala	2003	WHS	4408	55.2

Appendix B. Data used for computing associations between IWI and welfare measures and between IWI-30 and IWI-50 and poverty Headcount Ratios

ISO_code	Year	IWI-value	HDI	GNIc	Life exp.	Exp. eduyrs	Mean eduyrs	GINI	IWI-30	IWI-50	HR $1.25	HR $2.00
AFG	2010	32.9	0.4	1351	48.3	9.1	3.3	27.8	-	-	-	-
AGO	2000	-	-	-	-	-	-	-	76.8	90.2	54.3	70.2
AGO	2011	33.4	0.5	4874	51.1	9.1	4.4	-	-	-	-	-
ARM	2010	77.2	0.7	5009	74.1	12.0	10.8	30.9	0.2	4.4	1.3	12.4
AZE	2006	67.1	-	3940	69.0	11.5	-	34.7	2.2	18.9	2.1	9.8
BDI	2010	15.8	0.3	359	50.0	10.5	2.7	-	90.7	96.1	81.3	93.5
BEN	2006	28.7	0.4	1311	54.3	9.2	3.0	38.6	62.3	81.9	47.3	75.3
BFA	2003	19.4	0.3	996	51.6	4.2	1.3	39.6	83.5	91.1	56.5	81.2
BGD	2007	24.9	0.5	1256	67.6	8.0	4.4	32.8	69.0	84.9	47.6	75.4
BLZ	2006	71.2	0.7	5765	74.8	12.6	7.8	-	-	-	-	-
BOL	2008	54.6	0.7	4320	64.7	14.0	8.3	56.3	23.3	40.5	15.6	24.9
BRA	2000	67.7	0.7	7698	70.1	14.5	5.6	60.0	8.2	19.3	11.6	21.5
BTN	2010	56.1	0.5	5060	66.8	11.0	2.3	38.1	12.9	44.4	10.2	29.8
CAF	2006	15.8	0.3	660	44.4	5.8	3.2	56.3	89.8	96.8	62.8	80.8
CHL	2002	83.5	0.8	10483	77.6	13.4	9.0	54.6	1.7	4.8	2.1	5.2
CHN	2004	64.1	0.6	3832	71.9	10.5	7.0	42.5	5.0	26.3	20.3	41.7
CIV	2006	41.6	0.4	1492	52.1	6.3	3.1	43.8	39.8	63.4	23.6	46.5
CMR	2004	27.2	0.4	1866	49.5	8.6	5.3	39.7	62.1	82.5	10.2	31.4
COD	2010	15.8	0.3	270	48.1	8.2	3.5	-	84.4	91.4	87.7	95.2
COL	2010	76.9	0.7	8043	73.5	13.6	7.3	55.9	2.3	7.2	8.2	15.8
COM	1996	25.4	-	1118	56.9	7.8	-	-	-	-	-	-
CRI	2000	68.0	0.7	7467	77.8	10.7	8.0	46.5	3.5	13.6	5.5	10.9
DOM	2007	72.4	0.7	6632	72.5	11.9	6.9	48.7	3.5	14.4	3.8	11.5
DZA	2002	76.8	0.6	6209	70.7	12.0	5.9	-	-	-	-	-
ECU	2000	61.8	0.7	5005	73.4	12.9	6.9	56.6	9.8	25.6	20.7	37.7
EGY	2008	77.7	0.6	4917	72.4	11.0	6.0	30.8	0.6	3.1	1.7	15.4
ETH	2011	15.3	0.4	971	59.3	8.5	1.5	-	84.1	91.7	39.0	77.6
GEO	2005	64.7	0.7	3650	72.8	12.6	12.1	41.1	2.9	22.2	16.0	33.5
GHA	2008	43.0	0.5	1329	62.7	9.7	6.9	-	35.8	63.0	28.6	51.8
GIN	2005	16.9	0.3	860	51.1	7.5	1.6	39.8	81.0	91.3	49.8	75.2
GMB	2006	42.8	0.4	1075	56.9	8.4	2.4	-	34.4	67.5	33.6	55.9
GNB	2006	31.8	0.3	955	46.4	8.9	2.3	35.5	56.5	83.0	48.9	78.0
GTM	1999	44.4	0.5	3861	67.2	8.4	3.4	55.0	36.2	55.3	14.1	27.7
HND	2005	56.5	0.6	3120	71.4	10.9	5.9	59.7	20.7	42.7	26.4	40.1
HTI	2005	27.1	0.4	959	59.9	7.6	4.5	59.2	63.7	82.5	61.7	77.5
IDN	2007	48.7	0.6	3122	67.8	12.4	5.5	34.0	21.9	52.6	24.2	56.1
IND	2006	37.3	0.5	2474	63.7	10.0	4.1	33.4	48.4	66.7	39.8	74.2
IRQ	2006	74.1	0.6	2578	68.4	9.8	5.4	30.9	1.7	8.0	2.8	21.4
JOR	2007	87.3	0.7	4770	72.9	12.9	8.2	35.8	0.3	0.9	0.2	2.8
KAZ	2006	74.0	0.7	8264	65.5	14.9	10.2	30.8	0.2	7.7	0.4	3.3
KEN	2008	27.7	0.5	1407	55.2	10.4	6.8	-	62.3	84.3	43.4	67.2
KGZ	2006	65.0	0.6	1728	66.8	12.4	9.2	38.7	0.9	20.0	5.9	32.1
KHM	2010	40.6	0.5	1753	62.7	9.8	5.8	37.9	39.5	67.7	22.8	53.3
LBR	2007	20.7	0.3	254	53.7	11.0	3.6	38.2	76.1	93.6	83.8	94.9
LSO	2010	30.0	0.5	1643	47.6	9.9	5.9	-	-	-	-	-
MAR	2003	65.0	0.5	3203	69.7	9.4	3.7	40.7	15.0	27.7	5.0	20.9
MDG	2009	22.1	0.5	846	66.0	10.4	5.2	44.1	80.2	93.0	78.6	92.0
MDV	2009	80.0	0.7	4828	76.1	12.4	5.6	-	-	-	-	-
MLI	2006	22.0	0.3	978	49.4	6.9	1.8	39.0	76.1	89.1	51.4	77.1
MNG	2005	46.7	0.6	2550	66.0	12.6	8.2	34.7	-	-	-	-
MOZ	2003	13.8	0.3	571	47.8	7.2	1.0	47.1	90.3	95.3	74.7	90.0
MRT	2007	28.6	0.4	1762	57.7	7.8	3.5	40.5	58.9	78.6	23.9	48.9

