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OF SCIENCES AND LITERATURE

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FACULTY OF NATURAL HEALTH SCIENCES
DEPARTMENT OF SCIENTIFIC NUTRITION
(DOCTOR OF PHILOSOPHY)

Effect of Maternal Employment Status on the Nutritional Status and
child-caring practices among children 6-59 months in Abala Town,
Afar Region, Northeast Ethiopia: Comparative Study

By

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A Dissertation Submitted to the Graduate Faculty of Natural Health Science of the
Selinus University in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY
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PhD Research Submission Form

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I, the undersigned PhD of Scientific Nutrition student, declare that I have submitted my original work on a title “ *Effect of Maternal Employment Status on the Nutritional Status and Caring Practices among Children 6-59 months in Abala Town, Afar Region, Northeast Ethiopia*” for the examination.

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LISTS OF ACRONYMS AND ABBREVIATIONS

EDHS	Ethiopia Demographic Health Survey
CI	Confidence Interval
ENA	Emergency Nutrition Assessment
NCHS	National Center for Health Statistics
NGO	None- Government Organization
SD	Standard Deviation
ENA for SMART	Emergency Nutritional Assessment for Standardized Monitoring and Assessment for Relief and Transition
UNICEF	United Nations Children’s Fund
SPSS	Statistical Package for Social Science
WHO	World Health Organization
HAZ	Height for Age Z-score (Height for age <-2 z-score) =Stunting
WHZ	Weight for Height Z-score (Weight for height <-2 Z- score =Wasting
WAZ	Weight for Age Z-score (Weight for age <-2 z-score) = Underweight
SAM	Sever Acute Malnutrition
MAM	Moderate Acute Malnutrition
GAM	Global Acute Malnutrition
MUAC	Mid Upper Arm Circumference
SMART	Standardized Monitoring and Assessment of Relief and Transition

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ABSTRACT

Background: Maternal employment has increased due to the demand of increased household income thus giving mothers a double burden. The nutritional status and the overall health status of child in the world. In Ethiopia, malnutrition measuring as nutritional status (wasting, stunting and underweight) are the most serious public health problems.

Objective: To assess the effect of maternal employment status on the nutritional status and child-caring practices among children 6-59 months in Abala town, Afar Region, Northeast Ethiopia.

Methods: A community-based comparative cross-sectional study was conducted on 723 children aged 6–59 months of employed (361) and unemployed (362) mother-child pair in the year 2021. A simple random sampling method using computer generated number (Random Number Generator) was used to select the study participants. A structured questionnaire was used and anthropometric measurements were taken to collect data. ENA for SMART 2020, EPI Data 3.5.4 version, MS Excel spread sheet and SPSS version 24.0 were applied for data entry and analysis, respectively. Bivariate and multivariable logistic regression analysis was used to identify the factors associated with nutritional status of under-five children from employed and unemployed mothers. The statistical significance was declared at p value < 0.05 with 95% confidence intervals in the final model.

Result: The study found the overall prevalence of nutritional status- wasting, stunting, and underweight were 12.1% (95% CI: 9.9–14.7%), 30.5% (95% CI: 27.2–34.0%), and 24.3% (95% CI: 21.3–27.6%), respectively in the study town. The results from both mothers indicated the prevalence of child malnutrition (wasting, stunting, and underweight) were classified as a public health problem in the town population according to the WHO classification for public health significance. Children from unemployed mothers had significantly higher in stunting and underweight than employed mothers in the study town.

Conclusion and Recommendations: This study indicated that child nutritional status, such as stunting and underweight were higher prevalence in children of unemployed mothers than employed mothers in the study town. Strengthen the health system and increase quality care of nutrition services and addressing child morbidity and IYCF practices, and advocacy for social SafetyNet program cash support are vital interventions to improve nutritional status of the under five children in the study town.

Keywords: Nutritional Status, Employed mothers, Un-employed mothers, Child-caring practices

1. INTRODUCTION

1.1 Background

Nutritional status in childhood is a key predictor of an individual's well-being and health. Inadequate nutrition in childhood has irreversible consequences on human body growth such as low height for age. Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development [1].

Malnutrition remains among the most devastating problems currently being faced by the majority of the world's poor. As of many developing countries malnutrition is one of the most important health and welfare problems among infants and young children in Ethiopia studies showed that is a result of both inadequate food intake and illness. Inadequate food intake is a consequence of insufficient food available at the household level, or improper feeding practices, or both [2,3].

Traditionally, a woman's place has been her home and a generation ago, her employment outside her home was looked down by the society. Women have started seeking employment outside their homes, these entering the work field have both negative and positive effects, the one is that it increases the family income and it may give the women some economic independence and status in the society. It however also increases her work load and cuts into the time that she has to spend with her children [4-6].

Activities carried out by women such as breast feeding, preparing food, and seeking preventative and curative medical care are crucial for children's healthy development, women also play an important role as generators of family income, whether in household farms or businesses or as wage employees. This inevitable change, women entering the work field have an effect on the child care and development [5].

In this modern era, mothers' participation has been increased and part of the labor force compared to previous time. Maternal employment influence child feeding practices thus it reflects child nutrition status. Mothers exert strong influence over child feeding practices (6).

1.2 Statement of the problem

Under-nutrition is known as one of the biggest threats of resources-poor communities. Globally, under nutrition in children is highly prevalent and remains a big challenge [1]. Estimated 13.6 million children die annually from undernutrition globally [1]. Mortality in children from undernutrition is highest in developing countries [2]. At the global level, an estimated 151 million (22.2%) children under-five years of age were stunted in 2016 [3]. An additional 51 million (7.5%) were at risk of wasting in the same year. Stunting and wasting rates in Africa are above global estimates, although inter-country variations. In 2016, stunting affected an estimated 39% of children under-five years while wasting threatened the lives of an estimated 27% in Saharan African countries [4].

The causes of malnutrition are multifaceted and include diseases, inadequate diet, environmental, and socioeconomic factors [5]. The age of the child, gender, birth weight, child's vaccination status, birth spacing, maternal education, antenatal care (ANC) use by mother, improved water, hygiene and sanitation, and family size have been identified as some of the factors of children's nutritional status in sub-Saharan Africa [6].

Many studies reported the health and physical consequences of poor nutrition during infancy and childhood have been well documented and include impaired growth, poor cognitive and social development, poor school performance, increased risk of morbidity and mortality and reduced productivity later in life [4]. Stunting is linked to poor environmental conditions and repeated exposure to adverse economic conditions that result from poor nutrition during pregnancy and early childhood [5]. Wasting is a life-threatening result of insufficient food intake and/or disease; it is a measure of acute malnutrition [9]. Nevertheless, the nutritional status of children can serve as an indicator for measuring the health and well-being of populations; because early childhood health indicators are sensitive to food security situations, environmental, economic and policy changes [17]. Thus, they reflect the living conditions to which the child is "exposed" to.

Ethiopian government has been implementing a number of strategies such as the 2004 National Strategy for IYCF practices, the 2005/2006 National Nutrition Strategy, and the 2008 National Nutrition Program [7-9]. Furthermore, the government has planned to reach the zero-level under nutrition by 2030 [40]. As a result, the country has demonstrated a promising progress in reducing child malnutrition over the past decades. Since the last two decades, Ethiopia has been

thriving to improve the level of malnutrition in different segments of the population [8]. On the other hand, the magnitude and complications of acute undernutrition remain a public health problem in the country [11]. Undernutrition is the leading problems, causing morbidity and mortality in children under five years of age [12]. According to the Ethiopian Demographic and Health Survey (EDHS) 2016 report, about 9.7% of the children are wasted, 28.7% of the children are underweight, and 38.4% of the children are stunted with wide regional variations [7].

In Afar Regional State, the prevalence of wasting, stunting, and underweight among under-five children were 18%, 41%, and 36%, respectively, which is the highest as compared to the national average and across other regions [7]. Other earlier studies from other specific regions and localities of the country also indicated the prevalence of wasting in the range 11%–24%, stunting 35–49%, and underweight 21–48% [9]. Although the prevalence of child undernutrition is relatively well documented among other regions of Ethiopia, evidence on the nature, nutritional status and factors affecting for child undernutrition in Afar is limited. And, national estimates are also usually not a reflection of the local estimate of child undernutrition status. Afar regional state has been identified as one of the hotspot regions in the country with high food insecurity, higher child undernutrition rates, and recurrent onset of droughts, which are major threats to the nutritional status of young children in the Region [10]. This indicted that investigating the nutritional status and identifying its contributing factors within this context is an important step to design appropriate strategies to mitigate the undernutrition problem. Therefore, with this background in mind, this study required to assess the nutritional status (wasting, stunting and underweight), child-caring practices and associated factors affecting nutritional status among 6-59 months children of employed and unemployed mothers in Abala Town, Afar Regional State, Northeast Ethiopia.

1.3 Literature review

1.3.1 Prevalence of the Malnutrition in 6 – 59 months Children

Malnutrition remains one of the most common causes of morbidity and mortality among children under five children throughout the World. It is a leading cause of morbidity and mortality among children in the developing world, contributing to more than half of all child deaths (13). Worldwide, nearly one in four children under five ages are stunted, an estimated 101 million children of under-five age are underweight and 52 million children are moderately or severely wasted (14).

The burden of malnutrition is much higher in South Asia compared to that in Africa and other parts of the world. The prevalence of underweight and stunting in South Asia has been recorded as 46% and 44 %, respectively (9). Chronic malnutrition has been a persistent problem for under five years children in Sub-Saharan Africa. In Sub Saharan Africa, Malnutrition is a leading cause of morbidity and mortality. More than one third of countries in sub-Saharan Africa with high prevalence rates 40% of children are stunted, 25% of children are underweight and wasted (14).

A study conducted on influence of socio-economic factors on nutritional status of children in Osun state, Nigeria revealed that the prevalence rates of underweight, wasting and stunting were 23.1%, 9 % and 26.7% respectively and also prevalence and determinants of malnutrition among Under-five Children in Kwara State, Nigeria results indicate that 23.6%, 22.0% and 14.2% of the sample children were stunted, underweight and wasted, respectively (11, 12).

Study done on malnutrition among under-five children in Bangladesh revealed that, the high prevalence of stunting and underweight, for instance 42% and 40% of under-five children were stunted and underweighted, respectively (13). Also, study conducted nutritional status of under- five children in Mongolia also showed that, the prevalence of stunting, wasting and underweight were 15.6%, 1.7% and 4.7%, respectively (14).

According to research conducted in under five children in western Kenya revealed that, the prevalence of stunting, underweight and wasting were 30%, 20%, and 4%, respectively (18). Although a study conducted in Gumbrit district, the overall prevalence of malnutrition was high with 28.5% of the children being underweight, 24% stunted and 17.7% wasted (19, 20).

Similarly, study done at Beta-Israel revealed that, the prevalence of stunting, Underweight and wasting were 37.2%, 14.6%, and 4.5%, respectively. Moreover, severe stunting, severe underweight and severe wasting were seen in 14.8%, 2.9%, and 0.5% of the Children respectively (19, 20).

A study conducted West Gojam zone revealed that 49.2 % children were found to be underweight, 43.2 % of the children under age five were suffering from chronic malnutrition and 14.8 % acutely malnourished (21).

Study conducted Tigray region of Ethiopia also revealed that, the levels of stunting, underweight and wasting were 42.7%, 38.3% and 13.4%, respectively (22).and also the overall prevalence of stunting, underweight and wasting were 45.7%, 43.1% and 7.1%, respectively (23). Also, according to research conducted in Gimbi town in western Ethiopia indicated that, 32.4 % stunted, 23.5 % underweight and 15.9% of the children were wasted. Prevalence of severe stunting, severe underweight and severe wasting respectively were 15.7%, 8.0 % and 5.7% (24).

Study conducted in Harar, Ethiopia, revealed that, the prevalence of stunting, underweight, and wasting were 42.2%, 36.6%, and 14.1%, respectively. In addition, the proportion of the prevalence of malnutrition by its level of severity indicated that 19.9% were severely stunted, 16.6% were severely underweight and 3.9% were severely wasted (25).

In Ethiopia, 38.4 percent of children under five are stunted, while the proportion severely stunted is 18 percent, 24 % are underweight (low weight-for-age) and 7% are severely underweight, 10 percent of children are wasted, and 3 percent are severely wasted (7). Undernutrition observed in children under five years in the north-eastern part of Ethiopia where Afar Region is located is high, estimated at 41% stunting, 18% wasting and 36 % underweight (7).

1.3.2 Factors Associated with the Nutritional Status of 6-59 months Children

The causes of undernutrition are numerous and multifaceted. These causes are linking with each other and are hierarchically related. The most important associated factors of undernutrition include the education, income, and nutritional situation of the parents, access to clean water and sanitation, access to primary health care, sex and age of child. Factors that are contributing to malnutrition may differ among countries, communities and over time. The underlying factors themselves are influenced by the basic socio-economic and political Conditions (27).

Sex of children: Sex of the child has been observed to be a significant factor for child nutritional status. Prevalence and severity differ in these two sex groups. Study conducted in Western Maharashtra, India, reported that a higher proportion (80.3%) of females were malnourished compared to the males (28). In Bangladesh, 54% of malnourished children are females and have a likelihood of 1.44 times greater to be malnourished than males (29).

Other studies reported that males were more malnourished compared to female children. According to a study done in Kwara State, Nigeria, there was a significant relationship between sex of a child and malnutrition; male children were more likely to be malnourished than female (30). A study conducted in Haramaya District, Eastern Ethiopia reported that wasting among male children was 2 times higher than that of female children (31). According to these studies, there is variation in undernutrition depending on the areas where the study was conducted.

