COLLEGE OF DEVELOPMENT STUDIES CENTER FOR FOOD SECURITY STUDIES

FOOD SECURITY AND MALNUTRITION AMONG CHILDREN WITH SELECTED CHRONIC ILLNESS ON FOLLOW UP AT ST. PAUL'S HOSPITAL, ETHIOPIA: A CROSS-SECTIONAL STUDY."

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A RESEARCH THESIS TO THE CENTER FOR FOOD SECURITY STUDIES COLLEGE OF DEVELOPMENTAL STUDIES ADDIS ABABA UNIVERSITY, IN FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN DEVELOPMENTAL AND FOOD SECURITY

JUNE, 2024

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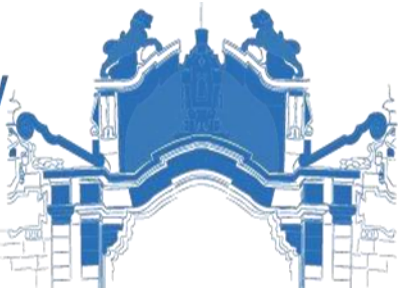

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BY
ABENEZER ADMASU WUBETIA

JUNE, 2024

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Declaration

I honestly declare that this thesis title "***food security and malnutrition among children with selected chronic illness on follow up at St. Paul's hospital, Ethiopia: a cross-sectional study."*** has been carried out by meunder the guidance and supervision of doctor Abebe Haile (PhD). My thesis is original and has notbeen submitted for the award of any degree and other university or organization. I also declare that no chapter of this thesis in the whole or part incorporated in this thesis from any earlier work done by others or myself. All sources of materials used for this thesis have been duly acknowledged. The participant's rights to anonymity and withdrawal from the study without prejudice are considered important ethical considerations in this research.

Researcher's Name	**Signature**	**Date**
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Adviser		
Dr. Abebe Haile (PHD)	_____	_____

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As supervisors/co-advisers of the thesis, we certify that we have read and evaluated the thesis prepared by **ABENEZER ADMASU** Entitled "food security and malnutrition among children with selected chronic illness on follow up at St. Paul's hospital, Ethiopia: a cross-sectional study**."** and recommend for as fulfilling the requirement for the degree of **Master of Science Degree in Food Security and Development Studies.** The candidate has incorporated all the comments of the examiner/s during thesis defense session.

Examiner

1. Dr Bichaye Tesfaye …….…….
Internal Examiner
Signature & Date

2. Mr Challachew Arega ……..…
External Examiner Signature & Date

Final approval and acceptance of this thesis is contingent upon the candidate's submission of the final copy of the thesis, incorporating all the comments by Examining Board, to the Council or Graduate Studies (CGS) through the Centre Academic Committee (CAC) of the Centre.

_____

Chairperson of the Centre or Graduate Program Coordinator

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List of Abbreviation and Acronyms

BMI	Body Mass Index
CHD	Congenital Heart Disease
CKD	Chronic Kidney Disease
DM	Diabetes Mellitus
ESRD	End Stage Renal Disease
G.C	Gregorian Calendar
GFR	Glomerular Filtration Rate
GH	Growth Hormone
HTSDS	Height Standard Deviation Score
RVI	Retroviral Infection
SAM	Severe Acute Malnutrition
SDS	Standard Deviation Score
SPHMMC	Saint Paul's Hospital Millennium Medical College
T1DM	Type 1 Dm
WT	Weight

Abstract

Children living with chronic disease are at risk for food insecurity but evidence about food insecurity status and its predictors is scarce in this group of population, particularly developing countries like Ethiopia. As a result, the objective of this study was to assess the food security of malnutrition among children with chronic disease on follow up at St. Paul Hospital Millenium Medical College. A Cross-sectional study was conducted from Jan 1 to June 1, 2024 G.C. Data were collected when the patients came for follow up from both the patient/ care taker and chart. Anthropometric data at the time of diagnosis and on follow up were taken from the chart and current anthropometry were measured as per the standard protocol. The collected data was analyzed using SPSS 27 and it was subjected to both descriptive and inferential statistics. Accordingly, 332 out of the 414 children with chronic diseases (80.2%) suffer from food insecurity in their respective household. But 319 (77.1%) of them were mild. Only 13 (3.1%) of them suffer from moderate food insecurity. Children with chronic disease who were severely stunted, severely underweight, and severely wasted accounted for 143 (34.5%), 95 (22.9%), and 45 (10.9%) of the participants, respectively. Overall, any kind of stunting, underweight, and wasting was found in 44.9%, 39.8%, and 18.4% of the cases, correspondingly. Though there was no variable significantly associated with food insecurity and malnutrition was higher in children with diabetes (86.5%) and RVI (81.5%). The levels of food insecurity, stunting, underweight, and wasting were higher in children with chronic diseases than the general child population. Therefore, health professionals should be trained to identify food insecurity and malnourishment in under-five children with chronic illnesses and should advise caretakers on nutrition.

Kay word

Malnutrition, Chronic disease, Linear growth, Children

1 Introduction

1.1 Background

Food security refers to the availability, accessibility, and affordability of sufficient and nutritious food for individuals and households. It is an important aspect of ensuring proper nutrition and overall health, especially for children (Akombi et al. 2017). Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients (Puntis 2010) Wasting usually indicates recent and severe weight loss because a person has not had enough food to eat and/ or they have had an infectious disease such as diarrhea which has caused them to lose weight. A young child who is moderately or severely wasted has an increased risk of death, but treatment is possible. Stunting is the result of chronic or recurrent undernutrition usually associated with poor socioeconomic conditions, poor maternal health and nutrition, frequent illness, and/or inappropriate infant and young child feeding and care in early life. Stunting holds children back from reaching their physical and cognitive potential. A child who is underweight can be stunted, wasted or both. Chronic disease adds a layer of complexity when thinking about malnutrition. The underlying disease needs to be considered when thinking about the pathophysiological cause of malnutrition, diagnosis of malnutrition, and the provision of optimal nutrition therapy.

There are several reasons that children with chronic disease are at risk for malnutrition, including increased caloric needs, malabsorption, altered nutrient utilization, and limitations in nutrient provision due to fluid status and/or feeding tolerance. Like other children, children with chronic disease are also at risk for malnutrition secondary to social and economic factors (Larson-Nath and Goday 2019).

Chronic disease adversely affects growth, and the resulting impairment in height may be transient or sustained depending on the nature and course of the illness. Advances in management have altered the natural history of many conditions, reduced morbidity and improved survival. Where long-term remission of the primary disorder can be achieved, the outcome for growth and attainment of normal adult height are good. For children with refractory disease, impaired growth, short stature, delayed puberty and reduced adult height are increasingly highlighted as being problematic both physically and psychologically (Patel 2008). Severe famine in Gode district caused high mortality due to wasting and communicable diseases. Humanitarian response was delayed and inadequate, with low coverage of feeding programs. Measles vaccination campaign should be implemented immediately in all complex

emergencies. Nutrition and mortality data

should be collected and analyzed together during famines. Lack of anthropometric data on adultsresulted in undernutrition not being targeted. Adjusting BMI for body shape is important for accurate assessment. No international agency has a mandate for overseeing surveillance systems in complex emergencies. Structural changes to the humanitarian system are needed to prevent lossof life (Salama 2013). In Ethiopia, childhood malnutrition is a public health problem with 37% of children aged less than 5 years being stunted, 21% underweight and 7% wasted (Ethiopian PublicHealth Institute (EPHI) and ICF. 2019 2019).

1.2 Statement of the problem

The prevalence of chronic conditions is rising in most developed and developing countries (Epping-Jordan et al. 2001). Among children, increased life expectancy due to improvements in nutrition, hygiene and control of infectious diseases are producing an epidemiological transition in which non communicable diseases including chronic diseases and disability are emerging as major health problems occurred in developed countries (Anon et al 1999).

Growth failure is observed in a number of chronic childhood diseases. Long-term inadequate dietary intake leads to growth faltering, which impairs the immune status and increases the risk of disease; it can also lead to deficiencies in micronutrients (Kyle, et al 2015). Children are considered to have stunting if they have low height for age, have wasting if weight is low for height, and be underweight if they have low weight for age (McDonald et al. 2013). Traditionally, stunting is considered a marker of chronic undernutrition and wasting of acute undernutrition, although some children may be persistently wasted. Growth failure can be either underweight or stunting. Moderate or severe growth failure is considered growth more than 2 or 3 standard deviations below the World Health Organization growth standards, respectively (McDonald et al. 2013).