Appendix C. Pearson correlations between DHS wealth index and IWI for DHS countries

ARM	2005	0.856	GTM	1999	0.935	NGA	2003	0.929
ARM	2010	0.784	HND	2005	0.917	NGA	2008	0.937
AZE	2006	0.863	HTI	2005	0.940	NIC	1998	0.967
BDI	2010	0.939	IDN	2003	0.895	NIC	2001	0.951
BEN	2001	0.927	IDN	2007	0.915	NPL	2006	0.924
BEN	2006	0.914	IND	1999	0.935	NPL	2011	0.898
BFA	2003	0.951	IND	2006	0.944	PAK	2007	0.925
BFA	1998	0.923	JOR	2002	0.894	PER	2000	0.962
BGD	2007	0.933	JOR	2007	0.700	PER	2004-8	0.952
BOL	2003	0.958	KAZ	1999	0.920	PHL	1998	0.933
BOL	2008	0.951	KEN	1998	0.965	PHL	2008	0.935
BRA	1996	0.925	KEN	2003	0.891	RWA	2010	0.928
CIV	1999	0.958	KEN	2008	0.894	SEN	1997	0.943
CMR	1998	0.968	KGZ	1997	0.921	SEN	2011	0.939
CMR	2004	0.935	KHM	2005	0.914	SLE	2008	0.938
COD	2007	0.938	KHM	2010	0.939	STP	2009	0.921
COL	2005	0.900	LBR	2007	0.915	SWZ	2006	0.941
COL	2010	0.846	LSO	2010	0.922	TCD	2004	0.899
COM	1996	0.965	MAR	2003	0.950	TLS	2009	0.898
DOM	1996	0.908	MDG	1997	0.890	TUR	2003	0.750
DOM	2002	0.928	MDG	2009	0.880	TZA	2004	0.899
DOM	2007	0.873	MDV	2009	0.761	TZA	2010	0.936
EGY	2000	0.877	MLI	2006	0.843	UGA	2006	0.934
EGY	2003	0.862	MOZ	1997	0.953	UZB	1996	0.942
EGY	2005	0.870	MOZ	2003	0.950	VNM	1997	0.967
EGY	2008	0.829	MWI	2004	0.941	YEM	1997	0.949
ETH	2005	0.950	MWI	2010	0.936	ZAF	1998	0.972
ETH	2011	0.961	NAM	2000	0.980	ZMB	2002	0.971
GAB	2000	0.933	NAM	2006	0.972	ZMB	2007	0.923
GHA	1998	0.958	NER	1998	0.970	ZWE	1999	0.938
GHA	2008	0.937	NER	2006	0.968	ZWE	2006	0.966
GIN	2005	0.959	NGA	1999	0.920	ZWE	2011	0.939