Children age: It is important to note that specific ages, children's nutritional status is sensitive to feeding, weaning practices, care, and exposure to infection. Majority of the studies conducted in different parts of the world confirmed that child's age was the main contributing factors to child malnutrition (22). A study conducted in Ethiopia showed that the prevalence of stunting was low in children at age of 1 year and below year (32). Tanzania Demographic and Health Survey (33) reported that stunting increases with age, peaking at 44% among children age 24-35 months.

Another study conducted in East Belesa District, northwest Ethiopia reported that children aged 36–47 months were less likely to be stunted compared to infants aged 6–11

months. This could be due to the fact that the latter have poorer nutritional reserve capacity compared to the former (34).

Marital status: A study conducted in Ethiopia found that child's malnutrition is significantly associated with marital status. It was found out that malnutrition in children below five years were

higher among unmarried rural and divorced/separated women compared to married ones (16). Similarly, being a married mother was positively associated with good nutritional status among children under five years in the Volta Region of Ghana (15). On the other hand, a study conducted in Tanzania found that mothers who were married were more likely to have undernourished children unlike those who were unmarried perhaps because of the cost of maintaining families hence sometimes these families fail to produce nutritious supplements to their children below five years (26).

Maternal education: Undernutrition seems to have relationship with education level especially of mothers. Several studies conducted within and outside the country reported that undernutrition decrease with increase of maternal education level. Study on influence of socio-economic factors on nutritional status of children in Nigeria, Children of mothers who were not educated beyond secondary school level had one and a half to two times the prevalence rate of stunting (15).

On the other hand, children of mothers with post-secondary education were apparently more often affected by wasting than those with less educated mothers but there was no consistent trend in the pattern of wasting or stunting with respect to paternal educational level (16).

According research conducted in Sudan, maternal education was found to be the strongest factor associated with malnutrition among under five children (15, 17).

Mother's employment: Mother's employment has a positive association with the nutritional status of children younger than five years. A study found that mothers engaged with office work has significantly less underweight and wasted children compared to them who are occupied as a laborer, farmer and housewife. Mother's occupation is also significantly associated with child stunting. But the risk for being stunted by the type of occupation/employment is not as high compared to underweight and wasting (35).

Studies conducted in different places showed that mother's occupation was a significant factor of nutritional status of children under five years. Children whose mothers were housewives showed a lesser prevalence of wasting and stunting as compared to mothers working out-doors (35).

A study in Vietnam showed that children from mothers who were laborers or self-employee and housewives had a greater prevalence of stunting, underweight and wasting than those from mothers who worked in office or were housewives (36). This is because working mothers rarely get time to take care of their children. They also leave their children at home with other siblings who may neglect feeding them following the right frequency and this sometimes worsens the problem of undernutrition (36).

Household income: Low maternal income and overcrowding were associated with higher prevalence of wasting. According study conducted in Ethiopia the most serious nutritional problems are mainly due to low intake of foods in general. The problem is more severe among children aged 1-3 years who suffer from Kwashiorkor and Marasmus (4%) and underweight (60%). Any change in income or income from influence of the nutritional status at the household and individual levels. The effect of income is measured by expenditure on food which reflects a household's income and resources (26). Among the socio-economic variables included in the study of Gumbrit, North West Ethiopia, family income was significantly associated with undernutrition (19).

Diseases

It is clear that Infection and nutritional status of children are interrelated where malnutrition can accelerate disease progression, and Infection worsens malnutrition by weakening the immune system and hindering nutrient intake, absorption, and storage. A study conducted by FAO shows that one in four had experienced symptoms of illness including fever, cough, and/or diarrhea in the previous two weeks; and 55% had been ill during the previous 6 months (23).

Children become malnourished if they suffer from diseases that cause undernutrition if they are unable to eat sufficient nutritious food (37). Diseases and inadequate dietary intake often occur together and are caused by multiple underlying factors including inadequate physical or economic access to food, poor health services, an unhealthy environment and inadequate caring practices for children and women (38). A study conducted in Haramaya District, Eastern

Ethiopia showed that children who had fever in the past two weeks, prior to the study, were 3 times more wasted (OR=2.9, 95 % CI (1.16-7.2) (31).

Child Caring Practices

Care affects nutritional status in three ways: through feeding practices such as breast-feeding and the preparation of nutritious foods for weaned infants and others in the household; through health and hygiene practices both within the family and within the community; and through support to the mother, both by the family and by the community, so that she has sufficient time to care for the child (10).

Study conducted at Beta-Israel also show that the main contributing factors for under-five undernutrition were found to be sex of the child, child's age, diarrhea episode, deprivation of colostrum, duration of breastfeeding, pre-lacteal feeds, type of food, age of introduction of complementary feeding and method of feeding (20). Also, study conducted in Ethiopia revealed that, a very high proportion of the mothers (80%) initiated feeding of newborns with pre-lacteal feeds primarily butter or water. Child age, inadequate complementary foods, and area of residence were the main contributing factors to child malnutrition (22).

UNICEF and WHO recommend that children be exclusively breastfed (i.e. feed only on breast milk with no other liquids including water or food) on demand for the first 6 months of life (37).

Environmental Condition

Study conducted on prevalence and factors affecting nutritional status of under-five Children in Nigeria, nutritional status was significant associated with access to clean water and presence of toilet in the households (16).

Unsafe water, poor sanitation and unhygienic conditions claim many lives each year. An estimated 1.2 million children die before the age of 5 years from diarrhea. Poor urban areas where insufficient water supply and sanitation coverage combine with overcrowded conditions tend to maximize the possibility of fecal contamination (39). Without sufficient access to safe drinking water and an adequate water supply for basic hygiene, children's health suffers (39).

1.3.3 Maternal employment and nutritional status among under-five children

According to the study in Sri Lanka shows that the poor nutritional status among under-five children of unemployed mothers than employed mothers' under-five children (16). Similarly, study in India shows that the adjusted odds of infants being wasted in employed mothers was 39% (OR=0.57; 95% CI=0.37–0.89; p=0.014) lower compared with mothers that did not engage in work after controlling for socioeconomic factors, below poverty line, class, duration of care by other caregivers, birth order and child's age but prevalence of stunting did not differ significantly between groups (28).

Study in Ethiopia also shows that the mother's occupation (being unemployed) [(AOR=4.5, 95%CI (1.8-11.2)] was significantly associated with prevalence of stunting of the children aged 6-59 months respectively (23). However, study done in West Bengal shows that the proportion of stunting was more among children of employed mothers (80.6%) when comparing with children of unemployed mothers /housewives (47.8 %) (10). Similarly, the effect of mothers' work status on their children's aged 6–36-month nutrition and health were determined that the relative risk of a child of working mother (88.5%) versus a non-working mother (81.2%) being malnourished was 1.8 by height for age, respectively Chandrapur District of Maharashtra, India (16, 24).

1.4 Significance of the study

Malnutrition is one of the leading causes of morbidity and mortality children in developing countries. Ethiopia being one of these countries' malnutrition is an important public health problem. Therefore, this study will be supporting and informing policy dialogue, strengthen knowledge and support policy development to implement intervention programs for the improvement of nutritional status of age group children, health care program planners, parents or guardians, clinicians and all other stakeholders to give an emphasis for childhood nutritional status for employed and non-employed mothers.

1.5 Conceptual Framework

The framework recognizes that nutrition status affects by socio-demographic and maternal employment related factors, dietary practice, hygiene & sanitation and chronic diseases are involved and serve as useful indicators of specific groups at risk of becoming malnourished child (Figure1).

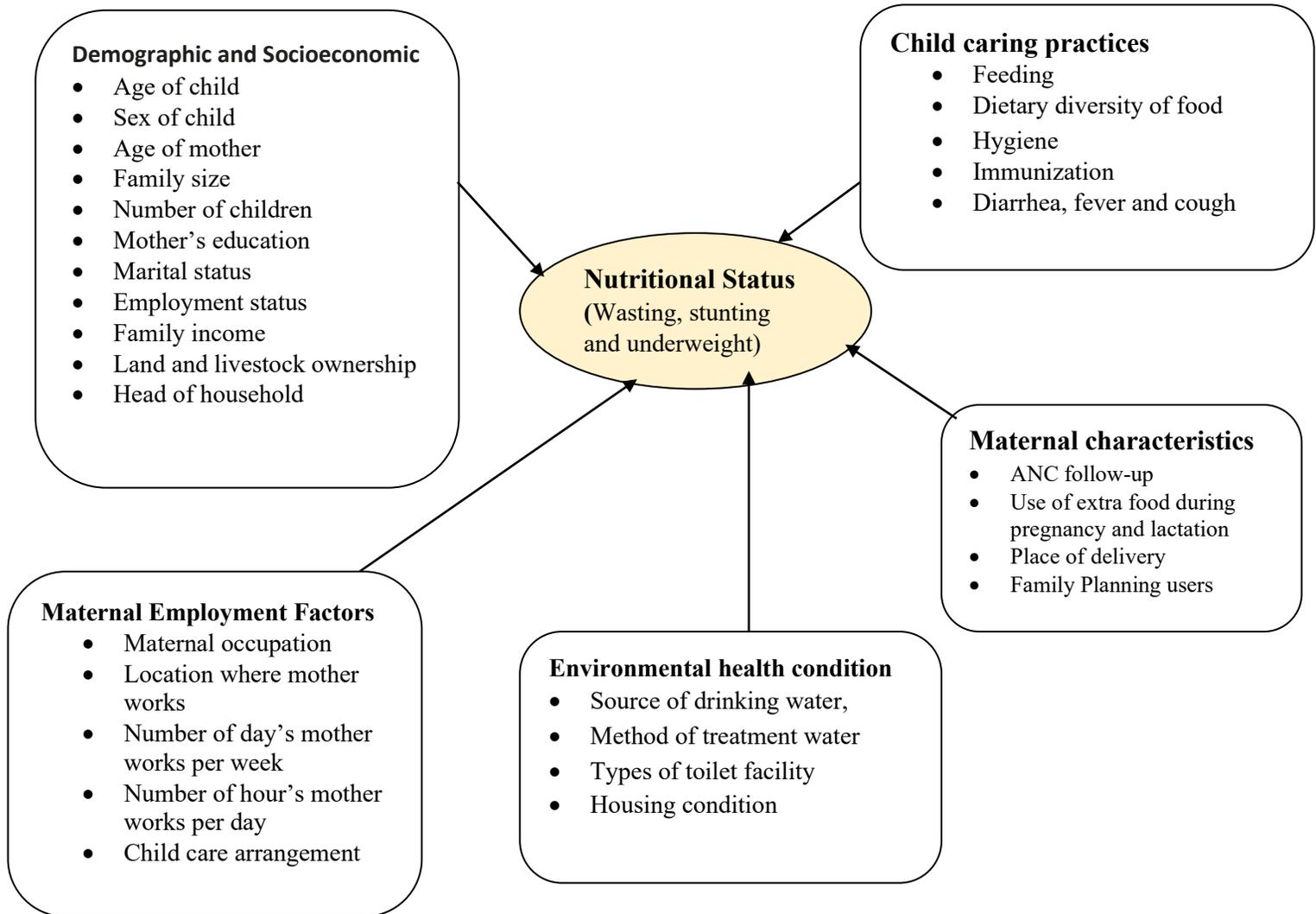


Figure1: Conceptual frame work of factors associated with nutritional status among preschool children, 2021 (self-developed from different literatures)

2. Objectives

2.1 General Objective

- To assess the effect of maternal employment status on the nutritional status and child-caring practices among children 6-59 months in Abala town, Afar Region, Northeast Ethiopia, 2021.

2.2 Specific Objectives

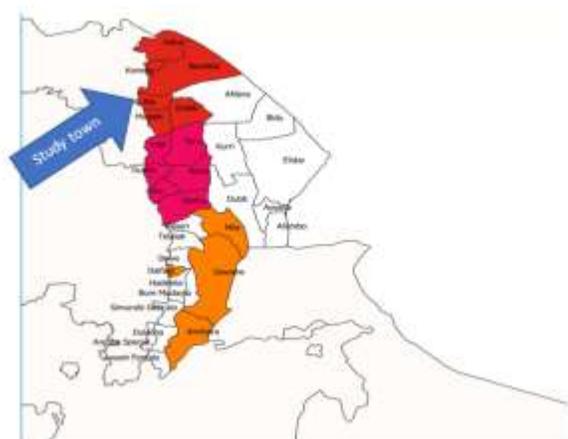
- To determine the nutritional status (stunting, wasting and underweight) among 6-59 months children of employed and unemployed mothers in the Abala town.
- To identify factors associated with the nutritional status among 6-59 months children of employed and unemployed mothers in the Abala town.
- To assess the association between maternal employment and child feeding practices in the Abala town.
- To assess child feeding practices related to beliefs and their challenges in the Abala town.

3. Methods and Materials

3.1 Study area and Period

Abala is one of the 34 Woredas found in the Afar Region. It is part of Keblati-Rasu (Zone-2), the Woreda bordered on the south by Megale Woreda, on the west by the Tigray Region, on the north by Berhale Woreda, on the northeast by Afdera, and on the east by Erebti Woreda. Abala is the capital town of Zone-2 and administrative centre of the Woreda, which is found at distance of 50km from Mekele, Tigray regional capital city and about 400km from samara (through Afdera-Erebt route) the regional capital and about 820km from Addis Ababa.