Stunting has been linked to many adverse outcomes related to late physical and cognitive development (Victora et al. 2008). Small size in school-age children should be viewed as a reflection of early growth failure (Martorell 2010). In underdeveloped countries, infections are the primary causes of poor growth and stunting, and growth tends to be normal in the absence of malnutrition. Children who were small adults in all physical dimensions, including height, weight, head circumference, muscle circumference, and lean body mass (Martorell 2010). Delayed cognitive impairment may be a consequence of chronic malnutrition and growth failure. In children with chronic diseases, the effects of their disease compound the effects of inadequate nutrition and nutrition condition. A major factor that leads to growth failure is inflammation in chronic disease it results in cachexia, a condition described as an observed decrease in appetite, increase in basal metabolic rate, loss of lean muscle, and inefficient use of fat tissue for energy. Also observed in chronic disease states in children is growth hormone (GH) resistance. GH stimulates linear growth; increases muscle mass, and improve bone density. Resistance to these effects will lead to short stature, poor weight gain, and poor bone

health. Other factors that lead to growth failure in chronic disease include malabsorption, feeding intolerance, increased nutritional needs with decreased caloric intake, and medication effects (Sevilla 2017). Food security consists of three components: availability, access, and utilization, stability. Access is measured at the population level, while access and utilization are measured at the household and individual levels. Measuring all three aspects of food insecurity has been challenging, but recent research shows promise in the area of food access measurement with the Household Food Insecurity Access Scale (HFIAS). Low-cost and valid measures of household food insecurity are necessary to accurately predict the prevalence of food insecurity in response to changing conditions and inform targeted interventions to diminish childhood morbidity and mortality. A multi-country study was conducted to assess the acceptability, validity, and generalizability of the HFIAS, an existing nine-item measure of household food access. The study collected cross-sectional data on household food access insecurity and child nutritional status, as measured by anthropometry, in eight country sites to determine whether these variables were related and whether this relationship was consistent across different populations.

Although different studies are done in developed countries on nutritional status on children with different specific chronic disease, there are limited studies in developing countries where there is high prevalence of malnutrition.

1.3 Objectives of study

1.3.1 General Objective

The main study objective is assessing a status of food security, malnutrition, and identify predictors of food insecurity among children with selected chronic disease on follow up in children (type I diabetic maltase, asthma, congenital heart disease, chronic kidneydisease, RVI). at Saint Paul's Hospital Millennium medical collage Addis Ababa Ethiopia 2024.

1.3.2 Specific objective

The Specific objectives of the study ware as:

- ❖ To evaluate the status of food security of children with selected chronic disease in children (type I DM, asthma,congenital heart disease, chronic kidney disease, RVI).
- ❖ To determine
- ❖ malnutrition among children selected chronic disease in children (type I DM, asthma, congenital heart disease, chronic kidney disease, RVI).
- ❖ To identify independent predictors of food insecurity among children with selected chronic disease in children (type I DM, asthma, congenital heart disease, chronic kidney disease, RVI).

1.3.3 Research Questions

- What is the current status of food security among children undergoing follow-up atSt. Paul's Hospital, Ethiopia?
- What is the prevalence of malnutrition among children with selected chronicdiseases in the same population?
- How do households of children attending follow-up at St. Paul's Hospital perceivetheir food security status?
- What are the main factors contributing to food insecurity among families withchildren experiencing chronic diseases?

1.4 Significance of the study

The findings of this study can provide crucial insights into the overall public health situation, specifically in relation to food security and malnutrition among children with chronic diseases. This information is vital for developing targeted interventions to address these risk factors and improve the overall health outcomes of these children. Understanding the role of food security in the context of these diseases can lead to more effective and comprehensive care plans. The study's findings can contribute to the development of policies aimed at improving food security and nutritional outcomes for children with chronic diseases. Given that the study is conducted in Ethiopia, where malnutrition remains a significant public health concern. This study may contribute to filling existing research gaps by exploring the specific link between food security, malnutrition, and chronic diseases in children. The knowledge generated can lay the foundation for future research endeavors and further investigations into related areas. Insights from this study may have broader implications for global health, especially in regions facing similar challenges. Understanding the interplay between food security and chronic diseases in children can contributeto a more comprehensive approach to addressing malnutrition on a global scale.

1.5 Scope of the Study

The scope of the study on the status of food security and its association with malnutrition among children with selected chronic diseases on follow-up at St. Paul's Hospital, Ethiopia, encompassesvarious dimensions to provide a comprehensive understanding of the issue. Here are key elementsto consider when clearly define the geographic location of the study, specifying that it is conducted at St. Paul's Hospital in Ethiopia. This ensures that the findings are contextualized within the specific healthcare setting and regional context. Clearly outline the criteria for including children in the study. This could include age ranges, specific chronic diseases under consideration, and the duration of follow-up at St. Paul's Hospital. Specify the chronic diseases that are the focus of thestudy.

1.6 Limitation of study

First Cultural practice is one of the factor household food insecurity assessment scale feelings are in community not expose poor in answering of real household status, there might be possible recall bias among respondents when they are answering questions related to past four weak and 24 hours recalls events it can affect result

1.7 Organization of the Paper

This thesis has five chapters. Accordingly, the first chapter deals with the background of the study and defines the problem of the study, basic questions and objectives of the study, the scope and limitation of study and the significance of the study. The second chapter includes concepts on child Malnutrition, empirical literature review and conceptual framework. The third chapter deals with study area description, research design and approach, source of population and study population, data sources, sample size determination, sampling technique and procedures, data collection instruments procedures used data processing and method of data analysis. The fourth chapter presents results, the fifth chapter discussions, and the sixth chapter of this paper deals with conclusions and recommendations.

2 Literature review

2.1 Malnutrition related to chronic illness

Environmental, behavioral (nutrition and physical activity), and disease-related factors can prevent attainment of full genetic potential for growth. Undernutrition is most often the cause of growth faltering and poor skeletal development. Disease-related factors, such as malabsorption, inflammation, and immobility also have profound effects. (Epping-Jordan et al. 2001)

A recent study by Antonella 2019 in Italy that analyzed a total of 541 children shows that the overall prevalence of malnutrition in the study population was 40.5 (severe, 21.6%) Particularly, the prevalence of low BMI (z-score < -2) and stunting (HFA z-score < -2) was 19.4% and 30.3% respectively. Estimates were 2-fold higher (x2 test, $P < 0.001$) in in-patients (56.7%) than in patients assessed at the out-patient (33.3%) and day-hospital (28.3%) clinics. The prevalence of malnutrition was significantly different across the different diagnostic groups (x2 test, $P < 0.001$), with higher rates in patients with neurologic, cardiac and respiratory diseases (Larson-eNath and Goday 2019).

Physical and mental development are indicators of children's health and nutrition. Anthropometric measurements are used to determine physical development. Malnutrition is a significant health problem in children with T1 diabetes mellitus. Children with T1DM are at risk for long-term chronic complications. Early diagnosis and treatment are important, especially in the 0-5 age group. Weight loss is a common symptom in diabetes. Proper nutrition and balanced diet are important for managing T1DM.Poor diet quality is common in young people with T1DM.The study aims to determine malnutrition status and associated factors in children with T1DM.study included 37 girls and 35 boys, with ages ranging from 2 to 18.BMI, head circumference, mid- upper arm circumference, and skinfold thickness were measured. The participants were categorized into different BMI percentile ranges. The STRONG kids scale identified 8.3% at low- risk, 65.3% at medium-risk, and 26.4% at high-risk. There was no significant difference in BMI, arm circumference, and skinfold thickness by age or gender (Şimşek and Okan Bakir 2021).

Normal growth parameters are important indicators of good disease control in children and adolescents with T1DM. Limited data confirms the presence of growth anomalies in children and adolescents with T1DM.Increased height at diagnosis, especially in children with early onset.

Impaired linear growth at prepubertal and pubertal age. T1DM duration and metabolic control caninfluence linear growth pattern and final adult height. Modern intensive insulin regimens can ensure a normal adult height. Regular measurement of growth parameters is important for pediatricdiabetologists. Technological advances in therapy for T1DM need further evaluation on growth pattern. Limited data available on growth anomalies in children and adolescents with T1DM. Increased height at diagnosis, especially in children with early onset. Impaired linear growth at prepubertal and pubertal age. T1DM duration and metabolic control can influence linear growth pattern. New technologies in therapy need to be evaluated for their effects on growth pattern (Santiet al. 2019).

Increased growth during the first year of life is associated with higher risk of childhood-onset type1 diabetes. Study investigates if increased growth in first year is associated with higher risk of type1 diabetes. Characteristics that may influence growth and diabetes risk were considered as confounders Data from Norwegian birth cohort and Danish Childhood Diabetes Registry used No significant differences in associations by sex Results remained consistent when excluding preterm children, children of smoking mothers, children of diabetic mothers, and children with celiac disease. Growth measures analyzed as age and sex-specific z scores. Adjustment for child's year of birth and cesarean delivery did not change results. Excluding children of non-Norwegian parentsdid not change results. Data available for 99,832 children born between 1998 and 2009.Risk of type 1 diabetes was similar among children with different growth patterns. Incidence rate of type 1 diabetes was 25 cases per 100,000 person-years in DNBC and 31 cases per 100,000 person-years(Magnus et al. 2015).