Annex B. Sample Questionnaires

JIMMA UNIVERSITY

COLLEGE OF PUBLIC HEALTH AND MEDICAL SCIENCES

DEPARTMENT OF HUMAN NUTRITION

QUESTIONNAIRE ON ASSESSMENT OF HOUSEHOLD FOOD INSECURITY AND ITS ASSOCIATION WITH NUTRITIONAL STATUS AMONG CHILDREN AGE OF 6-59 MONTHS IN GAMBELLA TOWN

Informed Consent

Dear Sir/madam;

My Name is_____, I am a Master's Degree studentat Jimma University. I am conducting thesis on the assessment of malnutrition in Gambella town. The purpose of this study is to identify and determine factors associated with malnutrition among under five children in Gambella Town. 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 30 minute and you have a full right to participate or refuse or to withdraw in the meantime.

Are you willing to continue with the interview? Yes_____ No_____

001. Questionnaire identification number/gage number /_____/

002. Interviewer code_____ Name_____ Date _____

004. Name of the Residence area_____

005. Result: 1. Completed 2. Partially completed 96.Others (Specify)_____

Checked by supervisor; Name_____, Signature_____

Instruction for Interviewer

- Collect data from the mother of the child (immediate care giver of the child) and/or the household food prepare person
- Check for completeness of the questionnaire before ending the interview with the re
- Perform Anthropometric measurement after you completed the interview
- Adhere to the standard procedures

Part one: Socio demographic characteristics

1. Head of the household? 1. Male 2. Female

2. What is your religion?
   1. Protestant 2. Orthodox 3. Catholic 4. Muslim 5. Others - _____
3. What is your Ethnic group? 1. Nuer 2. Agnua 3. Mejenger 4. Oromo 5. Amhara 6. Tigre 7. Others (specify)
4. What is the highest level of education you attended?1. Illiterate 2. Able to read and write 3. ____grade 6. College/university diploma 7. College/university degree 8. Others (specify)
5. What is the marital status of the respondent?
   1. Single 2. Married 3. Husband died 4. Divorced
6. What is the highest level of education your husband attended? (If, married) 1. Illiterate 2. Able to read and write 3. ____grade 6. College/university diploma 7. College/university degree 8. Others (specify)
7. How many members are there in your family? _____members
8. How many children <5 year live in the HH? _____
9. What is your occupation? (More than one answer is possible) 1. Housewife only 2. Farmer 3. Merchant/Trade 4. Private Organization employer 5. Government employee 6. Daily laborer 7. Other (specify)
10. What is your husband occupation? (If, married) (More than one answer is possible)
    1. Farmer 2. Merchant/Trade 3. Private Organization employee 4. Government employee 5. Daily laborer 6. Other (specify)

Part two: access to health and sanitation

1. 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)
2. Do you have a latrine? 1. Yes 2. No
3. If the Q3 answer is yes, what type of latrine they use? (Observation)
   1. Private pit / wooden slab 2. Private Pit / cement slab 3. Shared latrine/wooden slab 4. Shared VIP latrine 5. Open defecation 6. Other (Specify)
4. What is your main source of drinking water? 1. River 2. Pond 3. Pipe line 4. Unprotected well. 5. Protected well. 6. Spring 7. Other (specify)
5. How long does it take you to go and come back to fetch water? In minutes_____