Abala Woreda consists of 11 kebeles. Based on the 2017 population projection figure by the Central Statistical Agency of Ethiopia (CSA 2007), this Woreda has a total population of 47,385 of whom 25,337 are male and 22,048 females; the rural population accounts 31,337 (about 66.13%). According to the Woreda Health Office Report in 2017, a total of 7108 are under



five children out of the Woreda population which is estimated 15.1% of the Woreda population (47,385), and the average household size is 5.8 persons. With an area of 1188.72 square kilometers, Abala has an estimated population density of 31.94 people per square kilometers. The main food sources are own crops, purchase and livestock product in this study town. There are governmental health facilities (1 hospital and 3 health centers in the town), nongovernmental health facilities are 5 clinics) and 4 pharmacies.

Study Period: Data was collected between 1-25th October 2021 in Abala town.

3.2 Study design

A community-based comparative cross-sectional study design was applied.

3.3 Source and study population

The source populations were all 6 to 59 months old children of employed and unemployed mothers, living in Abala town; whereas the study populations were 6 to 59 months old children of employed and unemployed mothers, who were found in the randomly selected sub-kebeles in the study town.

3.3. Inclusion and Exclusion Criteria

3.3.1. Inclusion Criteria

All eligible 6-59 months old children who had been living with their mothers in the study area.

3.3.2 Exclusion Criteria

All 6-59 months -old children who were seriously ill and with physical deformity that hinder height measurements were excluded from the study.

3.4 Sample Size Determination and Sampling Procedures

3.4.1 Sample size Determination

Sample size calculation: The sample size is determined by using Epi Info- statistical software version 7.2.2.2 using two population proportion formula and considering the following assumptions into account:

- Confidence level=95%
- Power (1- β): 80%

- Design effect= 2
- Ratio=1:1
- Odds ratio=2
- P1 =22.6%, proportion of stunting among under five children of unemployed mothers (26).
- P2=36.9%, estimated proportion of stunting among under five children of employed mothers.

Considering 5% possible non response rate, 366 unemployed and 366 employed mothers were included in this study.

3.4.1 Sampling Techniques and Procedures

By using appropriate sampling techniques, from all eight kebeles in the town included and sub-kebeles (Ganda) were selected randomly using simple random sampling technique. Then complete enumeration of the selected sub-kebeles of the town was applied before the actual data collection process, to know the total number of under five children among employed and unemployed mothers and sampling frame were prepared, finally the study participants were selected from sampling frame list by simple random sampling technique, using computer generated random number. In case of households with more than one child of age 6-59 months, one child was selected randomly using lottery method.

3.5 Data Collection Tool and Process

Data was collected using a structured-interviewer administered questionnaire in a face-to-face manner from mothers of children 6–59 months of aged. The questionnaire was adapted from relevant literature based on the study objectives and modified to the local context. The questionnaire was translated into the local language (Afaraaf) for data collection. The questionnaire consists of socio-demographic factors, child caring practices, maternal factors, and environmental health related characteristics and anthropometrics measurements. Six health staff for data collection and two BSc nurse supervisors who are speakers of the local language, and the principal investigator involved in the data collection process.

3.6 Anthropometric Measurements

Anthropometric measurements such as weight and height of children was taken using the standard anthropometric measurement procedures outlined in the measurement guide prepared by the Food and Nutrition Technical Assistance (FANTA) project in 2007 [25]. Body weight was measured using a weighing scale in light clothing with no jackets or coats, shoes and additional clothing to the nearest 0.1kg on a new calibrated portable scale. Height of children was measured using a portable stadiometer with no shoes, the shoulders, buttocks and the heels was touched the vertical stand and the head in Frankfurt position to the nearest 0.1cm. For children 6-23 months of age, horizontal length, and for children 24–59 months of age, standing height to the nearest 0.1cm was measured. Age of each child was also collected from the mother and counter checked using vaccination cards or other recording.

ENA for SMART software (January 11th, 2020 updated version) was applied to convert weight, height and age of child (months) in to height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) Z-scores to assess malnutrition taking sex in to consideration. Anthropometric classifications were based on global standards: $<-3SD$, $<-2SD$ and $\geq -2SD$. Children with HAZ, WAZ and WHZ below -2 SD of the median of reference population was considered as stunted, underweight and wasted, respectively with reference population of WHO 2006. Children with HAZ, WAZ and WHZ below -3 SD was also considered as severely stunted, wasted and underweight respectively. Moreover, these variables were considered as the dependent variables during statistical analysis. The dichotomous variables stunting, underweight and wasting were defined as 1 = for stunted and 0 = for not stunted, 1 = for underweight and 0 = for not underweight and 1 = for wasted and 0 = for not wasted, respectively [14, 27].

3.7 Data quality control

To ensure data quality the English version questionnaire was translated into the local language. Pretest was conducted on 5% of the total sample in non-study kebele for necessary modification.

Two days training was given the data collectors and supervisors before the actual date of data collection. Continuous supervision was done by the supervisors and principal investigator on daily bases.

3.7. 1 Pre-test

Before the actual data collection, the questionnaire was pre-tested on 5% of the total sample size outside of the study kebeles in Abala town district. To ensure the quality of data, two days of pre-survey training was given for both the data collectors and supervisors on the objective of the study and methods of data collection, anthropometric measurements and data recording. In order to evaluate the clarity of the questions and to ensure the validity and reliability of the instrument used and the average time needed while interviewing and the reaction of the respondent to the questions, a pre-test was undertaken before the start of the actual data collection. Pre-test of questionnaires was done on 38 under five children in the two kebeles. The data from the pre-testing was not included in the study and some modifications were made on the basis of the findings. Written and verbal consent was obtained from the respondent households and mothers.

3.8 Study variables

3.8.1 Dependent variables

Nutritional status as measured, wasting, stunting and underweight.

3.8.2 Independent variables

Socio- demographic variables: Such as age, religion, educational status of mother, maternal employment status.

Child caring practices: such as Immunization, feeding style, health seeking behavior, hygiene;

Maternal characteristics: such as Extra food during pregnancy, ANC follow up, FP users;

Environmental condition: such as Latrine availability, Water availability, Source of water.

3.9 Operational Definitions Terms

The following are the operational definitions used in this study:

- **Employed mother** is defined as the engagement of mother in work outside the home for income generation activities for at least 8 hours per day and also mother who perform work for income generation activities in addition to raising their child. The work could be formal or informal.
- **Unemployed mother is** defined as the mothers who is staying at home and raising their children, and not engaged in any income-generation activities.
- **Caregiver-** is the most responsible person that provides child care when the mother is out of the home for work.
- **Nutritional status:** The anthropometric status for children expressed in weight for age, weight for height and height for age indices.
Stunting (HAZ) – Height for age Z score below-2SD of the 2007 WHO standard values (36).
- **Wasting (WHZ)** – weight for height Z score below-2SD of the 2007 WHO standard values (36).
- **Underweight (WAZ)** – Weight for age Z-score below-2SD of the 2007 WHO standard values (36).
- **Child care Practices-** Child care practices refer to child rearing practices by the mother and other caregivers for the wellbeing of their children under the age of five years. Such practices will include breastfeeding, infants and young child feeding and health seeking behavior.

3.10 Data Processing and Analysis

The collected data was checked for completeness, inconsistencies and all raw data with the exception of anthropometric data was entered in SPSS 24 version for statistical analysis; whereas anthropometric data such as Age of child, height/length and weight of children were entered and converted in to anthropometric indices: height for- age, weight-for-age and weight-for-height Z scores by using the ENA for SMART software (January 11th, 2020 updated version). Descriptive statistics was computed for all variables according to type of variable. Frequency, mean and standard deviation was produced for continuous variables while categorical variables were assessed by computing frequencies and proportions.

Bivariable and Multivariable logistic regressions was used measure the strength of association between **independent variables** and the dependent variables (stunting, wasting and underweight) with 95% confidence interval. Significance was determined using unadjusted and adjusted odds ratio with 95% CI and P value respectively. First, bi-variate analysis was done to see the association between independent and outcome variables with 95% CI and P value. Then, all independent variables that were significantly associated with each outcome variables (wasting, stunting and underweight) in bivariable analysis at p-value of less than 0.25 were subsequently included in the final multivariable logistic regression analysis to determine independent predictors for nutritional status of children after controlling confounding effect.

The strength of statistical association was measured by adjusted odds ratios and 95% confidence intervals in the final model. All tests were two-sided and P value < 0.05 was considered to declare the result as statistically significant. Hosmer - Lemeshow test was performed for model fitness in the final model and P-value >0.05 are considered a good fit. Comparisons between employed and non-employed mothers' nutritional status of children were assessed using chi square test. The results were presented in the form of texts, tables and graphs based on the types of data collected.

3.11 Ethical Considerations

Ethical clearance was obtained from the Faculty of **Natural Health Sciences** of **Selinus** University, Research and Ethical Review Committee (RERC). Then administrative officials in the study town were communicated through letters from the Afar National Regional Health Bureau in Ethiopia. Permission from Abala town administrative and health office was obtained before field activities started.

Verbal consents were obtained from the study respondents prior to the interview after explaining the study purpose and procedures to to the study participants. Those children with severely malnourished (SAM) using MUAC measurement were referred to the nearest health center/facility for medical treatment service and management. All incomplete questionnaires were considered as non-response rate. Confidentiality of responses was also ensured throughout the research process as well as used for the study purpose.

3.12. Dissemination of results

The finding of the study will be presented to Department of Scientific Nutrition, Faculty of Natural Health Sciences, **Selinus University**. The copy of the thesis results will be provided to Afar Regional Health Bureau and to Abala town district Health Office who were take a part in the study.

4.RESULTS

4.1. Demographic and Socioeconomic Characteristics

In this study, the final analysis included 723 employed and unemployed mothers with their children aged 6–59 months, making the response rate of 98.7%. Of the total respondents, 361 (49.9%) were employed mothers, and 362 (50.1%) were unemployed mothers. The majority of the employed and unemployed mothers, 322 (89.2%) and 311 (85.9%) were currently married, respectively. Of the total employed mothers, 188 (52.1%) and 198 (64.8%) of them were Afar of them were Afar in their ethnicity and Muslims in their religion, respectively. Similarly, of the total unemployed mothers, 280 (77.3%) and 289 (79.8%) of them were Afar of them were Afar in their ethnicity and Muslims in their religion, respectively. Among employed mothers 155 (45.9%) and 163 (45.2%) of them were Tigray in their ethnicity and Orthodox in their religion, respectively. Of the total employed and unemployed mothers, 160(44.3%) and 179(49.4%) were attended secondary education, respectively (Table 1).

Of the total respondents, employed and unemployed mothers about 204 (57.0%) and 171 (48.2%) of them owned house, respectively. Majority of the employed and unemployed mothers, 254 (70.4%) and 254 (69.1%) the households had more than five family size, whereas more than half of the employed and unemployed mothers, about 242 (67.0%) and 244 (67.4%) had at least two under-five children, respectively. The majority 204(57.5%) of employed and 288(79.6%) of unemployed mothers had less 1500 and 2000 ETB in their monthly income, respectively.

Table 1: Demographic and socioeconomic characteristics by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021($n=723$)

Characteristics	Categories	Employed mother		Unemployed mother	
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Mother Employment	Employment Status	361	49.9	362	50.1
Number of Family Size	<5	107	29.6	112	30.9
	≥ 5	254	70.4	250	69.1
Mother's age (in years)	15-19	35	9.7	21	5.8
	20-24	106	29.4	100	27.6
	25-29	92	25.5	105	29.0
	30-34	34	9.4	32	8.8
	≥ 35	94	26.0	104	28.7
Number of under-five children	1	114	31.6	109	30.1
	2	242	67.0	244	67.4
	≥ 3	5	1.4	9	2.5
Mother's marital status	Currently married	322	89.2	311	85.9
	Divorced	23	6.4	46	12.7
	Widowed	16	4.4	5	1.4
Mother's ethnicity	Afar	188	52.1	280	77.3
	Tigray	155	42.9	82	22.7
	Others*	18	3.3	0	0.0
Mother's religion	Muslim	198	64.8	289	79.8
	Orthodox	163	45.2	73	20.2
Mother's education	Cannot read and write	69	19.1	75	20.7
	Grade 1-8	102	28.3	212	58.6
	Grade 9-10	131	36.3	59	16.3
	College and above	59	16.3	16	4.4
Family monthly income (ETB)	<1500	157	43.5	288	79.6
	1500-2000	84	23.3	20	5.5
	>2000	120	33.2	54	14.9
Ownership of House	Owned	204	57.0	171	48.2
	Rented	135	37.7	104	29.3
	Dependent	19	5.3	80	22.5

4.1.2 Maternal Occupation Characteristics

The employed mothers were asked the type of occupation they work. Of the total employed mothers, 236 (65.4%) and 86 (23.8%) of them were government employed and merchant, respectively. Majority of the respondents, 314 (87.0%) of employed mothers were spent less than one hours to reach their work area. With regards to the number of working days per day, a total of 259 (71.8%) of mothers were working for more than 8 hours per a day, and 186 (51.5%) of them were working for 6 days per a week. The employed mothers were asked the arrangement of child care while at work, majority of the mothers 258 (71.5%) were cared their child with grandmothers/family caregiver. A total of 351 (97.2%) of employed mothers rated as their work area was inconvenient for child feeding and caring (Table 2).