Investigate if asthma or its treatment affects children's growth. Study conducted in Tayside, Scotland with 3347 children with asthma. Children in socially deprived areas had lower height and weight. Children on high doses of inhaled steroids and receiving both hospital and general practice care had lower height and weight. Children on high doses of inhaled corticosteroids showed lower growth rates. Most children with asthma had normal height, weight, and growth rates (Fullerton 1955). The literature review assessed the impact of asthma and its treatment on growth. A total of 37 articles were included in the review. Asthma, especially severe and uncontrolled cases, can impair child's growth. Inhaled corticosteroids may cause a small reduction in linear growth.

Observational studies did not find significant effects of inhaled corticosteroids on growth. Systemic corticosteroids can cause dose-dependent growth suppression in severe asthma. (Zhang, Lasmar,et al 2019) risk factors of malnutrition in Chinese children with CHD Prevalence of preoperative malnutrition was 23.3% for underweight, stunting, and wasting. Factors associated with malnutrition included hospitalization, age at surgery, and heart conditions - Patients showedsignificant improvement in growth after surgery. Malnutrition after surgery was associated with residual cardiac abnormalities and heart function classification. Prevalence of preoperative malnutrition in Chinese children with CHD. Underweight (23.3%), stunting (23.3%), wasting (14.3%). Factors associated with preoperative malnutrition hospitalization, age at surgery, risk adjustment for congenital heart surgery, mechanical ventilation, pulmonary hypertension, cyanotic heart disease Factors associated with stunting. parents' height, single ventricle, cyanotic heart disease Factors associated with wasting: hospitalization, pulmonary hypertension. Significant improvement in growth observed within the first year after surgery. Prevalence of malnutrition declined to 3.2% underweight, 2.7% stunted, and 1.9% wasted 3 years after surgery Factors associated with malnutrition after surgery (Zhang et al. 2020).

Lower total body fat mass and malnourishment are associated with worse outcomes in children undergoing surgery for CH. Malnutrition is common in pediatric intensive care units and affects recovery after surgery. Adequate nutrition is crucial for children undergoing congenital heart surgery. Changes in metabolism after surgery can lead to poor wound healing and myocardial dysfunction. Malnourishment is associated with decreased perioperative myocardial function. Duration of inotropic support and BNP levels increase as nutritional status decreases. (Radman et al. 2014). Growth hormone improves final height in children with CKD. Malnutrition and inadequate linear growth are common in children with CKD. Recognizing and addressing the causes of these co-morbidities is important. Nutrition and growth are interconnected in children with CKD. Improved growth should focus on height and weight gain. Nutritional supplementation may result in weight he studies compared growth and maturation in 384 German children with renal replacement therapy (RRT) between 1998 and 2009 with 732 children enrolled in the European Dialysis and Transplant Association (EDTA) Registry from 1985 to 1988. The results showed that the mean height standard deviation score (SDS) has improved over the past 20 years from -3.03 to -1.80. The difference in height SDS was not

significant until the age of 6 years, but it improved significantly in adolescence. Significant improvements in the delay of the pubertal growth spurt, age at menarche, bone maturation, and body mass index (BMI) were noted in the recent German group compared to the EDTA group. Gain but not necessarily height increase (Franke et al. 2013).

Recombinant human growth hormone (rhGH) has been used for 25 years in children with chronic kidney disease (CKD). Multiple studies show a benefit from rhGH in the short and long term. Only 16 of these studies are randomized controlled trials (RCTs). The growth of patients with CKD is improving due to various factors. The use of rhGH in CKD is based on the GH-IGF-1 axis. There is resistance to GH in CKD, leading to poor growth. Studies show no significant impact of rhGH on serum cholesterol and triglycerides. Segmental growth may be affected in CKD, but rhGH may improve body proportions. There is some concern about rhGH increasing hyperfiltration in CKD. Benign intracranial hypertension is a potential adverse event of rhGH(Rees 2016).

HIV infection can contribute to disturbances in growth in early childhood. Little evidence for a difference in growth of HIV-exposed but uninfected children. Growth monitoring may improve clinical course and quality of life. Longitudinal studies were conducted to examine postnatal growth over time. PubMed search was used to identify relevant papers. Inclusion criteria included specific outcomes, exposure groups, and study design. Case reports and studies on antiretroviral treatment were not included. Information on study design, measurement methods, and results were extracted. - Studies were categorized by economically developed and less developed countries. Results were presented separately for the impact of HIV infection and HIV exposure. Studies that included all three groups of children were included in both comparisons. Limited exposure assessment in one study from Zambia affected interpretation of findings. - Increase in evidence for association between HIV status and growth in children in the 1990s.Majority of studies on HIV- infected and HIV-exposed children were from sub-Saharan Africa. Follow-up duration ranged from 4 months to 8 years (Isanaka, et al 2009)
Infected children grew slower than uninfected children. Growth differences between infected and uninfected children increased with age. Infected children were estimated to be significantly shorter and lighter than uninfected children. Growth differences were more marked in weight than in height. Uninfected children grew faster in height and weight than infected children. By 10 years,

uninfected children were on average 7 kg heavier and 7.5 cm taller than infected children. Infected children with mild or serious symptoms lagged behind asymptomatic children in growth. Growth in uninfected children did not differ before and after the availability of ART. Combination therapyimproved weight and height in severely ill infected children.

2.2 Anthropometer measurement of chronic illness child.

Anthropometric measures accurately predict metabolic syndrome in both boys and girls. The sumof four skinfolds is the most accurate method for predicting metabolic syndrome. Number of steps per day is a protective factor against metabolic syndrome in boys. Current recommendations and cutoff points for diagnosing metabolic syndrome in children need to be reviewed and developed (Andaki et al. 2013)

Anthropometric study of 232 children with Perthes' disease aged 5-10 years. Examined in three centers: Birmingham, Liverpool, and Nottingham. Impaired and disproportionate growth observedin affected boys. Ratios of biacromial width, bi-iliac width, and head circumference to standing height analyzed. No significant difference in Suh ischial height between normal and affected boys. Length of foot and tibia compared in normal boys and boys with unilateral Perthes' disease. Percentage of adult length achieved by forearm and hand and by upper arm analyzed (Burwell et al. 1978)

2.3 Checking nutritional status chronic illness child

Malnutrition in children with chronic disease affects growth and development. Causes of malnutrition in chronic disease are multifactorial. Review focuses on malnutrition in congenital heart disease, chronic kidney disease, liver disease, and cystic fibrosis. Standard anthropometric assessments may not accurately diagnose malnutrition in pediatric chronic disease. Implementation of standardized nutrition protocols can help prevent malnutrition and improve outcomes. The paper discusses the causes, evaluation, and management of malnutrition in pediatric chronic diseases. Malnutrition in children with chronic disease is multifactorial and complex. Standard anthropometric assessments may not accurately diagnose malnutrition in these children. Body composition assessment modalities like ultrasound and BIA can help diagnose malnutrition. Implementation of standardized nutrition protocols may prevent malnutrition and improve outcomes. Weight alone is not accurate for assessing nutrition status in children with chronic kidney disease. Serum albumin level is not a reliable marker of nutrition status in chronic kidney

disease. Dual-energy x-ray absorptiometry (DEXA) can accurately determine body composition in children with chronic kidney disease. Malnutrition in pediatric chronic liver disease is associatedwith poor outcomes. Predictive energy expenditure equations do not accurately reflect energy expenditure in children with end-stage liver disease (Larson et al 2019)

The paper assesses the prevalence and risk factors of chronic malnutrition in children under five in Aydin, Turkey. The study used a cross-sectional design and included 1,400 children. Stunting, wasting, and underweight were used as indicators of nutritional status. The prevalence of malnutrition was 10.9% for stunting, 4.8% for underweight, and 8.2% for wasting. Increased riskwas found in families without social security, low birth weight, and not giving colostrum. Improving social security coverage and promoting breastfeeding are essential interventions (Erginet al. 2007)

Study on malnutrition in urban and rural areas of Telangana and Andhra Pradesh. Examined demographic dynamics, chronic illnesses, and risk factors associated with malnutrition. Data collected through a cross-sectional study with a large sample size. Burden of stunting among under-five children. The study included 10,350 individuals from urban and rural areas. The prevalence of hypertension was higher in urban areas compared to rural areas. The prevalence of diabetes was higher in urban areas compared to rural areas. The burden of stunting among under-five children was 33.7% (Ramanujam et al. 2023)

2.4 Conceptual frame work

Malnutrition among preschool major health concern in the conceptual framework used for After reviewing different literatures about factors associated in children with chronic diseases, the effects of their disease compound the effects of inadequate nutrition Anthropometer measurement of and nutrition stasis condition this framework was adopted (Larson-Nath and Goday 2019).