Part three: international wealth index

1. What is quality of water supply in the household? 1. High quality 2. Medium quality 3. Low quality
2. What is quality of toilet facility in the household?1. High quality 2. Medium quality 3. Low quality
3. What is quality of floor material in the household? 1. High quality 2. Medium quality C. Low quality
4. Has household access to electricity? 1. Yes 0. No
5. How many the numbers of sleeping room in the household? 1. Zero or one sleeping rooms 2. Two sleeping rooms 3. Three or more sleeping rooms.
6. If the household or one of its members owns the durable, will be take "1" on the box for yes otherwise take "0" for no.
   ( )Television ( )Refrigerator ( ) Phone ( ) Car
   ( )Bicycle ( )Cheap utensils ( )Expensive utensils

Part four: Child care practice

1. For how many months did you breast-fed the child? _____ Months 99. Don't know/not sure/
2. At what age did you start feeding other additional food? _____ Months
   99. Don't know/not sure/
3. If the child had history of illness how was the practice of feeding changed?
   1. Preventing from breast 2. Preventing from giving food 3. Providing additional food 4. No change 5. Other (specify)
4. Duration practiced washing of the child? 1. Daily 2. Weekly 3. Other (Specify)
5. Within how many times you took the child to get a treatment/ health institution after the onset of symptoms? 1. Immediately 2. Within 24 hours 3. After 24-hours 99. Don't know/not sure
6. What measure is taken during meal if the food to be eaten is small in your family members? 1. Shared equally 2. Given to the children only 3. Given to the husband only 4. Shared between mother and children 5. Other (specify)
7. Who receives a best portion of meal in your family members?1. Shared equally 2. Husband 3. Children 4. Husband and children 5. Mother and children 6. Other (specify)
8. When does child'sportion is dished during meal?1. Along with husband 2. After husband 3. After husband and mother 4. Others (specify)

Part five: household food access

Household Food Insecurity Access Scale (HFIAS)

1. In the past four weeks, did you worry that your household would not have enough food?0. No (skip to Q2) 1. Yes

2. How often did this happen? 1. Rarely 2. Sometimes 3. Often

3 In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? 0. No (skip to Q4) 1. Yes

4. How often did this happen? 1. Rarely 2. Sometimes 3. Often

5. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? 0. No (skip to Q6) 1. Yes

6. How often did this happen? 1. Rarely 2. Sometimes 3. Often

7. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? 0. No (skip to Q8) 1. Yes

8. How often did this happen? 1. Rarely 2. Sometimes 3. Often

9. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? 0. No (skip to Q10) 1. Yes

10. How often did this happen? 1. Rarely 2. Sometimes 3. Often

11. In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food? 0. No (skip to Q12) 1. Yes

12. How often did this happen? 1. Rarely 2. Sometimes 3. Often

13. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? 0. No (skip to Q14) 1. Yes

14. How often did this happen? 1. Rarely 2. Sometimes 3. Often

15. In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? 0. No (skip to Q16) 1. Yes

16. How often did this happen? 1. Rarely 2. Sometimes 3. Often

17. In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? 0. No (skip to Q18) 1. Yes

18. How often did this happen? 1. Rarely 2. Sometimes 3. Often

Key; rarely = 1-2 days

Sometimes = 3-9 days
Often = 10-30 days

Part six: anthropometric measurement

1. What is child's sex? 1. Male 2. female
2. What is [his /her] birthday? doesn't know the exact (vaccination card with the birthday recorded) Day/month/year_____/_____/_____
3. Child's height? 1st_____ Meter 2nd_____Meter
4. Child's weight? 1st_____g/Kg 2nd_____g/kg
5. Does child have bilateral edema of the feet? 1. Yes 2. No

Thank you for your time and concern!