Table 2: Maternal employment characteristics in Abala town, Afar Regional State, Northeast Ethiopia, 2021 ($n=361$)

Characteristics	Categories	Employed mother (n=361)	
		Frequency (<i>n</i>)	Percent (%)
Mother's occupation status	Government employee	236	65.4
	Merchant/ trader	86	23.8
	Daily laborer	35	9.7
	Others	4	1.1
Time taken to reach work area (distance)	<1 hour	314	87.0
	1 hour	32	8.9
	>1hour	15	4.1
Mother's working hours per day	≥ 8 hours	259	71.8
	9-10 hours	78	21.6
	11-12 hours	24	6.6
Mother's working day per week	4 days	4	1.1
	5 days	102	28.3
	6 days	186	51.5
	7 days	69	19.1
Child care while mother at work	Grandmother/family caregiver	258	71.5
	Leave with older siblings	73	20.2
	Leaves with Neighbour	10	2.8

Characteristics	Categories	Employed mother (n=361)	
		Frequency (<i>n</i>)	Percent (%)
	Takes with me to work area	20	5.5
Suitability of work area for child feeding	Yes	10	2.8
	No	351	97.2

3.3. Child Caring Practices Characteristics

Among the under-five children of employed mothers participated in this study, 185 (51.2%) and 176 (48.8%) were females and males, respectively, where 176 (48.8%) fell in the age group of 6–29 months. While among the under-five children of unemployed mothers, 204 (56.4%) and 158 (43.6%) were males and females, respectively, where 181 (50.1%) fell in the age group of 6–29 months in the study town. The mean age \pm SD of children of employed and unemployed mothers were 28.4 ± 11.39 months, and 29.1 ± 12.31 months, respectively.

Of the studied under-five children of employed and unemployed mothers, 239 (66.2%) and 226 (64.5%) of them were started breastfeeding immediately after birth within one hour, respectively.

Among the under-five children of employed and unemployed mothers, about 228 (63.2%) and 196 (54.3%) of children were received pre-lacteal feeding, respectively; milk was the most predominant pre-lacteal food given for both employed and unemployed mothers, which accounts for 164 (71.9%) and 153 (78.1%) children, respectively. A total of children from employed and unemployed mothers, 225 (62.3%) and 169 (46.7%) children were started complementary feeding at 6 months, respectively; and about 190 (52.5%) and 180 (49.6%) of children employed and unemployed mothers were feed three times per day, respectively (Table 2).

With regarding children vaccination status, 271 (75.1%) and 295 (81.5%) of the children employed and unemployed mothers did not receive vaccination, respectively. About 38 (10.5%) and 128 (35.4%) of children employed and unemployed mothers had Diarrhoea, respectively in the past two weeks prior to the study period. similarly, 52 (14.4%) and 147 (40.6%) of children employed and unemployed mothers had fever, respectively in the past two weeks prior to the study period in Abala town (Table 3).

Table 3: Characteristics and caring practices of under-five children by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021 ($n = 723$)

Characteristics	Categories	Employed mother		Unemployed mother	
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Child's sex	Male	176	48.8	204	56.4
	Female	185	51.2	158	43.6
Child age in months	6-17	74	20.5	67	18.5
	18-29	102	28.3	114	31.5
	30-41	73	20.2	87	24.0
	42-53	74	20.5	68	18.8
	54-59	38	10.5	26	7.2
	Total	361	100.0	362	100.0
	Birth order	1	127	35.4	113
2-3		168	46.8	161	44.5
4-5		60	16.7	85	23.5
Child immunization	Yes	271	75.1	285	81.5
	No	90	24.9	42	11.6
Diarrhoea preceding two weeks	Yes	38	10.5	128	35.4
	No	323	89.5	272	64.6
Fever preceding two weeks	Yes	30	8.3	70	19.3
	No	331	91.7	292	80.7
Cough preceding two weeks	Yes	52	14.4	147	40.6
	No	309	85.6	215	59.4
Ways treating the child illness	Home treatment	30	8.3	61	16.9
	Traditional healers	56	15.5	42	11.6
	Health institution	275	76.2	259	71.5
Initiation of breastfeeding	Within one hour	239	66.2	226	64.5
	Hours later	58	16.1	46	14.4
	Days later	64	17.7	88	21.1
Received pre-lacteal feeding/food	Yes	228	63.2	196	54.3
	No	133	36.8	165	45.7
Type of pre-lacteal food	Water	13	5.7	11	5.6

Characteristics	Categories	Employed mother		Unemployed mother	
		Frequency (<i>n</i>)	Percent (%)	Frequency (<i>n</i>)	Percent (%)
<i>(n</i> =424)	Butter	47	20.6	31	15.8
	Milk	164	71.9	153	78.1
	Others*	4	1.8	1	0.5
Avoiding colostrum	Yes	237	65.7	212	58.6
	No	124	34.3	150	41.4
Currently breastfeeding	Yes	119	33.0	107	29.6
	No	242	67.0	255	70.4
Initiation of complementary feeding	<6 months	228	63.2	165	45.6
	6 months	33	9.1	147	40.6
	>6 months	100	27.7	50	13.8
Meal frequency in a day (CF)	2 times	115	32.2	133	37.0
	3 times	190	53.2	180	50.1
	≥4 times	52	14.6	46	12.9
Materials used to feed	Bottle	20	5.5	21	5.8
	Cup	27	7.5	19	5.2
	Spoon	192	53.2	210	58.0
	Hand	122	33.8	112	30.9
Dietary diversity score (Food Groups)	<4 Food groups	101	28.0	346	95.6
	≥4 Food groups	260	72.0	16	4.4

Others include* Dates (temir)

3.4. Maternal Health Characteristics

Among the total mothers interviewed, 198 (54.7%) employed and 132 (36.5%) of unemployed mothers had extra food consumption during the last pregnancy. About 207 (57.3%) employed and 130 (35.9%) of unemployed mothers attended antenatal care visit their child, and 279 (77.1%) of employed and 287 (79.3%) unemployed mothers delivered at health institution for their index child (Table 5).

Table 4: Maternal characteristics of respondents by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021($n=723$)

Characteristics	Categories	Employed mother		Unemployed mother	
		Frequency (<i>n</i>)	Percent (%)	Frequency (<i>n</i>)	Percent (%)
Extra food consumption during pregnancy	Yes	198	54.7	132	36.5
	No	153	42.5	211	58.3
Antenatal care follow-up (index child)	Yes	207	57.3	287	79.4
	No	154	42.7	42	11.6
Frequency of ANC follow up ($n=494$)	Twice	70	33.8	55	19.2
	Three times	89	43.0	202	70.4
	Four or more	48	23.2	30	10.5
Place of delivery for (index child)	Health institution	279	77.1	287	79.3
	At home	50	13.9	63	17.4

3.5. Environmental Health Characteristics of Households

The source of drinking water for 230 (63.7%) and 204 (56.4%) of employed and unemployed mothers' households were piped water source in their compound, respectively (Table 6).

With regard to the presence of latrine, 365 (98.6%) and 341 (94.2%) of employed and unemployed households had latrine, respectively. Whereas, 170 (47.1%) and 181 (50.0%) of employed and unemployed households used in a pit to dispose solid waste, respectively. However, 159 (44.0%) and 158 (43.6%) of employed and unemployed households used open field to dispose solid waste, respectively. Majority of the respondents, about 185 (51.2%) and 192 (53.0%) of employed and unemployed mothers were washed their hand before preparing and serving food, respectively in Abala town.

Table 5: Environmental health characteristics by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021($n=723$)

Characteristics	Categories	Employed mother		Unemployed mother	
		Frequency (<i>n</i>)	Percent (%)	Frequency (<i>n</i>)	Percent (%)
Source of drinking water	Household piped water	230	63.7	204	56.4
	Public tap	88	24.4	109	30.1
	Spring /river	43	11.9	49	13.5
Presence of latrine	Yes	356	98.6	341	94.2
	No	5	1.4	7	2.0
Type of toilet facility	Traditional pit latrine	117	32.9	110	31.0
	Ventilated improved pit latrine (VIP)	181	50.8	178	50.1
	Water carriage system	58	16.3	67	18.9
Solid waste disposal	In a pit	170	47.1	181	50.0
	Open field	159	44.0	158	43.6
	Municipality Service	31	8.6	23	6.4
Hand washing practice of mother	Before preparing food	185	51.2	192	53.0
	After latrine use	119	33.0	126	34.9
	Before feeding the child	26	7.2	21	5.8

3.6 Anthropometric results (based on WHO standards 2006)

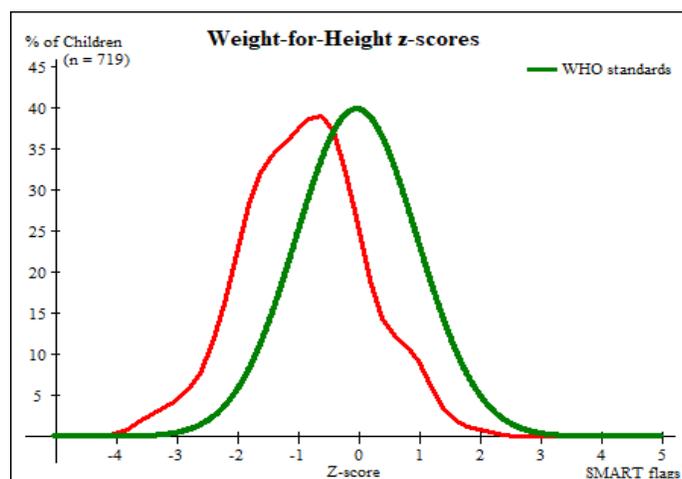
A total of 723 children 6-59 months aged from both employed and unemployed mothers were taken anthropometric measurement with distribution of girls (47.4%) and boys (52.6%) indicating boys girls ration of 1.1. The overall sex ratio of boys to girls among children 6-59 months of employed and unemployed mothers were 1.1 boys to 1.0 girl, which is found within the acceptable threshold of sex ratio (0.8 to 1.2). The overall sex ratio showed no significant difference (p-value = 0.169) and it can be interpreted as boys and girls equally represented in the sample in the study town. The under-five children age and sex distributions are shown in table 6.

Table 6: Distribution of age and sex of sample in Abala town, 2021

AGE (month)	Boys		Girls		Total		Ratio
	no.	%	no.	%	no.	%	Boy:girl
6-17	73	51.8	68	48.2	141	19.5	1.1
18-29	108	50.0	108	50.0	216	29.9	1.0
30-41	95	59.4	65	40.6	160	22.1	1.5
42-53	66	46.5	76	53.5	142	19.6	0.9
54-59	38	59.4	26	40.6	64	8.9	1.5
Total	380	52.6	343	47.4	723	100.0	1.1

Prevalence of Wasting (<-2 z-score)

The study results indicated that the prevalence of wasting (based on weight-for-height z-scores) among under-five children was 12.1 % (9.9 - 14.7 95% CI) with Severe wasting of 2.2 % (1.4 - 3.6 95% CI). The results further indicated that boys were more wasted than girls in the study town as shown in table 7.



The normal distribution curve figure 2, shows that the distribution of wasting /malnutrition is skewed to the left, compared to the WHO Standard. The reason is that the surveyed children have higher wasting/malnutrition level than the reference population. The results further indicated that the mean of -0.88 and standard deviations of ± 1.00 .

Figure 2: Observed distribution of wasting by WHZ in Abala town, 2021

Prevalence of Wasting based on MAUC

A further analysis of malnutrition by Mid Upper hand Circumference (MUAC) <125 mm and /or oedema indicated a GAM of 10.1 % (8.1 - 12.5 95% C.I.), and Severe MUAC <115 mm and/or oedema was 1.8 % (1.1 - 3.1 95% C.I.) in the study town. The overall results of boys and girls children were almost equally malnourished with boys 10.5 % (7.8 -14.0 95% C.I) and 9.6 % (6.9 - 13.2 95% C.I) for girls.

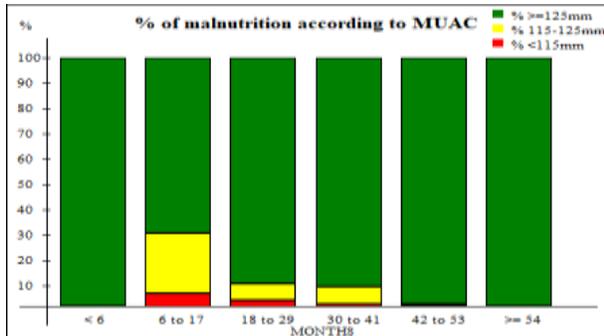


Figure 3 shows that the distribution of Wasting/ Malnutrition by MUAC measurement (MUAC<125mm). The findings indicated that children aged 6-17 months were more wasted/malnourished compared to other age groups in the study town.

Figure 3: Distribution Malnutrition (MUAC) by age group in Abala town, 2021

Prevalence of Underweight (<-2 z-score)

Under-weight is a composite indicator affected by both wasting and stunting. The result shown that the overall prevalence of underweight was 24.3 % (21.3 - 27.6 95% C.I.), with severe cases of 4.2 % (2.9 - 5.9 95% C.I.). The results further found that boys (29.4%) were more underweight than girls (18.7%) in the study town as shown in Figure 5.