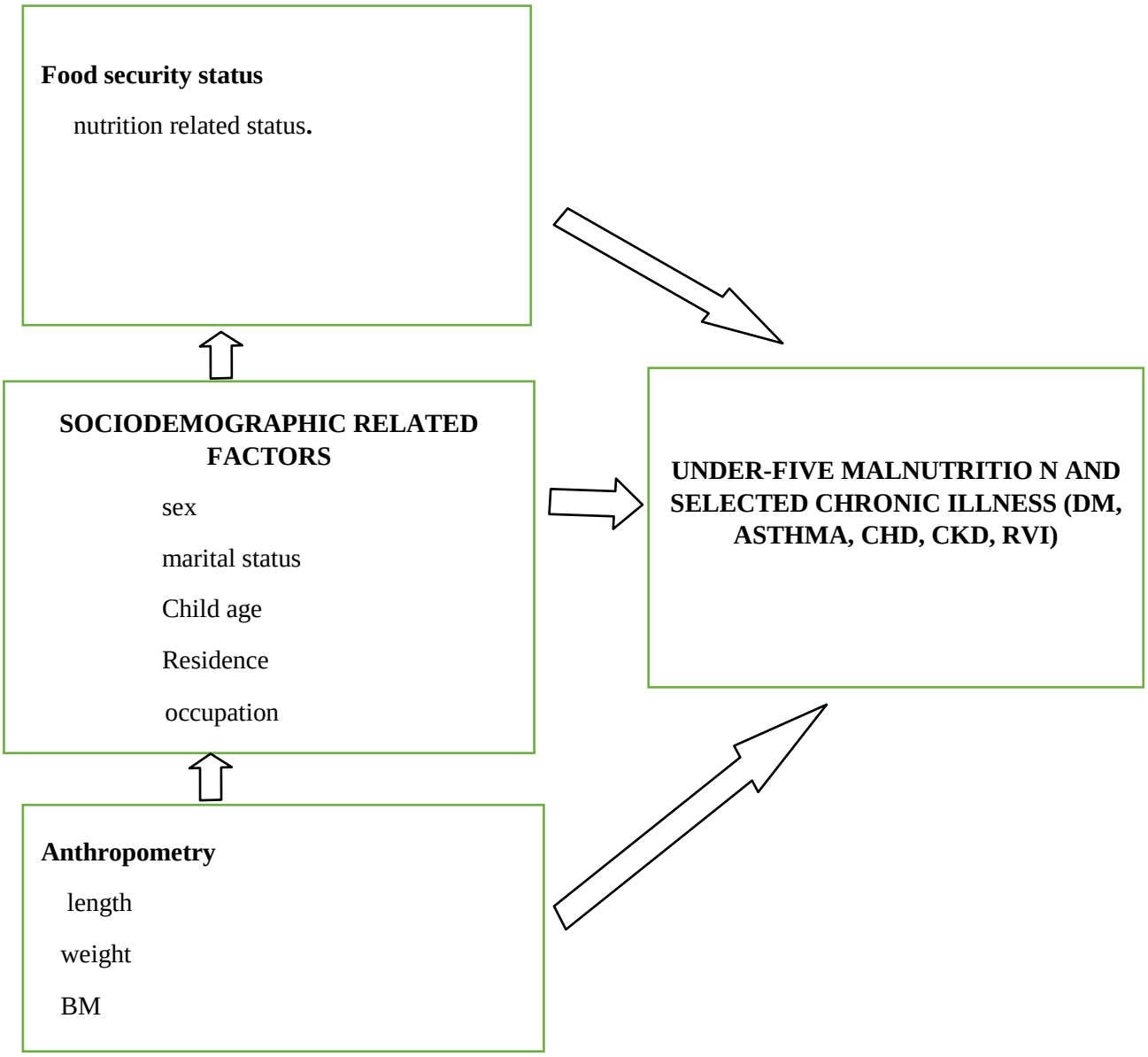


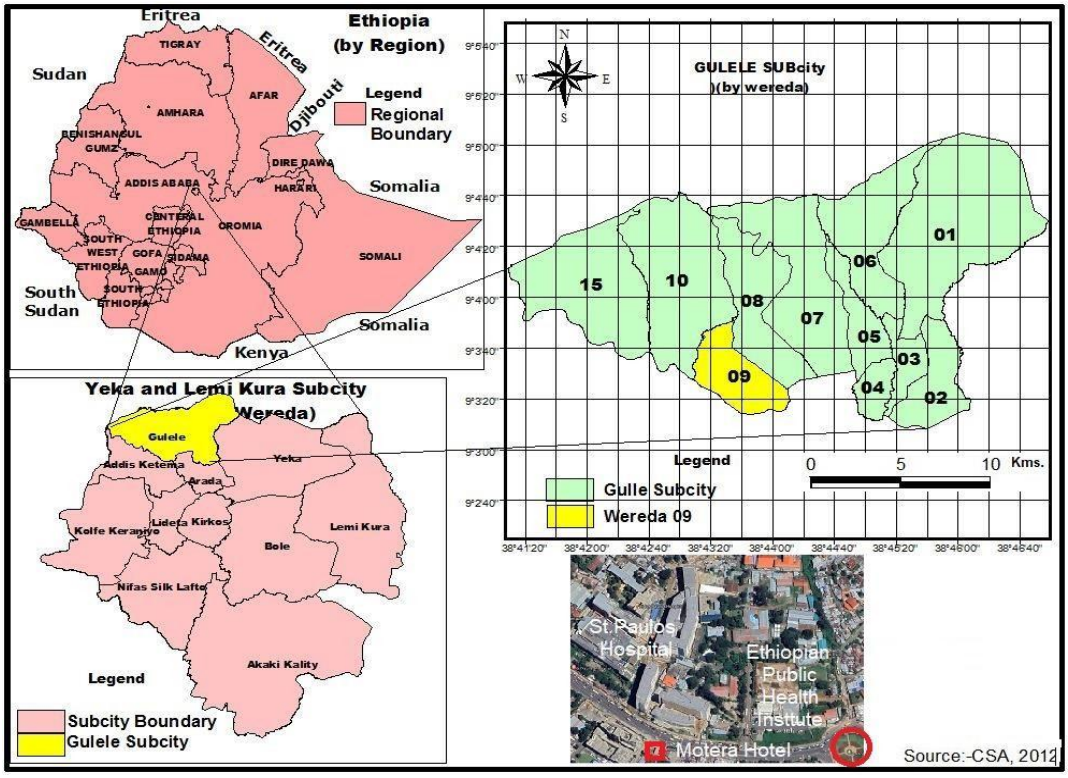
Figure 1: Conceptual frame work on Malnutrition among preschool factors associated in children with chronic diseases (Larson-Nath and Goday 2019)

3.Description of the Study Area and Research Method

3.1Description of Study Area

This study was conducted in St. Paul Hospital Millennium Medical College (SPHMMC). This hospital provides preventive, curative and rehabilitative clinical services structured in multipurpose terms in outpatient, inpatient, emergency and critical care, child health and the operation theatre. The hospital was chosen due to its highest patient and client attendance. It aimed to serve the poor.And a medical college was formed in 2007, currently known as St. Paul Hospital Millennium Medical College. Postgraduate programs, particularly the specialty programs are designed to be competency based. Given the infancy of the Medical College, its swift expansion and innovative approach.

Figure 2: St. Paul hospital millennium medical college location from GIS 10.5 version and Google earth satellite view of the study area (GIS 10.5 version and Google earth satellite view of the study a



3.2 Study Design and Period

A facility-based cross-sectional design was employed. Study period refers to the timeof data collection. Data collection took place from Mar 1 to Mar 30, 2024.

3.3 Population

3.3.1 Source of population

All children with chronic disease on follow up at SPHMMC.

3.3.2 Study Population

All children with type I Diabetes mellitus, Asthma, congenital heart disease, chronic kidney disease, and RVI and on follow up at SPHMMC.

3.4 Inclusion & exclusion criteria

3.4.1 Inclusion Criteria

All under five children with the selected chronic disease (Diabetes mellitus, asthma, congenital heart disease, chronic kidney disease and RVI) on follow up at SPHMMC and who came for followup during the study period whose chart was available and has documented anthropometry at start of follow up or diagnosis. Admitted to from Mar 1 to Mar 30, 2024.

3.4.2 Exclusion Criteria

Under five children admitted on without selected chronic illness Admitted to from Mar 1 to Mar 30, 2024.

3.5 **Sample size determination**

After checking HMIS log book on average the following number of patients are on follow up at follow up clinic currently. DM = 240 Asthma=50 CHD= 45 CKD= 35 RVI= 185

TOTAL=555

Since the follow up is at least every 1months for those with well controlled illness and the studyperiod is 3month, it was assumed that every case was done encountered.