ቀበሌ_____

የጥያቄዉ መለያ ቁጥር _____

ጅማዩኒቨርሲቲ

የሕብረተሰብ ጤናና ሕክምና ሳይንስ ኮሌጅ

የጋምበላ ክተማ በህጻናት ላይ የምግብ እጥረት ሁኔታ እና ተያያዥ የስነ-ምግብ መንስኤዎች መጠ

የስምምነት መግለጫ

እንደምን አደርሽ/ዋልሽ? ስሜ _____እባላለሁ፡፡ እኔ የጅማ ዩኒቬርሲቲ የምርምር ቡድን አባል ስሆን የመጣሁት በጋምቤላ ክተማ ህጻናት ላይ የምግብ እጥረትን በተመለከተ እና ከስነ-ምግብ ያለው ቁርኝት እና ተያያዥ መንስኤዎች ላይ ጥናት ለማድረግ ነዉ፡፡ ጥናቱን በተመለከተ ካንቺ ጋር አጭር ዉይይት እንዲኖረን ልገልፅልሽ እወዳለሁ፡፡ የጥናቱ ዓላማ ምግብ እጥረትና ተያያዥ የስነ-ምግብ መንሴዎችን በህጻናት ላይ ማጥናት ነዉ፡፡ አንቺ በጥናቱ ዉስጥ እንደ አንድ ተሳታፊ ተደርገሽ ተመርጠሻል፡፡ ማንኛዉም የምትሰጪኝ መረጃ ምስጥራዊ እና ለጥናቱ ብቻ የሚያገለግል ነዉ፡፡ ማንኛዉም ተሳታፊ የሚለየዉ በሚሰጠዉ የሚስጥር ቁጥር እንጂ ስማችዉ አይፃፍም፡፡ ዉይይቱ ባንቺ ፍላጎት ላይ የተመሰረተ ነዉ፡ በማንኛዉም ሰዓት ዉይይቱን የማቋረጥ መብት አለሽ፡፡ በዉይይቱ ዉስጥ አለመሳተፍሽ ባንቺም ሆነ በቤተሰቦችሽ ላይ ምንም ዓይነት ተፅዕኖ አያሳድርም፡፡ ይሁን እንጂ ያንቺ ተሳትፎ ለጥናቱ ሙላት እና በጋምቤላ ክተማ ለሚገኙት ህጻናት የምግብ እጥረትና ተያያዥ መንሴዎች እልባት ለመስጠት ወሳኝ ሚና አለዉ፡፡

ቃለመ ጠየቁን መቀጠል እንችላለን?

አዎን ከሆነ መልሷ.....ቃለ መጠየቁን ቀጥይዉ፡፡

አይደለም ከሆነ መልሷ.....ቃለ መጠየቁን ተይና ተጠያቂዋን አመስግነሽ ተሠናበቻት፡፡

የጠያቂዉ ስም _____ የጠያቂዉ ፍርማ _____

የተቆጣጣሪዉስም_____

የተቆጣጣሪዉፍርማ_____

ቀን_____/_____/_____

ክፍል አንድ የስነ-ሕዝብ መጠይቆች

1. የቤቱ አስተዳዳሪ ጾታ ምንድን ነዉ? 1/ ወንድ 2/ ሴት
2. ሀይማኖትህ/ሽ ምንድን ነዉ?
   1/ፕሮቴስታንት 2/ኦርቶዶክስ 3/ካቶልክ 4/ ሙሲሊም
   5/ ሌላ ከሆነ(ግለጪ)
3. ብሔርህ/ሽ ምንድን ነዉ?
   1/ ኑዌር 2/ አኙዋ 3/ መጀንግር 4/ ኦሮሞ 5/ አማራ
   6/ ትግሬ 7/ ሌላ ከሆነ(ግለጪ)_____
4. እሰከ ስንተኛ ክፍል ተምረሻል?
   1/ ትምህርት የለኝም 2/ ማንበብና መፃፍ እችላለሁ 3/ _____ ክፍል
   5/ የኮሌጅ /የዩኒቬርሲቲ ድፕሎማ 6/ የኮሌጅ /የዩኒቬርሲቲ ድግሪ
   7/ ሌላ ካለ(ግለጪ)_____
5. ባሁኑ ሰዓት የእናቲቱ የጋብቻ ሁኔታ ምን ይመስላል?
   1/ ያላገባች 2/ ያገባች 3/ ባል የሞተባት 4/ ከባሉዋ ጋር የተለያየች
   5/ ሌላ ካለ(ግለጪ)
6. ባለቤትሽ እስከ ስንተኛ ክፍል ተምሯል? (ያገባች ከሆነ)
   1/ ትምህርት የለዉም 2/ ማንበብና መፃፍ ይችላል 3/ _____ክፍል
   5/ የኮሌጅ /የዩኒቬርሲቲ ድፕሎማ 6/ የኮሌጅ /የዩኒቬርሲቲ ድግ 7/
   ሌላ(ግለጪ)
7. በአሁኑ ሰአት ቤተሰባችሁ ውስጥ ስንት አባላት አለ? _____
8. በአሁኑ ሰአት ቤተሰባችሁ ስንት እድሜው ከ5 ዐመት በታች የሆኑ ህጻናትይገኛሉ?
   _____
9. ባሁኑ ሰዓት ስራሽ ምንድ ነዉ? (ከአንድ በላይ መልስ ሊኖረው ይችላል)
   1/ የቤት እመቤት(ያልተቀጠረች) 2/ ግብርና 3/ ነጋዴ 4/ የግል ተቀጣሪ
   5/ የመንግስት ተቀጣሪ 6/ የቀን ስራ 7/ ሌላ ካለ(ግለጪ)
10. ባሀኑ ሰዓት የባለቤትሽ ሥራ ምንድ ነዉ? (ያገባች) ከአንድ በላይ መልስ ሊኖረው ይችላል
    1/ ግብርና 2/ ነጋዴ 3/ የግል ተቀጣሪ 4/ የመንግስት ተቀጣሪ
    5/ የቀን ስራ 6/ ያልተቀጠረ 7/ ሌላ ካለ(ግለጪ)