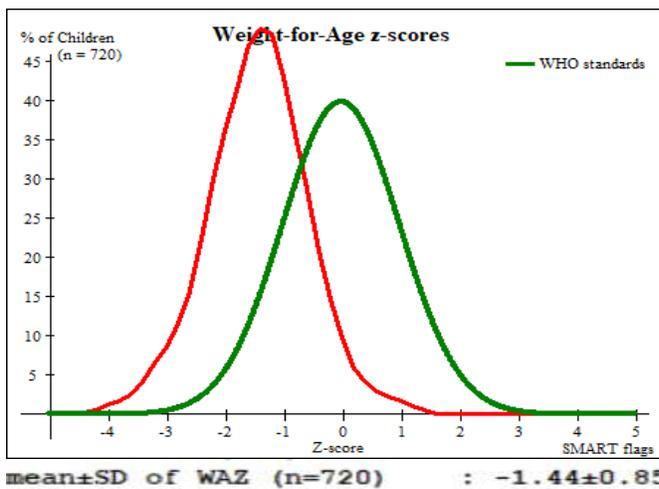


Figure 4, shows, weight for age Z scores for children compared to reference population indicate a negative shift. The mean and standard deviation was -1.44 and ±0.85, respectively.

Figure 4: Observed distribution of underweight by WAZ in Abala town, 2021

Prevalence of Stunting(<-2 z-score)

Stunting is measured by a height-for-age z-score below -2 standard deviations of the World Health Organization (WHO) Child Growth Standards median (WHO 2018). Based on WHO classifications, the current study overall stunting was shown high prevalence level 30.5 % (27.2 - 34.0 95% C.I), with severe stunting cases of 9.4 % (7.5 - 11.8 95% C.I). The results further found that boys (37.6%) were more stunted than girls (22.7%) in the study town as shown in Figure 5.

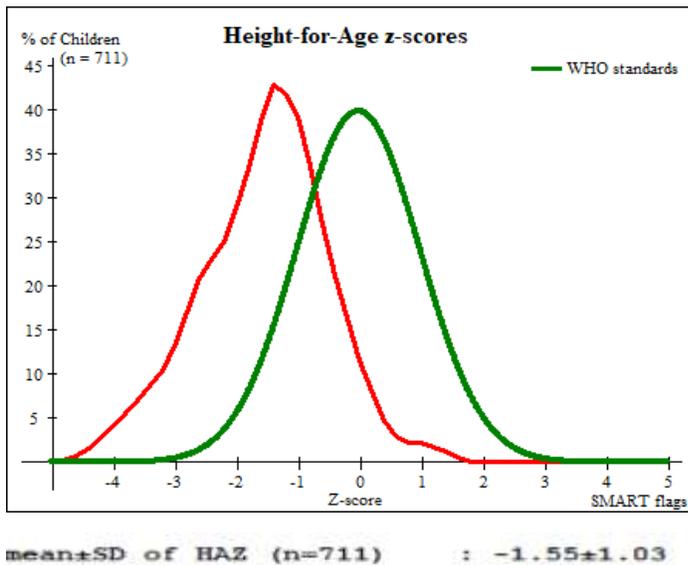


Figure 5 shows, height for age Z-scores for children compared to reference population. The findings indicated that a negative shift with mean and standard deviation was -1.55 and ± 1.03 , respectively.

Figure 5: Observed distribution of stunting by HAZ in Abala town, 2021

3.6.2 Nutritional Status among Children

The analysis of the three anthropometric indices revealed that the overall prevalence of wasting, stunting, and underweight among the children in the study area were 12.1 % (9.9 - 14.7 95% C.I.), 30.5 % (27.2 - 34.0 95% C.I.), and 24.3 % (21.3 - 27.6 95% C.I.), respectively. However, the prevalence of severe wasting, stunting, and underweight among the children were 2.2 % (1.4 - 3.6 95% C.I.), 9.4 % (7.5 - 11.8 95% C.I.), and 4.2 % (2.9 - 5.9 95% C.I.), respectively (Table 8).

Table 7: Nutritional status among under-five children of both mothers in Abala town, Afar Regional State, Northeast Ethiopia, 2021($n=723$)

Anthropometric indices	Categories	All	
		Frequency (n)	Percent (%)
Weight for height (wasting*)	Normal (≥ -2 WHZ score)	632	87.9
	Moderate wasting ($-3 \leq$ WHZ score < -2)	71	9.9
	Severe wasting (< -3 WHZ score)	16	2.2
	Overall wasting (< -2 WHZ score)	87	12.1
Height for age (stunting)	Normal (≥ -2 HAZ score)	494	69.5
	Moderate stunting ($-3 \leq$ HAZ score < -2)	150	21.1
	Severe stunting (< -3 HAZ score)	67	9.4
	Overall stunting (< -2 HAZ score)	217	30.5
Weight for age (underweight)	Normal (≥ -2 WAZ score)	545	75.7
	Moderate underweight ($-3 \leq$ WAZ score < -2)	145	20.1
	Severe underweight (< -3 WAZ score)	30	4.2
	Overall underweight (< -2 WAZ score)	175	24.3

*The prevalence of oedema is 0.0 %

The analysis of the three anthropometric indices by employment status revealed that the overall prevalence of wasting, stunting, and underweight among the children of employed mothers were 11.7 % (95% CI: 8.8%–15.4%), 21.8% (95% CI: 17.8%–26.4%), and 20.4% (95% CI: 16.5%–24.9%), respectively. Similarly, the prevalence of wasting, stunting, and underweight among the children of unemployed mothers were 12.5% (95% CI: 9.5%–16.3%), 39.4% (95% CI: 34.4%–44.6%), and 28.2% (95% CI: 23.8%–33.0%), respectively (Table 9).

Nutritional Status among under-five Children by Sex and Age

Table 3.1 Prevalence of wasting based on weight-for-height z-scores by sex

	All n = 719	Boys n = 377	Girls n = 342
Overall Wasting (<-2 z-score)	(87) 12.1 % (9.9 - 14.7 95% C.I.)	(53) 14.1 % (10.9 - 17.9 95% C.I.)	(34) 9.9 % (7.2 - 13.6 95% C.I.)
Moderate wasting (<-2 z-score and >=-3 z-score)	(71) 9.9 % (7.9 - 12.3 95% C.I.)	(43) 11.4 % (8.6 - 15.0 95% C.I.)	(28) 8.2 % (5.7 - 11.6 95% C.I.)
Severe wasting (<-3 z-score)	(16) 2.2 % (1.4 - 3.6 95% C.I.)	(10) 2.7 % (1.4 - 4.8 95% C.I.)	(6) 1.8 % (0.8 - 3.8 95% C.I.)

The prevalence of oedema is 0.0 %

Table 3.3: Prevalence of wasting based on weight-for-height z-scores by age

Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (>= -2 z score)	
		No.	%	No.	%	No.	%
6-17	139	5	3.6	19	13.7	115	82.7
18-29	216	5	2.3	15	6.9	196	90.7
30-41	160	4	2.5	12	7.5	144	90.0
42-53	142	0	0.0	16	11.3	126	88.7
54-59	62	2	3.2	9	14.5	51	82.3
Total	719	16	2.2	71	9.9	632	87.9

Table 3.5: Prevalence of wasting based on MUAC cut off's by sex

	All n = 723	Boys n = 380	Girls n = 343
Overall wasting (< 125 mm)	(73) 10.1 % (8.1 - 12.5 95% C.I.)	(40) 10.5 % (7.8 - 14.0 95% C.I.)	(33) 9.6 % (6.9 - 13.2 95% C.I.)
Moderate wasting (< 125 mm and >= 115 mm)	(60) 8.3 % (6.5 - 10.5 95% C.I.)	(35) 9.2 % (6.7 - 12.5 95% C.I.)	(25) 7.3 % (5.0 - 10.5 95% C.I.)
Severe wasting (< 115 mm)	(13) 1.8 % (1.1 - 3.1 95% C.I.)	(5) 1.3 % (0.6 - 3.0 95% C.I.)	(8) 2.3 % (1.2 - 4.5 95% C.I.)

Table 3.6: Prevalence of Wasting based on MUAC cut off's by age

Age (mo)	Total no.	Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (>= 125 mm)	
		No.	%	No.	%	No.	%
6-17	141	7	5.0	34	24.1	100	70.9
18-29	216	5	2.3	14	6.5	197	91.2
30-41	160	1	0.6	11	6.9	148	92.5
42-53	142	0	0.0	1	0.7	141	99.3
54-59	64	0	0.0	0	0.0	64	100.0
Total	723	13	1.8	60	8.3	650	89.9

Table 3.9: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 720	Boys n = 378	Girls n = 342
Overall underweight (< -2 z-score)	(175) 24.3 % (21.3 - 27.6 95% C.I.)	(111) 29.4 % (25.0 - 34.1 95% C.I.)	(64) 18.7 % (14.9 - 23.2 95% C.I.)
Moderate underweight (< -2 z-score and ≥ -3 z-score)	(145) 20.1 % (17.4 - 23.2 95% C.I.)	(89) 23.5 % (19.5 - 28.1 95% C.I.)	(56) 16.4 % (12.8 - 20.7 95% C.I.)
Severe underweight (< -3 z-score)	(30) 4.2 % (2.9 - 5.9 95% C.I.)	(22) 5.8 % (3.9 - 8.7 95% C.I.)	(8) 2.3 % (1.2 - 4.5 95% C.I.)

Table 3.10: Prevalence of underweight based on weight-for-age z-scores by age

Age (mo)	Total no.	Severe underweight (< -3 z-score)		Moderate underweight (≥ -3 and < -2 z-score)		Normal (≥ -2 z score)	
		No.	%	No.	%	No.	%
6-17	139	13	9.4	41	29.5	85	61.2
18-29	216	6	2.8	45	20.8	165	76.4
30-41	159	6	3.8	31	19.5	122	76.7
42-53	142	3	2.1	21	14.8	118	83.1
54-59	64	2	3.1	7	10.9	55	85.9
Total	720	30	4.2	145	20.1	545	75.7

Table 3.11: Prevalence of stunting based on height-for-age z-scores by sex

	All n = 711	Boys n = 372	Girls n = 339
Overall stunting (<-2 z-score)	(217) 30.5 % (27.2 - 34.0 95% C.I.)	(140) 37.6 % (32.9 - 42.7 95% C.I.)	(77) 22.7 % (18.6 - 27.5 95% C.I.)
Moderate stunting (<-2 z-score and >=-3 z-score)	(150) 21.1 % (18.3 - 24.2 95% C.I.)	(90) 24.2 % (20.1 - 28.8 95% C.I.)	(60) 17.7 % (14.0 - 22.1 95% C.I.)
Severe stunting (<-3 z-score)	(67) 9.4 % (7.5 - 11.8 95% C.I.)	(50) 13.4 % (10.3 - 17.3 95% C.I.)	(17) 5.0 % (3.2 - 7.9 95% C.I.)

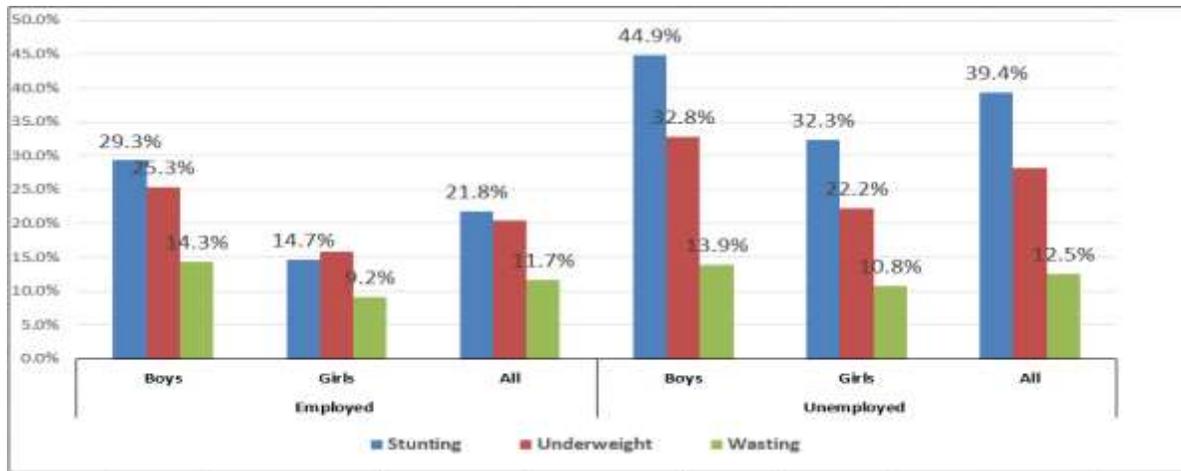
Table 3.12: Prevalence of stunting based on height-for-age z-scores by age

Age (mo)	Total no.	Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (>= -2 z score)	
		No.	%	No.	%	No.	%
6-17	137	19	13.9	33	24.1	85	62.0
18-29	211	20	9.5	58	27.5	133	63.0
30-41	157	20	12.7	30	19.1	107	68.2
42-53	142	5	3.5	20	14.1	117	82.4
54-59	64	3	4.7	9	14.1	52	81.3
Total	711	67	9.4	150	21.1	494	69.5

Table 8: Nutritional status among under-five children by employment status of mother's in Abala town, Afar Regional State, Northeast Ethiopia, 2021($n=723$)