Sample size was calculated using the single proportion formula

The required number of participants was estimated using the single population proportion formula with a 50% (p= 0.5) population proportion at 95% confidence level and 5% (0.05) marginof error (D). Hence, the required sample size was:

$$n = \frac{(z_{\alpha/2})^2 p(1-p)}{d^2} = \frac{(1.96)^2 0.5(1-0.5)}{0.05^2} = 384$$

Where;

- n = the minimum sample size required
- p= estimated proportion (50%) = 0.5
- z = the standardized value for the confidence level 95% (or alpha=0.05) which is 1.96
- d = the margin of error between the sample and the population (0.05).

The calculated sample size is 384

Assuming 10% contingency, a total of 422 study subjects were required.

Table 1: Sample size Calculated proportional sample random sampling technique to be proportionally distributed to each stratum with being as shown in the following table

Diagnosis	Average number of cases onfollow up	Sample size
Type 1 DM	240	240X422/555= 182
Bronchial asthma	50	50X422/555= 38
CHD	45	45X422/555=34
CKD	35	35x422/555=27
RVI	185	185X422/555=141
Total	555	422

3.6 **Sampling technique**

A sample random sampling technique was used to recruit the study participants.

3.7 **Data collection Toole and Procedure**

A checklist was used to extract data by reviewing admission register and patient chart. The checklist was prepared in English language. Data was collected when the patients come for follow up. Patients' demography; (age, sex, and address), birth order, family size, parents or care givers' occupation and income, duration of illness was also documented. Based on the checklist, electronic based data collection was conducted using Kobo Collect mobile application. Use of Kobo Collect ensured data consistency, completeness, accuracy, and absence of data entry errors. The data collection pace and trend were followed on daily basis since data is automatically submitted to Kobo server.

Data collection was conducted by three BSc nurses. The supervisor and data collectors were trained for one day about the aim of the study, relevance of the study, confidentiality of client information, eligibility criteria, and how to use Kobo Collect mobile application for data collection and submitfinalized forms.

3.8 **Data Sources**

The data was collected from eligible respondents during the data collection period. To collect the data, structured questionnaire was administered for the respondents by the trained data collectors.

3.9 **Study Variable**

3.9.1 Dependent variable

Food security status of malnutrition under five children.

3.9.2 Independent variable

Sex, marital status, Child age, Residence, occupation, Type of the disease the patienthas, Duration of illness. nutritional status.

3.10 **Data quality control**

Before the actual data collection, pretest was conducted on 25 (5%) of the study population at black lion hospital out of selected study hospitals, because of selected this hospital compere to my study area are equal number of population treatment. two weeks before the actual data collection to evaluate the clarity of the questions. Training of data collectors and supervisors was also helpful to obtain a valid data. The collected data was be reviewed on daily basis by the principal investigator and appropriate feedback was given to data collectors and supervisor.

3.11 **Anthropometric calculations and interpretations**

Anthropometric measurements were conducted using the WHO Anthropometric software:

- **Underweight**: For underweight classification, the Weight-for-Age Z (WAZ) scores were used. Children with WAZ scores below -3 standard deviations (SD) were classified as severely underweight, while those with WAZ scores between -3SD and -2SD were categorized as moderately underweight. Children with WAZ scores above -2SD were considered normal, indicating no underweight condition.
- **Stunting:** For stunting classification, the Height-for-Age Z (HAZ) scores were used. Children with HAZ scores below -3SD were classified as severely stunted, while those with HAZ scores between -3SD and -2SD were categorized as moderately stunted. Children with HAZ scores above -2SD were considered normal, indicating no stunting condition.

- **Wasting**: For wasting classification, the Weight-for-Height Z (WHZ) scores were used. Children with WHZ scores below -3SD were classified as severely wasted, while those with WHZ scores between -3SD and -2SD were categorized as moderately wasted. Children with WHZ scores above -2SD were considered normal, indicating no wasting condition.

3.12 Food insecurity status assessment

The Household Food Insecurity Access Scale (HFIAS) was utilized to assess the occurrence of food insecurity. This scale comprises nine questions, each paired with its respective frequency of occurrence. The responses to these questions were coded as follows:

- If the response was "No", it was coded as 0.
- If the response was "Yes", the code depended on the frequency of occurrence:

✓ "Yes, rarely" was coded as 1.

✓ "Yes, sometimes" was coded as 2.

✓ "Yes, often" was coded as 3.

The maximum value for each question is 3, leading to a maximum total score of 27 when summing the scores of all nine questions. Based on these scores, the food insecurity status was categorized as follows:

- "Secured" for scores between 0 and 1.
- "Mild food insecurity" for scores between 2 and 8.
- "Moderate food insecurity" for scores between 9 and 16.
- "Severe food insecurity" for scores above 16.

3.13 Data processing and analysis

The collected data was exported to Kobo server to SPSS 27 for analysis. Categorical variables are described using frequency and percent. Continuous variables are described using a relevant combination of measure of central tendency and measure of dispersion. Graphical presentation is also used to visualize prevalence of food insecurity. A binary logistic regression was fitted to identify independent predictors of food insecurity. Model fitness and Multicollinearity were checked using Hosmer-Lemeshow test and Variance Inflation Factor (VIF).

3.14 Ethical Considerations

Human participants were used in the investigation. After receiving ethical approval from the College of Development Studies' Institutional Review Board, an official letter was sent to the SPHMMC administrative office to begin the study, data collecting began after permission, and a cooperation letter was written to under five clinic wards. The study's objective, protocol, and duration, as well as the study's benefits, were all properly presented to the participants in the local language. Respondents were assured of their privacy and told that the information they supplied would be used solely for research purposes. Respondent names were not included on the questionnaires, only their identifying numbers, ensuring confidentiality.

3.15 Operational Definitions

Malnutrition in the study is defined as a state when the body does not have enough of the requirednutrients (under-nutrition).

Nutritional status is a measurement of the extent in which individuals' physiological needs fornutrients are being met and was measured using MUAC.

Chronic illnesses are diseases of long duration and generally slow progression.

Linear growth: increase in length/height.

Child (children): developmental period between infancy and adolescence.

Anthropometric measurement; measurement of nutritional status of the child.

RVI; Respiratory virus infection

Food security: Food security, as defined by the United Nations' Committee on World Food Security, means that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life.

HFIAS: house hold food insecurity access scale, women's household food security status was classified based on responses to the nine severity items in the HFIAS and coded "0" for "No"

and “1” for “Yes.” The procedure for scoring was used as follows: “0” was attributed if the event described by the question never occurred, “1” if it occurred during the previous 30 days. With regard to the occurrence, “1” was attributed if the events rarely occur, “2” sometimes and “3” often. Therefore, responses on the nine HFIAS questions were summed to create household food security score, with a minimum of “0” and a maximum score of “27.” According to the score, the higher the score, the more the women is vulnerable to food insecurity. The lower the score, the lesser the food insecurity a women experienced. Therefore, HFIAS score of 0–1 is categorized as food secure, 2 and above were considered as food insecure (Coates, Swindale, and Bilinsky 2007).

4. Result

From the 422 patient charts and registers reviewed, analyzed data of 414 under-five children. of them were included in this study. The rest were excluded due to missing data.

4.1 Sociodemographic and anthropometric characteristics

The mean age of the participants was 27.1 months (SD=12.9). Large proportion (39.1%) of the participants belong to the age group 24 to 35 months. The majority of participants were male 258 (62.3%). The participants were almost evenly distributed between rural 205 (49.5%) and urban 209 (50.5%) areas. Concerning parental educational status, a majority of mothers, 362 (87.4%), had completed secondary education. Fathers' education was more varied, with 209 (50.5%) having attained more than secondary education, 155 (37.4%) having completed secondary education, and the remaining 50 (12.1%) having completed primary education.

Maternal occupations were diverse, including government employees 106 (25.6%), self-business owners 103 (24.9%), farmers 100 (24.2%), NGO employees 53 (12.8%), and private employees 52 (12.6%). The most common birth order was 2 to 3 accounting for 258 (62.3%) of the study participants. The most prevalent chronic medical illness was chronic heart disease 155 (37.4%) followed by diabetes mellitus 104 (25.1%).

Nutritional status indicators discovered a noteworthy proportion of participants experiencing severe stunting 143 (34.5%), severe underweight 95 (22.9%), and severe wasting 45 (10.9%).