ክፍል ሁለት፡ የጤና አገልግሎት እና የአካባቢ ንፅህና ሁኔታ

1. ልጅሽ በሚታመምበት ጊዜ የት ነበር የምታሳክሚው/ያቸው?
   1/ ቤት ውስጥ በባህላዊ መንገድ 2/ የባህል ሀክምና ሰጭ ጋር
   3/ በአቅራቢያ በሚገኝ ጤና ተቋም 4/ ሌላ ካለ____
2. ሽንት ቤት አላችሁ? 1/ አዎን 2/ የለንም
3. ለጥያቄ 2 መልስ አዎን ከሆነ ሽንት ቤቱ ምን ዓይነት ነዉ? (በማየት)
   1/ የግል ሽንት ቤት (VIP) 2/ የግል ሽንት ቤት/ ወለሉ በንጨት የተሰራ
   3/ የጋራ ሽንት ቤት (VIP) 4. የጋራ ሽንት ቤት/ወለሉ በንጨት የተሰራ 5/ ሌላ ከለ____
4. የመጠጥ ዉሃ ከየት ነዉ የምታገኙት?
   1/ ከወንዝ 2/ ኩሬ 3/ ቧንቧ 4/ የግል ጉድጓድ ዉሃ(ያልተከለለ) 5/ የግል ጉድጓድ ዉሃ(የተከለለ) 6/ የምንጭ ዉሃ
   7/ ሌላ ካለ(ገለጪ)_____
5. ውሃ ለመቅዳት ምን ያህል ደቂቃ መጓዝ ይጠበቃል?_____

ክፍል ሦስት፡የቤተሰብ የገቢ ሁኔታ

1. የቤተሰቡ የመጠጥ ውሃው ጥራት ምን ይመስላል?
   1/ ጥሩ 2/ መካከለኛ 3/ ዝቅተኛ
2. የመጸዳጃው ጥራት ምን ይመስላል?
   1/ ጥሩ 2/ መካከለኛ 3/ ዝቅተኛ
3. የመኝታ ክፍሎች የወለል ጥራት እንዴት ነው?
   1/ ጥሩ 2/ መካከለኛ 3/ ዝቅተኛ
4. የኤሌትሪክ አገልግሎት በቤት ውስጥ ይገኛል?
   1/ አዎ 0/ የለም
5. የመኝታ ክፍሎች ምን ያህል ናቸው?
   1/ ዜሮ ወይንም አንድ 2/ ሁለት 3/ ሦስት ወይንም በላይ
6. ቤተሰቡ ወይንም ከቤተሰቡ መካከል አንዱ አባል ከታች የተዘረዘሩት ንብረቶች ባለቤት ከሆነ ካጠገቡ 1 ይፃፉ ከሌለ ደግሞ 0 ይፃፉ፡፡
   ( )ቴሌቪዥን ( )ፍሪጅ ( )የስልክ ቀፎ ( )መኪና ( )ሳይክል ( )ርካሽ የቤት ውስጥ ቁሳቁስ ( )ውድ የቤተ ወስጥ ቁሳቁስ