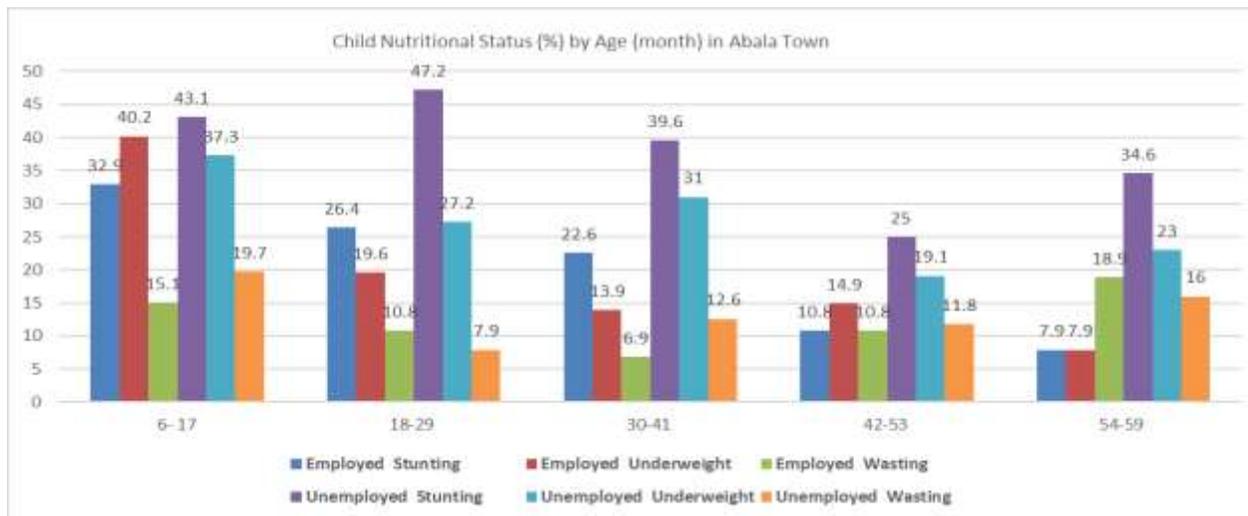
Anthropometric indices	Categories	Employed mother		Unemployed mother	
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Weight for height (wasting*)	Normal (≥ -2 WHZ score)	317	88.3	315	87.5
	Moderate wasting ($-3 \leq$ WHZ score < -2)	34	9.5	37	10.3
	Severe wasting (< -3 WHZ score)	8	2.2	8	2.2
	Overall wasting (< -2 WHZ score)	42	11.7	45	12.5
Height for age (stunting)	Normal (≥ -2 HAZ score)	280	78.2	214	60.6
	Moderate stunting ($-3 \leq$ HAZ score < -2)	58	16.2	92	26.1
	Severe stunting (< -3 HAZ score)	20	5.6	47	13.3
	Overall stunting (< -2 HAZ score)	78	21.8	139	39.4
Weight for age (underweight)	Normal (≥ -2 WAZ score)	285	79.6	260	71.8
	Moderate underweight ($-3 \leq$ WAZ score < -2)	62	17.3	83	22.9
	Severe underweight (< -3 WAZ score)	11	3.1	19	5.2
	Overall underweight (< -2 WAZ score)	73	20.4	102	28.2

*The prevalence of oedema is 0.0 %



The results revealed that the boys (44.9%) and girls(32.3%) of unemployed mothers were more stunted than children of employed mothers . Similarly, the results revealed that the boys (32.8%) and girls(22%.2) of unemployed mothers were more underweight than the children of employed mothers (Figure 6).

Figure 6: Nutritional status by sex among under-five children in Abala town, Afar Regional State, Northeast Ethiopia, 2021 ($n = 723$)



Stunting rates were highest between the age group 6-29 months aged in youger children of unemployed mothers compared to employed mothers children in the same age groups in the study town (figure 7).

Figure 7: Nutritional status by age group (months) among under-five children in Abala town, Afar Regional State, Northeast Ethiopia, 2021 ($n = 723$)

3.6.2 Comparison of Children Nutritional Status by Employment Status

The Independent Samples T-test was applied to determine and check any statistically significant difference between the employed and unemployed mothers' children on their nutritional status as measured prevalence of wasting, stunting and underweight (Table 10).

The result showed that there is no statistically significant difference at (p-value = 0.831) between the employed and unemployed mothers' children on the prevalence of wasting, and it can be interpreted as both mothers' children equally wasted in the study town.

The result showed that there is statistically significant difference at (p-value = 0.000) between the employed and unemployed mothers' children on the prevalence of stunting, and it can be interpreted as both mothers' children differ on stunting status. The unemployed mothers' children higher by 17.6% than that of employed mothers' children on stunting in the study town.

The prevalence result showed that there is statistically significant difference at (p-value = 0.016) between the employed and unemployed mothers' children on the prevalence of stunting, and it can be interpreted as both mothers' children differ on underweight status in the study town. This result indicates that unemployed mothers' children higher by 7.8% than employed mothers' children on underweight in the study town (Table 10).

Table 9: Comparison of children nutritional status by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021 (Independent Samples Test)

Nutritional Status (U5 Children)	Employment Status	The study prevalence results in Abala				t-test for Equality of Means						
		Prevalence (p)	95% CI		Prevalence p1-p2	Pooled Std Error	t (t-value)	P Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
			lower	upper							Lower	Upper
Height for age (stunting)	Employed mother	21.8%	17.8%	26.4%	17.6%	3.4%	4.925	0.000*	0.16515	0.03353	0.09932	0.23098
	Unemployed mother	39.4%	34.4%	44.6%								
Weight for height (wasting)	Employed mother	11.7%	8.8%	15.4%	0.8%	2.4%	0.213	0.831	0.00522	0.02448	-0.04284	0.05328
	Unemployed mother	12.5%	9.5%	16.3%								
Weight for age (underweight)	Employed mother	20.4%	16.5%	24.9%	7.8%	3.2%	2.412	0.016 *	0.07678	0.03184	0.01428	0.13929
	Unemployed mother	28.2%	23.8%	33.0%								

* T-test is significant at P < 0.05 level

3.7 Factors Associated with Nutritional Status of Children

3.6.1. Factors Associated with Wasting

Among the variables entered into bivariate logistic regression analysis showed that mothers occupation status and Religion background of mothers, child vaccination status were associated with wasting at $p < 0.05$.

3.6.2. Factors Associated with Stunting

The bivariate logistic regression analysis showed that variables such as employment status of mother, sex and age of child, mothers' ethnicity, Religion, marital status and education status of mothers, child caring and feeding practices, dietary diversity (food groups), family income were significantly associated with the outcome variables (stunting) at $p < 0.05$.

The final multivariable logistic regression model analysis showed that employment status and socio-demographics of mother were a predictor variable assessed whether they had associated with child stunting or not. After adjustment was done in logistic regression, mothers' educational status was associated with stunting and the odds of those children from unemployed mothers who did not attend school was 62% times more likely to be stunted than those mothers who attended education level at $p = 0.00$ [AOR = 0.38, 95% CI (0.23-0.64)]. Regarding the demographic variables of children, the result showed that male sex children of unemployed mothers were 48% times less likely to be stunted than those female sex children at $p = 0.00$ [AOR = 0.52, 95% CI (0.34-1.72)].

Table 10: Logistic regression analysis of factors associated with stunting among under-five children by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021 (*n*= 723)

Variables	Categories	Nutritional Status -Stunting			
		Yes (%)	No (%)	COR (95% CI)	AOR (95% CI)
Mother's employment status	Unemployed	139 (39.4)	214 (60.6)	0.81 (0.48-1.63)	2.24 (1.61-3.10)
	Employed	78 (21.8)	280 (78.2%)	1	1
Child's sex	Male	140 (37.6)	232 (62.4)	1.92 (1.37-2.68)	0.52 (0.34-1.72)
	Female	77 (22.7)	262 (77.3)	1	1
Child age in months	6-17	52 (38.0)	85 (62.0)	0.37(0.21-0.66)	1.28 (0.75-2.19)
	18-29	78 (37.0)	133 (63.0)	0.49(0.30-0.75)	0.92 (0.48-1.76)
	30-41	50 (31.8)	107 (68.2)	0.34(0.19-0.61)	1.45 (0.81-2.61)
	42-53	25 (17.6)	117 (82.4)	1	1
	54-59	12 (18.8)	52 (81.2)	0.54(0.33-0.90)	2.20(1.57-3.08)
Mothers' education	No education	126 (38.4)	202 (61.6)	2.11(1.53-2.92)	0.38(0.23-0.64)
	Educated	90 (22.8)	305 (77.2)	1	1
Child immunization	No	427 (84.2)	80 (15.8)	0.43 (0.28-0.65)	2.34 (1.53-3.58)
	Yes	164 (75.9)	52 (24.1)	1	1
Diarrhoea in the last two weeks	Yes	169 (78.2)	47 (21.8)	1.51 (1.01-2.26)	1.69 (1.12-2.53)
	No	388 (76.5)	119 (23.5)	1	1

*Significant at $p < 0.05$; COR=crude odd ratio; AOR=adjusted odd ratio; CI=confidence interval

3.6.3. Factors Associated with Underweight

The bivariate logistic regression analysis showed that variables such as employment status of mother, sex and age of child and mothers' and dietary diversity, family income and religion background were associated with underweight at p -value < 0.05 . In the final multivariate logistic analysis model, the employment status of mother and demographic factors of children were assessed whether they had association with underweight or not, where the result showed that the odds of unemployed mothers (caring practices-diversified food groups) were 2.6 times higher underweight than children of employed mothers at p -value of 0.000 [AOR=2.65, 95% CI (1.61- 4.39)] than those who did not. Regarding the socio demographic factors of children, the result showed that male sex children were 1.78 times more likely to be underweight than

those of female sex children at $p=0.001$ [AOR=1.78, 95% CI (1.25-2.53)]. Regarding mother's education, the result shows that children with no educated mothers were 3.1 times higher be to underweighted than children of employed mother.

Considering the age of children, the result shows that children in the age range between 6-29 months were 1.3 times higher likely to be underweighted than those children aged between 54-59 months at $p=0.000$ [AOR=1.228, 95% CI (0.646-2.335)].

Table 11: Logistic regression analysis of factors associated with underweight among under-five children by employment status in Abala town, Afar Regional State, Northeast Ethiopia, 2021 ($n= 723$)

Variables	Categories	Nutritional Status-Underweight			
		Yes (%)	No (%)	COR (95% CI)	AOR (95% CI)
Mother's employment status	Unemployed	102 (28.2)	260 (71.8)	0.74 (0.65-0.92)	1.35 (0.84-2.12)
	Employed	74 (20.5)	287 (79.5%)	1	1
Child's sex	Male	140 (37.6)	232 (62.4)	0.56 (0.39-0.80)	1.78 (1.25-2.53)
	Female	77 (22.7)	262 (77.3)	1	1
Mothers' education	Not educated	62(43.1)	82 (56.9)	0.32 (0.21-0.47)	3.10(2.09-4.58)
	Education	114 (19.7)	465 (80.3)	1	1
Dietary diversity (Food Groups)	<4	133 (29.8)	314 (70.2)	0.37(0.23-0.62)	2.65(1.61-4.39)
	≥ 4	43 (15.6)	233 (84.4)	1	1

*Significant at $p<0.05$; COR=crude odd ratio; AOR=adjusted odd ratio; CI=confidence interval

4.0. Discussions

Nutritional status in childhood is a key predictor of an individual's well-being and health. Inadequate nutrition in childhood has irreversible consequences on human body growth such as low height for age [1]. Child malnutrition continues to be a major public health problem in developing countries including Ethiopia. Children are most vulnerable to malnutrition because of low dietary intakes, infectious diseases, lack of appropriate care, and inequitable distribution of food within the household in developing countries [37, 38]. Therefore, the current study aimed to assess the nutritional status (wasting, stunting, and underweight) and associated factors among under-five children of employed & unemployed mothers in Abala town of Afar Regional State, Northeast Ethiopia.

In this study the analysis of the three anthropometric indices revealed that the overall prevalence of wasting, stunting, and underweight among the children of both employed and unemployed mothers were 12.1 % (9.9 - 14.7 95% C.I.), 30.5 % (27.2 - 34.0 95% C.I.), and 24.3 % (21.3 - 27.6 95% C.I.), respectively. Similarly, the prevalence of severe wasting, stunting, and underweight among the children of unemployed mothers were 12.5% (95% CI: 9.5%–16.3%), 39.4% (95% CI: 34.4%–44.6%), and 28.2% (95% CI: 23.8%–33.0%), respectively in the study town, which were found to be high according to WHO classification [33]. Regarding the associated factors with nutritional status of under-five children, analysis of this study indicated child caring practices mothers' education status, religion and marital status of mothers were significantly associated with wasting. Furthermore, sex of child, age of child and child immunization status were the independent predictors for stunting and underweight. According to this finding, mother's education, age and sex of child and caring practices were significantly associated with stunting and underweight in the study town.

In this study, the prevalence of stunting (39.4%) was slightly lower than the national figure, 44.4% [22]. But it was much higher than other studies done in Ethiopia like Somali region, 22.9% [31], Dollo Ado district, 34.4% [26], Gumbrit district, 24.0% [42], and other countries including Kenya, 28.9% [43], Sudan, 24.9% [44], and Mongolia [45]. It was also lower than the regional figure, 50.2% [22], Libokemekem, Ethiopia, 49.4% [46], and India, 74.2% [47]. Stunting showed a failure to get adequate food over long period and affected through infections.