Characteristics		Frequency	Percent	LL	UL
Age in months (Mean = 27.1 months, SD=12.9)	<12	50	12.1	9.2	15.5
	12-23	54	13.0	10.1	16.5
	24-35	162	39.1	34.5	43.9
	36-47	88	21.3	17.5	25.4
	48-59	60	14.5	11.4	18.1
Sex	Female	156	37.7	33.1	42.4
	Male	258	62.3	57.6	66.9
Residence	Rural	205	49.5	44.7	54.3
	Urban	209	50.5	45.7	55.3
Mother's educational status	Primary	52	12.6	9.6	16.0
	Secondary	362	87.4	84.0	90.4
Father's educational status	Primary	50	12.1	9.2	15.5
	Secondary	155	37.4	32.9	42.2
	More than secondary	209	50.5	45.7	55.3
Maternal occupation	Government employee	106	25.6	21.6	30.0
	Private employee	52	12.6	9.6	16.0
	NGO employee	53	12.8	9.8	16.3

	Self-business	103	24.9	20.9	29.2
	Farmer	100	24.2	20.2	28.4
Birth order	2-3	258	62.3	57.6	66.9
	4-5	156	37.7	33.1	42.4
Chronic illness	Asthma	52	12.6	9.6	16.0
	Chronic heart disease	155	37.4	32.9	42.2
	Chronic kidney disease	49	11.8	9.0	15.2
	Diabetes mellitus	104	25.1	21.1	29.5
	RVI	54	13.0	10.1	16.5
Stunting	Severe stunting	143	34.5	30.1	39.2
	Moderate stunting	43	10.4	7.7	13.6
	Non-stunting	228	55.1	50.3	59.8
Underweight	Severe underweight	95	22.9	19.1	27.2
	Moderate underweight	70	16.9	13.5	20.7
	Non-underweight	249	60.1	55.4	64.8
Wasting	Severe wasting	45	10.9	8.1	14.1
	Moderate wasting	31	7.5	5.2	10.3
	Non-wasting	338	81.6	77.7	85.1

4.2 Food insecurity related responses

In my study, we conducted a comprehensive assessment of food security over the past four weeks using a set of nine questions, along with their corresponding frequencies of occurrence. Among the surveyed households (n=414), 374 (90.3%) did not express concern about having enough food, while 40 (9.7%) reported worrying. Among those who worried, it occurred rarely (19/40, 47.5%), sometimes (19/40, 47.5%), or often (2/40, 5.0%). Regarding food preferences, 208 households (50.2%) had to compromise due to resource limitations. The frequency of compromised food preferences varied: rarely (53/208, 25.5%), sometimes (143/208, 68.8%), or often (12/208, 5.8%). Furthermore, 102 households (24.6%) faced limited food variety due to resource constraints. The occurrences were reported as rarely (28/102, 27.5%), sometimes (61/102, 59.8%), or often (13/102, 12.7%). Forced consumption of undesired foods due to resource scarcity affected 82 households (19.8%). The frequency of undesired food consumption was expressed as rarely (18/82, 22.0%), sometimes (58/82, 70.7%), and often (6/82, 7.3%).

Smaller meals due to insufficient food affected 84/414 households (20.3%), occurring rarely 30/84 (35.7%), sometimes 48/84 (57.1%), or often 6/84 (7.1%). Similarly, 67/414 households (16.2%) experienced fewer meals per day due to resource constraints, with frequencies reported as rarely 27/67 (40.3%), sometimes 31/67 (46.3%), and often 9/67 (13.4%). In severe cases, 65/414 households (15.7%) went without any food, with occurrences reported as rarely 22/65

(33.8%), sometimes 31/67 (63.1%), and often 9/67 (3.1%).

In our study, we found that 74 out of 414 households (17.9%) reported going to sleep hungry at night due to an insufficient amount of food. The frequency of this occurrence was reported as rarely (24/74, 32.4%), sometimes (43/74, 58.1%), or often (7/74, 9.5%). Additionally, 70 out of 414 households (16.9%) experienced full-day food deprivation, meaning they did not eat anything throughout the day and night. The frequency of full-day food deprivation was reported as rarely (19/70, 27.1%), sometimes (38/70, 54.3%), and often (13/70, 18.6%).

Table 2: Response to The Household Food Insecurity Access Scale (HFIAS) 9-item questions of food insecurity occurrence among respective households of children with chronic medical illness, N=414.

Characteristics		Frequency	Percent
In the past four weeks, did you worry that your household would not have enough food?	No	374	90.3
	Yes	40	9.7
How often did this happen?	Rarely	19	47.5
	Sometimes	19	47.5
	Often	2	5.0
In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	No	206	49.8
	Yes	208	50.2
How often did this happen?	Rarely	53	25.5
	Sometimes	143	68.8
	Often	12	5.8
In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	No	312	75.4
	Yes	102	24.6
How often did this happen?	Rarely	28	27.5
	Sometimes	61	59.8
	Often	13	12.7

In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	No	332	80.2
	Yes	82	19.8
How often did this happen?	Rarely	18	22.0
	Sometimes	58	70.7
	Often	6	7.3
In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	No	330	79.7
	Yes	84	20.3
How often did this happen?	Rarely	30	35.7
	Sometimes	48	57.1
	Often	6	7.1
In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	No	347	83.8
	Yes	67	16.2
How often did this happen?	Rarely	27	40.3
	Sometimes	31	46.3
	Often	9	13.4
In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	No	349	84.3
	Yes	65	15.7
How often did this happen?	Rarely	22	33.8
	Sometimes	41	63.1
	Often	2	3.1

In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	No	340	82.1
	Yes	74	17.9
How often did this happen?	Rarely	24	32.4
	Sometimes	43	58.1
	Often	7	9.5
In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	No	344	83.1
	Yes	70	16.9
How often did this happen?	Rarely	19	27.1
	Sometimes	38	54.3
	Often	13	18.6
Level of food insecurity	No	82	19.8
	Mild	319	77.1
	Moderate	13	3.1

4.3 Level of food insecurity

Finally, the overall level of food insecurity was categorized as follows: no insecurity, mild, moderate, and severe. More than three-fourths (77.1%) of households had mild food insecurity, while only 13 (3.1%) of households experienced moderate food insecurity. There were no households with severe food insecurity.

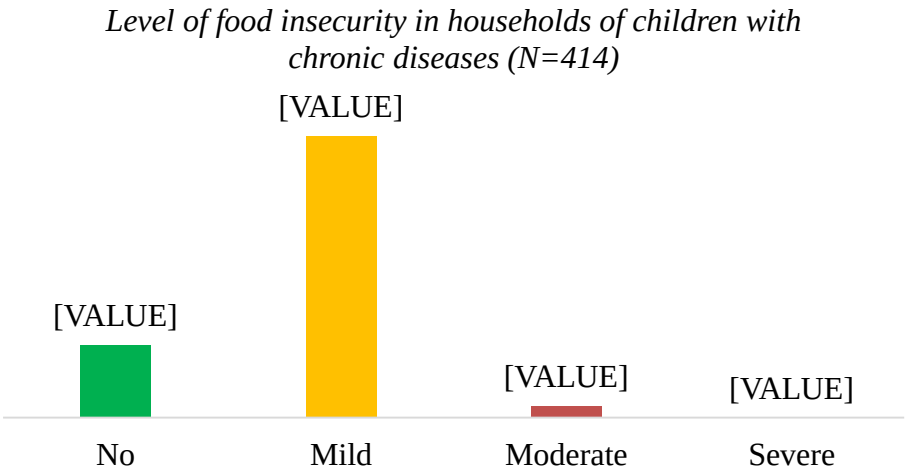


Figure 3: Level of food insecurity among the children with chronic medical illnesses, N=414

4.4 Predictors of food insecurity

We tried to identify predictors of food insecurity as secured and unsecured (mild/moderate food insecurity). The highest prevalence of food insecurity was observed in children in the age range of 12 to 23 months (88.9%) followed by infants (84.0%). The prevalence of food insecurity was relatively higher in patients with diabetes (86.5%) and HIV/AIDS (81.5%). Food insecurity was slightly higher in children from urban areas and females. We tried to identify independent predictors of food insecurity among the children and we couldn't statistically significant association during multivariable analysis. But during bivariate analysis, the odds of food insecurity was significantly higher in children with diabetes compared to children with asthma.