ቁልፍ

I የውሀ አቅርቦት፤ ሀ/ ጥሩ ፡- የታሸገ ውሀ ወይንም የቧንቧ ውሀ

ለ/ መካከለኛ፡- የቦኖ ፤የታንከር ፤ጥልቅ ጉድጋድ (የተከለለ) ውሀ

ሐ/ ዝቅተኛ ፡- የጉድጓድ ፡ የወንዝ ፡ የምንጭ ፤ጥልቅ ጉድጋድ (ያልተከለለ)

II መጸዳጃ ሀ/ ጥሩ፡- የግል ፍላሽ (ውሀ)

ለ/ መካከለኛ፡- vipl የግል ፡የህዝብ መጸዳጃ

ሐ/ ዝቅተኛ፡- ባህላዊ ወይንም ከሌለ

III ወለል ሀ/ ጥሩ፡- ሴራሚክ

ለ/ መካከለኛ፡- ሲቢንቶ ፡ እንጨት

ሐ/ ዝቅተኛ፡- አፈር

IV ርካሽ ቁሳቁስ (ከ1000ብር በታች)፤ ጠረጴዛ፡ዋንበር፡ሰአት፡ራዲዮ፡ፋን፡ውሃ ማሞቂያ የመሳሰሉት

V ውድ ቁሳቁስ (ከ6000ብር በላይ)፤ ማጠቢያ ማሽን፡ማድረቂያ፡ጀኔራተር፡ሞተርይክ፡ኤየር ኮንዲሽነር፡ኮምፒውተር፡ሞተርጀልባ የመሳሰሉት

ክፍል አራት፡ የህጻናት እንክብካቤ

1. ህጻኑ ለምን ያህል ጊዜ ነው የእናቲቱን ጡት ብቻ የተመገበው _____ወራት 99/ አላውቅም
2. ህጻኑ ተጨማሪ ምግብ መመገብ የጀመረው መቼ ነው?_____ወራት በኃላ 99/ አላውክም
3. ልጅሽ በሚታመምበት ወቅት የአመጋገቡ ሁኔታው ምን ይመስል ነበር ?
   1/ ጡት መከልከል 2/ ምግበ አለመሰጠት 3/ ተጨማሪ ምግብ መስጠት
   4/ ለውጥ የለም 5/ ሌላ ካለ_
4. የህፃኑ የገላ ማጠብ ሁኔታ
   1/ በየቀኑ 2/ በየሳምንቱ 3/ ሌላ ካለ_____
5. ህመም ከታየበት በምን ጊዜ ያህል ውስጥ ነው ህፃኑን ህክምና እንዲያገኝ የምታደርጉት ? 1/ ወዲያውኑ
   2/ በ 24ሰአት ውስጥ 3/ ከ 24ሰአት በኃላ 4/ አይታወቅም
6. እቤት ውስጥ የሚበላ በሚያንስበት ጊዜ የሚወሰደው እርምጃ ምነድን ነው?
   1/ እኩል ለቤተሰቡ አባለት ይካፈላል 2/ ለህጻናት ቅድሚያ የይሰጣል
   3/ ለአባወራው ቅድሚያ የይሰጣል 4/ ለናቶችና ህጻናተ ቅድሚያ ይሰጣል 5/ ሌላ ካለ_____
7. ለማን ነው ከቤታቹህ ውስጥ የተሻለ መጠን ምግብ የሚሰጠው?
   1/ እኩል ለቤተሰቡ አባላት 2/ ለአባወራው 3/ ለህጻናት
   4/ ለናቶችና ህጻናተ 5/ ሌላ ካለ___
8. ህጻኑ መቼ ነው የሚመገበው? 1/ ከአባወራው ጋር 2/ ከአባወራው በኃላ 3/ ከአባወራ እና ከእማወራ በኻላ
   4/ ሌላ ካለ_____

ክፍል አምስት፡ የቤተሰብ ምግብ ዋስትና መጠይቆች

1. ባለፉት አራት ሳምንታት ዉስጥ ቤተሰቦቼ በቂ ምግብ አያገኙም ብለሽ ተጨንቀሽ ታዉቂዋለሽ? 0/ አይደለም (ከሆነ ወደ ጥያቄ 3 ይሂዱ) 1/ አዎ