Despite little improvements from 2016 EDHS report, the current prevalence of stunting is still a public health problem of the area. The possible explanation for this difference in prevalence could be due to a difference in the socioeconomic, agricultural productivity, food insecurity at household level, and geographic hardship nature of the population including complex natural disasters occurrence from year-to-year as well as conflict crisis in both town and rural areas of Afar Region. An additional explanation for this could also be due to a difference in cultural, religion background and child feeding habits, study setting, and periods of the study.

4.2. Strengths and Limitation of the Study

4.2.1. Strength of the Study

- ❖ The study applied a quantitative method with modified EDHS variables and other relevant literatures based on the study objectives for validity of the findings.
- ❖ This study used double population sampling size which increases validity of the findings.
- ❖ The study employed random sampling method, which was representative.

4.2.2. Limitation of the Study

- ❖ As the study involved a cross-sectional design, causal inference might not be strong between the dependent and independent variables.
- ❖ There might also be the possibility of recall and reporting bias in some infant and young child feeding practices, such as breastfeeding patterns, dietary diversity (food groups) and child's history of illness events happening in the past; and recall bias in some conducting anthropometric assessments.

5. Conclusions and Recommendations

5.1. Conclusions

The current study revealed that the nutritional status of under-five children as measuring prevalence of wasting, stunting, and underweight were about 12.1% (95% CI: 9.9–14.7%), 30.5% (95% CI: 27.2–34.0%), and 24.3% (95% CI: 21.3–27.6%), respectively from both employed and unemployed mothers in the study town areas. Similarly, the analysis of the nutritional status indicators by mothers' employment status revealed that the prevalence of wasting, stunting, and underweight among children of employed and unemployed mothers were about 11.7 % (95% CI: 8.8%–15.4%), 21.8% (95% CI: 17.8%–26.4%), and 20.4% (95% CI: 16.5%–24.9%); and 12.5% (95% CI: 9.5%–16.3%), 39.4% (95% CI: 34.4%–44.6%), and 28.2% (95% CI: 23.8%–33.0%), respectively in the study town. The results from both mothers indicated the prevalence of child malnutrition (wasting, stunting, and underweight) were classified as a serious nutritional status and public health problem in the town areas of agro-pastoral community according to the WHO classification for public health significance. Children from unemployed mothers had significantly higher in stunting (HAZ < -2 z-score) and underweight (WAZ < -2 z-score) than employed mothers in the study town. However, under-five children from both employed and unemployed mothers were equally malnourished in wasting level (WHZ < -2 z-score). This could be due to mothers' constraints related to child caring, family income and inconvenient working area for child feeding practices, and inadequate food intake, such as dietary diversity (food groups) and meal frequency per a day were considered as contributing factors for the higher prevalence and serious nutritional status in the study area.

Sex and age of children, dietary diversity (food groups), meal frequency, mother education status, religion, type of toilet facility, and treatment of drinking water were significantly associated with the nutritional status of under-five children for increasing stunting and underweight in the study town.

5.2. Recommendations

Key Recommendations	Whom (Responsible)
<ol style="list-style-type: none"> 1. Strengthen the health system and increase quality care of nutrition services in the study town to address child morbidity and malnutrition. 2. Advocacy for social SafetyNet program targeting children 6-29 months for food fortification support and household cash support for the most vulnerable mothers with children in the study town. 3. Improve knowledge of mothers on child malnutrition and IYCF-E practices, and improve nutrition-sensitivity interventions in the study area. 4. Ensuring nutrition program- Link with food security and WASH programs to ensure increased access by vulnerable population group and families. 5. Conduct further research on nutrition status of under-five children in the present study town and rural areas of Abala district. 	

6. REFERENCES

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7. Annex: Questionnaire

Annex I: Participant Information Sheet

Title of the Research project: To assess the Effect of Maternal Employment Status on the Nutritional Status and Caring Practices among Children 6-59 months in Abala Town, Afar Region, Northeast Ethiopia, 2021.

Principal Investigator: Kedir Mohammed (MPH)

Advisors:

Department of Scientific Nutrition, Faculty of Natural Health Sciences, Selinus University

Introduction: My name is **KEDIR MOHAMMED** I am here on behalf of **Graduate Ph.D Program** student of Selinus University, Department of Scientific Nutrition. He is conducting research on for the partial fulfillment of Ph.D. degree in Scientific Nutrition, Selinus University. He received permission from Selinus University Department of Scientific Nutrition and the Regional Health Bureau administrators to conduct this study. You are selected by the random sampling method to participate in this study. Your participation is purely based on your willingness. You have the right to choose not to take part in this study. If you choose to take part, you have the right to stop at any time. If you are willing to participate or refuse or decide to withdraw later, you will not be subjected to any ill-treatment. If you agree to participate in the study, you will be asked to answer some questions about yourself, your parents, your household and your dietary practice. The interview with you will take about 45 minutes. The study will help you to practice the recommended diversified dietary foods & food frequency for proper nutritional status of your body. It can also provide base line data for policy makers and other researchers for further improvements on nutritional status.

Purpose: this study will benefit baseline information and reference data on the effect of maternal employment status on nutritional status of children (6-59 months aged), Child-caring practices and its factors associated of stunting, thinness, and underweight, among children for policy makers, stake holders, & health care providers in order to plan prevention strategies for both under and over nutrition simultaneously.

Procedures & Participation: you will be asked about your child's health and nutrition information and demographic related questions and also you will measure your weight, height & MUAC. You have to know that your participation is largely based on your willingness and approval.

Confidentiality: Information will be kept in a secure place. It will only be used for the purpose of the study and you will not be personally identified in the study report. For this purpose, the data will be secured strictly without your name and detail identification.

Benefits: You have the right to know the findings of the study. Furthermore, you will be given advice and nutrition education after study.

Risk: There is no physical or psychological risk expected being involved in the study.

Results Dissemination: The results of the study will be shared to Selinus University college of Health science, Afar National Regional Health Bureau, Abala District Health Office.

Freedom to withdraw: You have the right to say “no” and not participate in the study. You will not be punished if you decide not to participate. If you wish to withdraw from this study, you can do so at any time without penalty.

Questions: You can ask any question about this study.

If you want more information and check about this project you can contact the following people Selinus University, College of Natural Health Sciences IRB Office Tel: xxxxxxxxxxxxxxx

Principal Investigator Name and Address: Kedir Mohammed Mobile: 09 21 03 87 74;

Advisor’s: ----- and Address: Selinus University

Annex II: Informed Consent Form

Title of the Research Project: To assess the Effect of Maternal Employment Status on the Nutritional Status and Caring Practices among Children 6-59 months in Abala Town, Afar Region, Northeast Ethiopia, 2021.

I have been well aware of that this research undertaking is for a partial fulfillment of Ph.D. degree by Research which is fully supported and coordinated by the Department of Scientific Nutrition, College of Natural Health Sciences, Department of Scientific Nutrition and the designate principal investigator is **Kedir Mohammed**. I have been fully informed in the language I understand about the research project objectives that are to understand my nutritional status, child-caring practices & associated factors.

I have been informed that all the information I shall provide to the interviewer will be kept confidential. I understood that the research has no any risk and no composition. I also knew that I have the right to withhold information, skip questions to answer or to withdraw from the study any time I have acquainted nobody will impose me to explain the reason of withdrawal. There

would have no effect at all in my health benefit or other administrative effect that I get from the refuge. I have assured that the right to ask information that is not clear about the research before and or during the research work and to contact

Selinus University, Faculty of Natural Health Sciences, Office Tel: xxxxxxxxxxxxxxxx

Principal Investigator Name and Address: **Kedir Mohammed**, Samara-Ethiopia;

Mobile: 09 21 03 87 74;

Advisor's Name _____ and Address: Selinus University

I have read this form, or it has been read to me in the language I comprehend and understood the condition stated above, therefore, I am willing and confirm my participation by signing the consent.

Agreed to participate in the study: Yes /No

Signature ___ Date _____ Thank you for your willingness to participate in this study.

Annex: Questionnaire

Annex III: English Version of the Questionnaire

Instruction: First tell interviewee that you are going to ask him/ her question about himself/herself and his/her family, and finally you are going to measure the child's weight and height. Then, request him/her to correctly respond to the questions.

001. Questionnaire identification number _____

002. Date of interview (dd/mm/yyyy) _____

003. Interviewer name _____

004. Kebele's/Village number _____

005. House number _____

006. **Result of interview:** 1. Completed 2. Partially completed 3. Refused 4. Respondent not available

Checked by supervisor;

Name _____, Signature _____ Date _____

No	Question	Response	Remark
007	How many members are present in the HH now (Family size)	In number _____	
008	Number of under five children in the HH	In number _____	
100	Mothers' employment status	1. Employed 2. Unemployed	

PART I- SOCIO-DEMOGRAPHIC VARIABLES

No	Questions	Responses and Codes	Skip to
101	Who is the head of the Household (HH)?	1. Male 2. Female	
102	Age of the mother (in year)	____ years	
103	What is the mother's Ethnicity?	1. Afar 2. Tigray 3. Amhara 4. Oromo 98. Other, specify -----	
104	What is the Religious of family/mother?	1. Muslim 2. Orthodox 3. Protestant 98. Other, specify -----	

105	What is the marital status of the mother?	1. Married 2. Divorced 3. Widowed 98. Other, specify-----	
106	What is the educational status of the mother?	1. Cannot read and write 2. Can read and write 3. Primary education (1-8 Grade) 4. Secondary education (9-12 Grade) 5. College and above	
110	What is your household total monthly income?	_____ ETB	
111	Does your household have own livestock?	1. Yes 2. No	
111a	Does your household have own land?	2. Yes 2. No	
112	What is the ownership of your house?	1. Owned 2. Rented 3. Dependent 98. Other, specify -----	
113	Does your household have Electricity?	1. Yes 2. No	
114	While you are at home, what do you do in your leisure time?	1. Watch TV/ Listen radio 2. Reading 3. Hand work 4. Preparing/cooking food 5. Care for my child 6. Nothing 98. Other, specify -----	More than one possible answer
	Maternal employment related factor information (For worked mothers only)		
105	What is the main occupation?	1. Government employee 2. Merchant/Trader 3. Daily laborer 98. Other, specify -----	
116	How many hours do you work per day?	_____ hours	
117	How many days you work per a week?	_____ days	
118	How much hour needed to reach your work area?	Distance in hour _____	
119	Who usually takes care of your child while you are at work (outside home)?	1. Grandmother/family caregiver 2. Older siblings/servant 3. Leaves with Neighbour 4. Takes with me to work area 98. Other, specify -----	
120	Is your work area convenient for breast feeding and complementary feeding?	1. Yes 2. No	
121	How do you mainly get earnings? (For unemployed mother)	1. From husband 2. From relatives 3. Help from others, specify ----	

122	How many hours do you spent with child per day? (For both mothers)	----- hours	
PART II: CHILD CHARACTERISTICS AND CARING PRACTICES			
201	What is the sex of the child?	1. Male 2. Female	
202	What is the age of the child in month?	_____ month	
202A	Birth order	_____	
203	Where is the place of delivery of the child?	1. Home 2. Health facility 98. Other, specify	
204	Who assisted you at delivery of the child?	1. Health professional 2. Traditional birth attendant 3. Relatives/ Neighbor 98. Other, specify -----	
205	Does the child ever been immunized?	1. Yes 2. No	
206	If the answer for question no. 205 Yes, what type of vaccination the child-take? (From card or mother recall)	1. BCG only (see scar) 2. DPT (no. of dose-----) 3. Measles 4. Rota	
208	Has the child had diarrhea in the last two weeks?	1. Yes 2. No 99. Don't know	
209	If the answer for question no. 208 Yes, did you seek advice/treatment for the diarrhea?	1. Yes 2. No	
210	If the answer for question no. 209 Yes, where did you seek advice/treatment?	1. Public health facility 2. Private medical sector 3. Traditional practitioner	
211	Has the child been ill with fever at any time in the last two weeks?	1. Yes 2. No 99. Don't know	
212	If the answer for question no. 211 Yes, did you seek advice/treatment for the fever?	1. Yes 2. No	
213	If the answer for question no. 212 Yes, where did you seek advice/treatment?	1. Public health facility 2. Private medical sector 3. Traditional practitioner	
214	Has the child been ill with cough at any time in the last two weeks?	1. Yes 2. No 99. Don't know	

215	If the answer for question no 214 Yes, during a cough, did the child breathe faster than usual with short, fast breaths?	1. Yes 2. No 99. Don't know					
215	If the answer for question no. 215 Yes, did you seek advice or treatment for the cough?	1. Yes 2. No					
216	If Yes for question no 215, where did you seek advice/treatment?	1. Public health facility 2. Private medical sector 3. Traditional practitioner					
301	Did you ever breastfed the child?	1. Yes 2. No	If No, skip to 303				
302	How long after birth did mother start breastfeeding the child for the first time?	1. Immediately 2. within one hour 3. ____ Hours later 4. ____ Days later 99. Don't know/ Do not remember					
303	Did you give the child food/fluid immediately after birth before breast?	1. Yes 2. No	If no, skip to				
304	If yes, what did you gave him /her	1. Water 2. Butter 3. Milk 98. Other, specify -----					
305	Did you squeeze out and throw the first milk?	1. Yes 2. No					
306	Are you still breastfeeding?	1. Yes 2. No					
307	How many times a day did you breastfed?	____ Times					
308	Do you breastfeed in the night?	1. Yes 2. No					
309	For how many months did you exclusively breastfed the child?	____ months 99. Don't know/ Do not remember					
310	At what age did you start feeding other additional food?	____ months 1. <6 months 2. At 6 months 3. >=6 months					
311	What do you use to feed the child?	1. Bottle 2. Hand 3. Cup 4. spoon 98. Other, specify -----					
312	How do you usually prepare food for children under five of aged?	1. Together with adult food 2. Separately for them					
313a	What kinds of dietary diversity (food groups) do you give to your child? Please tell us the child has taken by recalling in the past 24 hour).	Food diversity/Food group in the past 24 hour taken <table border="1" style="margin-left: 20px;"> <tr> <td style="width: 10%;"></td> <td style="width: 40%;">Food Groups</td> <td style="width: 10%;">Yes/ 1</td> <td style="width: 10%;">No/ 2</td> </tr> </table>		Food Groups	Yes/ 1	No/ 2	More than one answer is possible
	Food Groups	Yes/ 1	No/ 2				