Predictor	Secured	Unsecured	COR [95% CI]	COR [95% CI]
Age in months				
<12	8 (16.0)	42 (84.0)	1.5 [0.5, 3.8]	2.6 [0.6, 11.0]
12-23	6 (11.1)	48 (88.9)	2.2 [0.8, 6.3]	2.6 [0.5, 12.9]
24-35	33 (20.4)	129 (79.6)	1.1 [0.5, 2.2]	1.6 [0.5, 4.6]
36-47	22 (25.0)	66 (75.0)	0.8 [0.4, 1.8]	0.8 [0.3, 1.9]
48-59	13 (21.7)	47 (78.3)	1	1
Sex				
Male	55 (21.3)	203 (78.7)	1	1
Female	27 (17.3)	129 (82.7)	1.3 [0.8, 2.2]	1.3 [0.7, 2.5]

Residence					
	Rural	44 (21.5)	161 (78.5)	1	1
	Urban	38 (18.2)	171 (81.8)	1.2 [0.8, 2.0]	0.6 [0.2, 1.5]
Type of chronic medical illness					
	Asthma	15 (28.9)	37 (71.1)	1	1
	Chronic heart disease	32 (20.7)	123 (79.3)	1.6 [0.8, 3.2]	1.3 [0.6, 3.0]
	Chronic kidney disease	11 (22.5)	38 (77.5)	1.4 [0.6, 3.4]	1.1 [0.4, 3.1]
	Diabetes mellitus	14 (13.5)	90 (86.5)	2.6 [1.1, 5.9] *	1.8 [0.7, 4.5]
	RVI	10 (18.5)	44 (81.5)	1.8 [0.7, 4.4]	1.7 [0.6, 4.4]

5. Discussion

The purpose of this study was to assess the current status of food security among children undergoing follow-up at St. Paul's Hospital, Ethiopia, determine the prevalence of malnutrition among children with selected chronic diseases, assess perceived food security status in the respective household, and pick the main factors contributing to food insecurity among families with children experiencing chronic diseases. Accordingly, 332 out of the 414 children with chronic diseases (80.2%) suffer from food insecurity in their respective household. But 319 (77.1%) of them were mild. Only 13 (3.1%) of them suffer from moderate food insecurity. Children with chronic disease who were severely stunted, severely underweight, and severely wasted accounted for 143 (34.5%), 95 (22.9%), and 45 (10.9%) of the participants, respectively. Overall, any kind of stunting, underweight, and wasting was found in 44.9%, 39.8%, and 18.4% of the cases, correspondingly. Though there was no variable significantly associated with food insecurity, the prevalence of food insecurity was higher in children with diabetes (86.5%) and RVI (81.5%).

It is concerning that a large percentage of young children with chronic medical illness (80.2%) experience food insecurity, despite the majority of these cases (77.1%) are mild. This implies that even while there may not be a serious food insecurity issue in these households, they are nevertheless having difficulty giving their kids a healthy and adequate diet. Comparatively, studies carried out in other regions of Ethiopia and sub-Saharan Africa also show that children suffer from a high rate of malnutrition and food insecurity (Mohammed *et al.*, 2020; Beyene, 2023). Malnutrition and food insecurity continue to be a serious public health issues, especially for under-five children, according to research done in Ethiopia (Mohammed *et al.*, 2020). In addition, these children with chronic illness are at risk for poor health outcome. For example, the sub-Saharan African study has discovered a substantial link between poor health outcomes and food insecurity (Beyene, 2023).

The prevalence of stunting, underweight, and wasting among children with chronic medical illnesses in our study is higher compared to the broader literature on child nutrition in Ethiopia. For instance, a comprehensive review of systematic reviews and meta-analyses on child nutrition in Ethiopia found the prevalence of stunting, underweight, and wasting to be 42%, 33%, and 15%, respectively (Mohammed *et al.*, 2020). According to the 2019 Ethiopia Mini

Demographic and Health Survey (EMDHS), 37% of Ethiopian children are stunted, 21% are underweight, and 7% are wasted (‘Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF. 2019. Ethiopia Mini Demographic and Health Survey 2019: Key Indicators. Rockville, Maryland, USA: EPHI and ICF.’, no date). When comparing our findings with these studies, it becomes evident that children with chronic diseases are at an even higher risk of malnutrition. This could be attributed to various factors, including the increased nutritional needs of these children, the impact of their illnesses on their ability to consume and absorb nutrients, and the potential side effects of their medications on appetite and digestion.

This study disclosed a concerning prevalence of food insecurity among children with diabetes and HIV/AIDS, at 86.5% and 81.5% respectively. For children under five with chronic medical illnesses like diabetes mellitus and HIV/AIDS, food insecurity can exacerbate their health conditions, disrupt their treatment plans, and diminish their quality of life (Thomas, Miller and Morrissey, 2019; Wylie-Rosett and DiMeglio, 2023). In children with diabetes, food insecurity can lead to elevated A1C levels, an increased risk of diabetes-related complications, more frequent hospitalizations, and poorer psychological well-being (Wylie-Rosett and DiMeglio, 2023). For children with HIV/AIDS, food insecurity can interfere with disease management and overall health by worsening the symptoms of HIV/AIDS and complicating treatment plans (Thomas, Miller and Morrissey, 2019). In children with chronic illnesses like diabetes and HIV/AIDS, the substantial costs of managing these illnesses, including expenses for medications, devices, and supplies, can compete with the need to buy healthy food, thereby leading to food insecurity.

6. Conclusion

The prevalence of food insecurity was higher in children with chronic medical illnesses, particularly those with diabetes mellitus and HIV/AIDS. Malnutrition was also more prevalent in children with chronic medical illnesses compared to the general population. The study highlights that a significant number of children with chronic illnesses face food insecurity, even if mild, impacting their ability to maintain a healthy diet. These findings align with broader regional data indicating high malnutrition and food insecurity rates. Compared to national statistics, children with chronic diseases show higher rates of stunting, underweight, and wasting, potentially due to their increased nutritional needs and the effects of their illnesses and treatments. The study underscores the heightened risk of poor health outcomes for these children, emphasizing the need for targeted interventions to address food insecurity and malnutrition among children with chronic diseases.

7. Recommendations

Based on our findings, we recommend health professionals, health facilities, and health bureaus as follows:

Health Professionals:

- Health professionals should receive training on identifying indicators of malnourishment and food insecurity in under-five children with chronic medical illnesses. This entails being aware of the particular dietary requirements these kids have as well as how their diseases affect their capacity to consume, absorb and process nutrients.

For Health Facilities:

- Health facilities should implement routine screening programs for food insecurity and malnutrition among children with chronic diseases. This can help identify at-risk children early and intervene before their health deteriorates.
- Health bureaus should develop policies that address food insecurity among children with chronic diseases. This could include policies that reduce the cost of essential medicines, increase wages, or provide social support.
- Urban gardening
- Nutrition sensitive agriculture
- Income generation agriculture

8. Reference

Akombi, Blessing Jaka, Kingsley Emwinyore Agho, John Joseph Hall, Dafna Merom, Thomas Astell- Burt, and Andre M. N. Renzaho. 2017. "Stunting and Severe Stunting among Children Under-5 Years in Nigeria: A Multilevel Analysis." *BMC Pediatrics* 17(1):1–16. doi: 10.1186/s12887-016-0770-z.

Andaki, Alynne Christian Ribeiro, Adelson Luiz Araújo Tinôco, Edmar Lacerda Mendes, Roberto AndakiJúnior, Andrew P. Hills, and Paulo Roberto S. Amorim. 2013. "Anthropometry and Physical Activity Level in the Prediction of Metabolic Syndrome in Children." *Public Health Nutrition* 17(10):2287–94. doi: 10.1017/S136898001300253X.

Anon. 1999. "Programming for Adolescent Health and Development." *World Health Organization - Technical Report Series* (886):220–37.

Burwell, R. G., P. H. Dangerfield, D. J. Hall, C. L. Vernon, and M. H. Harrison. 1978. "Perthes' Disease. An Anthropometric Study Revealing Impaired and Disproportionate Growth." *Journal of Bone andJoint Surgery - Series B* 60 B(4):461–77. doi: 10.1302/0301-620x.60b4.711791.

Epping-Jordan, J. A., R. Bengoa, R. Kawar, and E. Sabaté. 2001. "The Challenge of Chronic Conditions: WHO Responds." *British Medical Journal* 323(7319):947–48. doi: 10.1136/bmj.323.7319.947.

Ergin, Filiz, Pinar Okyay, Gonca Atasoylu, and Erdal Beşer. 2007. "Nutritional Status and Risk Factors ofChronic Malnutrition in Children under Five Years of Age in Aydin, a Western City of Turkey." *Turkish Journal of Pediatrics* 49(3):283–89.

Ethiopian Public Health Institute (EPHI) and ICF. 2019. 2019. *Mini Demographic and Health Survey 2019: Key Indicators*.

Franke, Doris, Stella Winkel, Jutta Gellermann, Uwe Querfeld, Lars Pape, Jochen H. H. Ehrich, DieterHaffner, Leo Pavičić, and Miroslav Živičnjak. 2013. "Growth and Maturation Improvement in Children on Renal Replacement Therapy over the Past 20 Years." *Pediatric Nephrology* 28(10):2043–51. doi: 10.1007/s00467-013-2502-z.
FULLERTON, W. W. 1955. "General Practice." *The Illinois Medical Journal* 107(1):46–48.

Isanaka, Sheila, Christopher Duggan, and Wafaie W. Fawzi. 2009. "Patterns of Postnatal Growth in HIV-Infected and HIV-Exposed Children." *Nutrition Reviews* 67(6):343–59. doi: 10.1111/j.1753- 4887.2009.00207.x.

Kyle, Ursula G., Lara S. Shekerdemian, and Jorge A. Coss-Bu. 2015. "Growth Failure and Nutrition Considerations in Chronic Childhood Wasting Diseases." *Nutrition in Clinical Practice* 30(2):227–38. doi: 10.1177/0884533614555234.