2. ለጥያቄ ቁጥር 1 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?
   1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ
3. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ ንብረት ስላጣችሁ አንቺ የሚትፈልጊዉን ምግብ መብላት ያልቻለ አለ?
   0/ አይደለም (ከሆነ ወደ ጥያቄ 5 ይሂዱ) 1/ አዎ
4. ለጥያቄ ቁጥር 3 መልስሽ አዎን ከሆነ ለምን ያህል ጊዜ ነዉ ይሄ የተከሰተዉ?
   1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ
5. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ ንብረት ስላጣችሁ ውስን የምግብ ዓይነቶችን የበላ አለ?
   0/ አይደለም (ከሆነ ወደ ጥያቄ 7 ይሂዱ) 1/ አዎ
6. ለጥያቄ ቁጥር 5 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?
   1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ
7. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ ንብረት ስላጣችሁ አንቺ የማትፈልጊዉን ምግብ በልተዋል?
   0/ አይደለም (ከሆነ ወደ ጥያቄ 9 ይሂዱ) 1/ አዎ
8. ለጥያቄ ቁጥር 7 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?
   1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ
9. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ በቂ ምግብ ባለመኖሩ አንቺ ከምትፈልጊዉ በታች የሆነ በመጠን አነስተኛ ምግብ የበላ አለ?
   0/ አይደለም (ከሆነ ወደ ጥያቄ 11 ይሂዱ) 1/ አዎ
10. ለጥያቄ ቁጥር 9 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?
    1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ
11. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ በቂ ምግብ ባለመኖሩ በሙሉ ቀን ዉስጥ ትንሽ ምግብ የበላ አለ?
    0/ አይደለም (ከሆነ ወደ ጥያቄ 13 ይሂዱ) 1/ አዎ
12. ለጥያቄ ቁጥር 11 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?
    1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ
13. ባለፉት አራት ሳምንታት ዉስጥ ንብረት ስላጣችሁ ከቤታችዉ ምንም የሚበላ ምግብ ጠፍቶ ያዉቃል? 0/ አይደለም (ከሆነ ወደ ጥያቄ 15 ይሂዱ) 1/ አዎ

14. ለጥያቄ ቁጥር 13 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?

    1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ

15. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ ምግብ ባለመኖሩ ሌሊት እየራበዉ የተኛ አለ?

    0/ አይደለም (ከሆነ ወደ ጥያቄ 17 ይሂዱ) 1/ አዎ

16. ለጥያቄ ቁጥር 15 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?

    1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ

17. ባለፉት አራት ሳምንታት ዉስጥ ካንቺ ወይም ከቤተሰቦችሽ ዉስጥ አንድ ሰዉ በቂ ምግብ ባለመኖሩ ምንም ሳይበላ ዉሎ ያደረ አለ? 0/ አይደለም 1/ አዎ

18. ለጥያቄ ቁጥር 17 መልስሽ አዎን ከሆነ ለምን ያእል ጊዜ ነዉ ይሄ የተከሰተዉ?

    1/ በጣም ትንሽ ቀናት 2/ አልፎ አልፎ 3/ ብዙ ጊዜ

ቁልፍ; - በጣም ትንሽ ቀናት = 1-2 ቀን

አልፎ አልፎ= 3-9 ቀናት

ብዙ ግዜ= 10-30 ቀናት

ክፍል አምስት፡ አንትሮፖሜትሪክ ልኪት

1. የህጻኑ ጸታ 1/ ወንድ 2 / ሴት
2. የህጻኑ እድሜ (የተወለደበት ቀን/ወር/ዓመት)_____/_____/_____
3. የህጻኑ ቁመት ሀ/ 1st ልኪት_____ሜትር ለ/ 2nd ልኪት_____ሜትር
4. የህጻኑ ክብደት ሀ/ 1st ልኪት_____ግ/ኪ.ግ ለ/ 2nd ልኪት _____ግ/ኪ.ግ
5. ህጻኑ በሁለቱም እግሮቹ ላይ በውሃ የተሞላ እባጭ አለው? 1/ አዎን 2/ አይደለም

ላደረጉልን ትብብር ከልብ እናመሰግናለን!!!