		1	Grains, roots and tubers			
		2	Legumes and nuts			
		3	Dairy products (milk, yogurt)			
		4	Flesh food (meat, fish)			
		5	Eggs			
		6	Vitamin A- rich fruits and vegetables			
		7	Other fruits and vegetables			
313	How many times a day does the child eat food on an average?	Meal frequency in a day ____				
		1. Once				
		2. 2 times				
		3. 3 times				
		4. 4 times and above				
		5. Any time as child needed				
314	Who is usually taking care of the baby and feeding?	1. Mother				
		2. Sister/brother				
		3. Grand mother				
		98. Other, specify -----				
315	During the illness, has the child feeding practice changed?	1. Yes 2. No				If no, skip to 317
316	How could the practice change?	1. Preventing from breastfeeding				
		2. Frequently breastfeeding				
		3. Preventing from giving food				
		4. Providing additional food				
		98. Other, specify -----				
317	How did you usually treat your child when get sick?	1. Health institution				
		2. Home treatment				
		3. Traditional healer				
		98. Other, specify -----				
PART FOUR: MATERNAL CHARACTERSTICS						
402	Total number of children ever born?	_____ in number				
403	Did you consume extra food during pregnancy/lactation? (the child under the study)	1. Yes 2. No				
404	Has mother ever visited health facility for ANC during pregnancy of this child (child under the study)?	1. Yes 2. No				If no, skip
405	How many times you visited health facility for ANC during the pregnancy?	1. One times				
		2. Two times				
		3. Three times				
		4. Four times and above				
		99. Don't know				

406	Did you ever use family planning service?	1. Yes 2. No	
PART FIVE: ENVIRONMENTAL CONDITIONS			
501	What is your main source of drinking water?	1. Household piped water 2. Public tap 3. Unprotected well 4. River and unprotected spring 98. Other, specify -----	
501a	Do you treat water before drinking?	1. Yes 2. No	
501b	How do you treat drinking water before giving it to child to drink?	1. Boiling 2. Water guard 3. Use filter 98. Other, specify -----	
503	Do you have latrine?	1. Yes 2. No	If no skip to
504	What kind of toilet facility does your household use? (Observation)	1. Traditional pit latrine 2. Ventilated improved pit latrine (VIP) 3. Water carriage system 4. 98. Other, specify -----	
505	How do you dispose garbage?	1. In a pit 2. Open field 3. Municipality service 98. Other, specify -----	
506	When do you usually wash your hands?	1. After latrine use 2. Before preparing food 3. Before serving food 4. Before feeding the child 98. Other, specify -----	More than one answer is possible
507	How do you wash your hand? (mother's hand washing practices)	1. Using water only 2. Sometimes use of soap 3. Rarely use of soap 4. Use of soap always 98. Other, specify -----	
PART SIX: ANTHROPOMETRIC MEASUREMENTS (6–59 MONTHS OLD CHILDREN)			
508	Weight of the child in kilogram (if no bilateral pitting edema) [to the nearest 0.1kg]	----- (kg)	
509	Height of the child in centimeter [to the nearest 0.1cm]	----- (cm)	
600	Presence of bilateral pitting edema	1. Yes 2. No	
601	Child MUAC in millimeter (mm)	_____mm	

Annex IV: Data Check and Overall Quality

Plausibility check for:

ETH_20112021_Kedir_ENA_Thesis_AbalaTown.as

Standard/Reference used for z-score calculation: WHO standards 2006

(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	Score
Flagged data (% of out of range subjects)	Incl	%	0-2.5 0	>2.5-5.0 5	>5.0-7.5 10	>7.5 20	0 (0.6 %)
Overall Sex ratio (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	0 (p=0.169)
Age ratio(6-29 vs 30-59) (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	2 (p=0.064)
Dig pref score - weight	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	0 (6)
Dig pref score - height	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	0 (6)
Dig pref score - MUAC	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	0 (5)
Standard Dev WHZ .	Excl	SD	<1.1 and 0	<1.15 and 5	<1.20 and 10	>=1.20 or 20	0 (1.00)
Skewness WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	0 (0.02)
Kurtosis WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	0 (0.02)
Poisson dist WHZ-2	Excl	p	>0.05 0	>0.01 1	>0.001 3	<=0.001 5	0 (p=)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	2 %

The overall score of this survey is 2 %, this is excellent.

There were no duplicate entries detected.

Annex V: Result Tables for NCHS growth reference 1977

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 720	Boys n = 378	Girls n = 342
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(88) 12.2 % (10.0 - 14.8 95% C.I.)	(53) 14.0 % (10.9 - 17.9 95% C.I.)	(35) 10.2 % (7.5 - 13.9 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=3 z-score, no oedema)	(80) 11.1 % (9.0 - 13.6 95% C.I.)	(48) 12.7 % (9.7 - 16.4 95% C.I.)	(32) 9.4 % (6.7 - 12.9 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(8) 1.1 % (0.6 - 2.2 95% C.I.)	(5) 1.3 % (0.6 - 3.1 95% C.I.)	(3) 0.9 % (0.3 - 2.5 95% C.I.)

The prevalence of oedema is 0.0 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (>= -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	139	2	1.4	19	13.7	118	84.9	0	0.0
18-29	216	5	2.3	25	11.6	186	86.1	0	0.0
30-41	160	0	0.0	14	8.8	146	91.3	0	0.0
42-53	142	0	0.0	14	9.9	128	90.1	0	0.0
54-59	63	1	1.6	8	12.7	54	85.7	0	0.0
Total	720	8	1.1	80	11.1	632	87.8	0	0.0

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor. 0 (0.0 %)	Kwashiorkor. 0 (0.0 %)
Oedema absent	Marasmic No. 9 (1.2 %)	Not severely malnourished. 714 (98.8 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 723	Boys n = 380	Girls n = 343
Prevalence of global malnutrition (< 125 mm and/or oedema)	(73) 10.1 % (8.1 - 12.5 95% C.I.)	(40) 10.5 % (7.8 - 14.0 95% C.I.)	(33) 9.6 % (6.9 - 13.2 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(60) 8.3 % (6.5 - 10.5 95% C.I.)	(35) 9.2 % (6.7 - 12.5 95% C.I.)	(25) 7.3 % (5.0 - 10.5 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(13) 1.8 % (1.1 - 3.1 95% C.I.)	(5) 1.3 % (0.6 - 3.0 95% C.I.)	(8) 2.3 % (1.2 - 4.5 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

Age (mo)	Total no.	Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	141	7	5.0	34	24.1	100	70.9	0	0.0
18-29	216	5	2.3	14	6.5	197	91.2	0	0.0
30-41	160	1	0.6	11	6.9	148	92.5	0	0.0
42-53	142	0	0.0	1	0.7	141	99.3	0	0.0
54-59	64	0	0.0	0	0.0	64	100.0	0	0.0
Total	723	13	1.8	60	8.3	650	89.9	0	0.0

Table 3.7: Prevalence of combined GAM and SAM based on WHZ and MUAC cut off's (and/or oedema) and by sex*

	All n = 723	Boys n = 380	Girls n = 343
Prevalence of combined GAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema)	(131) 18.1 % (15.5 - 21.1 95% C.I.)	(76) 20.0 % (16.3 - 24.3 95% C.I.)	(55) 16.0 % (12.5 - 20.3 95% C.I.)
Prevalence of combined SAM (WHZ < -3 and/or MUAC < 115 mm and/or oedema)	(20) 2.8 % (1.8 - 4.2 95% C.I.)	(9) 2.4 % (1.3 - 4.4 95% C.I.)	(11) 3.2 % (1.8 - 5.7 95% C.I.)

*With SMART or WHO flags a missing MUAC/WHZ or not plausible WHZ value is considered as normal when the other value is available

3.8: Detailed numbers for combined GAM and SAM

	GAM		SAM	
	no.	%	no.	%
MUAC	43	5.9	12	1.7
WHZ	58	8.0	7	1.0
Both	30	4.1	1	0.1
Edema	0	0.0	0	0.0
Total	131	18.1	20	2.8

Total population: 723

Table 3.5: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 720
Prevalence of global acute malnutrition (<80% and/or oedema)	(44) 6.1 % (4.6 - 8.1 95% C.I.)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(43) 6.0 % (4.5 - 7.9 95% C.I.)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(1) 0.1 % (0.0 - 0.8 95% C.I.)

Table 3.9: Prevalence of malnutrition by age, based on weight-for-height percentage of the median and oedema

Age (mo)	Total no.	Severe wasting (<70% median)		Moderate wasting (>=70% and <80% median)		Normal (> =80% median)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	139	1	0.7	13	9.4	125	89.9	0	0.0
18-29	216	0	0.0	13	6.0	203	94.0	0	0.0
30-41	160	0	0.0	8	5.0	152	95.0	0	0.0
42-53	142	0	0.0	2	1.4	140	98.6	0	0.0
54-59	63	0	0.0	7	11.1	56	88.9	0	0.0
Total	720	1	0.1	43	6.0	676	93.9	0	0.0

Table 3.9: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 721	Boys n = 379	Girls n = 342
Prevalence of underweight (<-2 z-score)	(233) 32.3 % (29.0 - 35.8 95% C.I.)	(135) 35.6 % (31.0 - 40.6 95% C.I.)	(98) 28.7 % (24.1 - 33.7 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(203) 28.2 % (25.0 - 31.5 95% C.I.)	(114) 30.1 % (25.7 - 34.9 95% C.I.)	(89) 26.0 % (21.7 - 30.9 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(30) 4.2 % (2.9 - 5.9 95% C.I.)	(21) 5.5 % (3.7 - 8.3 95% C.I.)	(9) 2.6 % (1.4 - 4.9 95% C.I.)

Table 3.10: Prevalence of underweight by age, based on weight-for-age z-scores

Age (mo)	Total no.	Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	140	15	10.7	47	33.6	78	55.7	0	0.0
18-29	216	5	2.3	72	33.3	139	64.4	0	0.0
30-41	159	6	3.8	46	28.9	107	67.3	0	0.0
42-53	142	2	1.4	29	20.4	111	78.2	0	0.0
54-59	64	2	3.1	9	14.1	53	82.8	0	0.0
Total	721	30	4.2	203	28.2	488	67.7	0	0.0

Table 3.11: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 714	Boys n = 374	Girls n = 340
Prevalence of stunting (<-2 z-score)	(184) 25.8 % (22.7 - 29.1 95% C.I.)	(116) 31.0 % (26.5 - 35.9 95% C.I.)	(68) 20.0 % (16.1 - 24.6 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(141) 19.7 % (17.0 - 22.8 95% C.I.)	(85) 22.7 % (18.8 - 27.2 95% C.I.)	(56) 16.5 % (12.9 - 20.8 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(43) 6.0 % (4.5 - 8.0 95% C.I.)	(31) 8.3 % (5.9 - 11.5 95% C.I.)	(12) 3.5 % (2.0 - 6.1 95% C.I.)

Table 3.12: Prevalence of stunting by age based on height-for-age z-scores

Age (mo)	Total no.	Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (>= -2 z score)	
		No.	%	No.	%	No.	%
6-17	140	14	10.0	35	25.0	91	65.0
18-29	211	15	7.1	46	21.8	150	71.1
30-41	157	8	5.1	33	21.0	116	73.9
42-53	142	3	2.1	19	13.4	120	84.5
54-59	64	3	4.7	8	12.5	53	82.8
Total	714	43	6.0	141	19.7	530	74.2

Table 3.13: Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

	All n = 720	Boys n = 378	Girls n = 342
Prevalence of overweight (WHZ > 2)	(0) 0.0 % (0.0 - 0.5 95% C.I.)	(0) 0.0 % (0.0 - 1.0 95% C.I.)	(0) 0.0 % (0.0 - 1.1 95% C.I.)
Prevalence of severe overweight (WHZ > 3)	(0) 0.0 % (0.0 - 0.5 95% C.I.)	(0) 0.0 % (0.0 - 1.0 95% C.I.)	(0) 0.0 % (0.0 - 1.1 95% C.I.)

Table 3.14: Prevalence of overweight by age, based on weight for height (no oedema)

Age (mo)	Total no.	Overweight (WHZ > 2)		Severe Overweight (WHZ > 3)	
		No.	%	No.	%
6-17	139	0	0.0	0	0.0
18-29	216	0	0.0	0	0.0
30-41	160	0	0.0	0	0.0
42-53	142	0	0.0	0	0.0
54-59	63	0	0.0	0	0.0
Total	720	0	0.0	0	0.0

Table 3.15: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	720	-1.06±0.85	1.00	0	3
Weight-for-Age	721	-1.66±0.79	1.00	0	2
Height-for-Age	714	-1.34±1.00	1.00	0	9

* contains for WHZ and WAZ the children with edema.