Larson-Nath, Catherine, and Praveen Goday. 2019. "Malnutrition in Children with Chronic Disease." *Nutrition in Clinical Practice* 34(3):349–58.

Magnus, Maria C., Sjurdur F. Olsen, Charlotta Granström, Geir Joner, Torild Skrivarhaug, Jannet Svensson, Jesper Johannesen, Pål Njølstad, Per Magnus, Ketil Størdal, and Lars C. Stene. 2015. "Infant Growth and Risk of Childhood-Onset Type 1 Diabetes in Children from 2 Scandinavian Birth Cohorts." *JAMA Pediatrics* 169(12). doi: 10.1001/jamapediatrics.2015.3759.

Martorell, Reynaldo. 2010. "Physical Growth and Development of the Malnourished Child: Contributionsfrom 50 Years of Research at INCAP." *Food and Nutrition Bulletin* 31(1):68–82. doi: 10.1177/156482651003100108.

McDonald, Christine M., Ibironke Olofin, Seth Flaxman, Wafaie W. Fawzi, Donna Spiegelman, Laura E.Caulfield, Robert E. Black, Majid Ezzati, and Goodarz Danaei. 2013. "The Effect of Multiple Anthropometric Deficits on Child Mortality: Meta-Analysis of Individual Data in 10 Prospective Studies from Developing Countries." *American Journal of Clinical Nutrition* 97(4):896–901. doi: 10.3945/ajcn.112.047639.

Patel, Leena. 2008. "Growth and Chronic Disease." *Annales Nestle* 65(3):129–36.

Puntis, John W. L. 2010. "Malnutrition and Growth." *Journal of Pediatric Gastroenterology and Nutrition* 51(SUPPL. 3):125–26. doi: 10.1097/MPG.0b013e3181f2cb3e.

Radman, Monique, Ricardo Mack, Joaquin Barnoya, Aldo Castañeda, Monica Rosales, Anthony Azakie,Nilesh Mehta, Roberta Keller, Sanjeev Datar, Peter Oishi, and Jeffrey Fineman. 2014. "The Effect of Preoperative Nutritional Status on Postoperative Outcomes in Children Undergoing Surgery for Congenital Heart Defects in San Francisco (UCSF) and Guatemala City (UNICAR)." *Journal of Thoracic and Cardiovascular Surgery* 147(1):442–50. doi: 10.1016/j.jtcvs.2013.03.023.

Ramanujam, Karthikeyan, Nagaraju Mergu, Henna Kondeth, Garlapati Venkat Raji Reddy, Upadrasta Venkata Prasad, Renuka Sadasivuni, Jagajeevan Babu Geddam, Hemalatha Rajkumar, and Nusi Samarasimha Reddy. 2023. "Chronic Illness, Nutritional Status, and Factors Associated with Malnutrition among Various Age Groups Residing in Urban Areas of Telangana and Rural Areas ofAndhra Pradesh." *Nutrients* 15(20). doi: 10.3390/nu15204470.

Rees, Lesley. 2016. "Growth Hormone Therapy in Children with CKD after More than Two Decades ofPractice." *Pediatric Nephrology* 1421–35. doi: 10.1007/s00467-015-3179-2.

Salama, Peter. 2013. "And the Humanitarian Response During a Famine in Ethiopia." 286(5):563–71.Santi, Elisa, Giorgia Tascini, Giada Toni, Maria Giulia Berioli, and Susanna Esposito. 2019. "Linear Growth in Children and Adolescents with Type 1 Diabetes Mellitus." *International Journal ofEnvironmental Research and Public Health* 16(19):1–12.

Sevilla, Wednesday Marie A. 2017. "Nutritional Considerations in Pediatric Chronic Disease." *Pediatricsin Review* 38(8):343–50. doi: 10.1542/pir.20160030.

Şi mşek, Dilek, and Binnur Okan Bakir. 2021. "Determination of Malnutrition Status of Children with

Diabetes during Diagnosis." *Human Nutrition and Metabolism* 24. doi: 10.1016/j.hnm.2021.200123.

Victora, Cesar G., Linda Adair, Caroline Fall, Pedro C. Hallal, Reynaldo Martorell, Linda Richter, and Harshpal Singh Sachdev. 2008. "Maternal and Child Undernutrition: Consequences for Adult Healthand Human Capital." *The Lancet* 371(9609):340–57. doi: 10.1016/S0140-6736(07)61692-4.

Zhang, Linjie, Laura Belizario Lasmar, and Jose A. Castro-Rodriguez. 2019. "The Impact of Asthma andIts Treatment on Growth: An Evidence-Based Review." *Jornal de Pediatria* 95(xx):10–22. doi: 10.1016/j.jped.2018.10.005.

Zhang, Mingjie, Liping Wang, Rui Huang, Chongrui Sun, Nan Bao, and Zhuoming Xu. 2020. "Risk Factors of Malnutrition in Chinese Children with Congenital Heart Defect." *BMC Pediatrics* 20(1):1–7. doi: 10.1186/s12887-020-02124-7.

Beyene, S.D. (2023) 'The impact of food insecurity on health outcomes: empirical evidence from sub-Saharan African countries', BMC Public Health, 23(1), p. 338. Available at: https://doi.org/10.1186/s12889-023-15244-3.

'Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF. 2019. Ethiopia Mini Demographic and Health Survey 2019: Key Indicators. Rockville, Maryland, USA: EPHI and ICF.' (no date).

Mohammed, S.H. et al. (2020) 'The state of child nutrition in Ethiopia: an umbrella review of systematic review and meta-analysis reports', BMC Pediatrics, 20(1), p. 404. Available at: https://doi.org/10.1186/s12887-020-02301-8.

Thomas, M., Miller, D.P. and Morrissey, T.W. (2019) 'Food insecurity and child health', Pediatrics, 144(4).

Wylie-Rosett, J. and DiMeglio, L.A. (2023) 'Strategies to reduce food insecurity for people with diabetes: a call to action', Diabetes care, 46(2), p. 245.

Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3.

Annex

Annex I: Information Sheet

Addis Ababa university school of developmental study department of food security currently I will be undertaking research on a topic entitled prevalence of malnutrition and its association with children with selected chronic disease on follow up at St. Paul's hospital millennium medical collage 2024. the aim of this form is to make the concerned body clear about the purposeof the research, data collection procedure and get permission to conduct the research.

The objective of the study: prevalence of malnutrition and its association with children withselected chronic disease on follow up at St. Paul's hospital millennium medical collage 2024.

Design of the study: institution based, cross-sectional design.

Risks and benefits: The result of the study helps programmers or policy makers to design intervention related to prevalence of malnutrition. In this way you may get benefit from the intervention policy. There is no payment and risk or discomfort as a result of Participating in thisstudy except that you lost your time.

Confidentiality; All information given by you will be kept strictly confidential. Any of your personal information will not register. The information obtained in this study will be used only forresearch purposes.

Address of the principal investigator:

Name –Abenezer Admasu

Email – admasuabenezer1@gmail.com

Supervisor: Name_____Signature:_____Date: _____

Phone- +251935285817

Annex II question

Part 1: Sociodemographic characteristics and common questions for all cases

Medical record number_____phone number_____

1) Age to be filled in months or completed years and months_____
2) Sex: 1. Male 2. Female
3) Residence: 1: Urban 2. Rural
4) Mother's or primary care taker's education: 1. No education 2. primary 3. Secondary

3. More than secondary

5) Education of the father or other primary care giver: 1. No education 2. primary 3.Secondary 4. More than secondary
6) Occupation of the mother or other primary care giver: 1. no formal job 2. Government employee 3. Private employee 4. NGO employee 5. Self-business 6. Farmer
7) Occupation of the father or other primary care giver: 1. no formal job 2. Government employee 3. Private employee 4. NGO employee 5. Self-business 6. farmer
8) Birth order. 1. 1 2. 2-3 3. 4-5 4. 6+
9) Which of the following chronic illness does your child has?

a) Asthma

b) Diabetes mellitus

c) Chronic heart disease

d) Chronic kidney disease

e) RVI

10) Age at diagnosis _____

i. **Part II: anthropometry**

1) Anthropometry at diagnosis by using WHO z score

a) Height or length in cm.....Height for age Z score_____

b) Weight Weight for age Z score _____

c) Weight for height/length Z score_____

d) BMI BMI for Age Z score __

2) Current anthropometry by using WHO Z score

a) Height/length in centimeter----------Height or length for age Z score----------

b) Weight in Kg----------weight for age Z score ----------

_____

c) Weight for Length Z score ----------

ii. Part iv: food security status

Household Food Insecurity Access Scale (HFIAS) Generic Questions

Each of the questions in the following table is asked with a recall period of four weeks (30 days).

The respondent is first asked an occurrence question – that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an

occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

Characteristics
In the past four weeks, did you worry that your household would not have enough food?
How often did this happen?
In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
How often did this happen?
In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?
How often did this happen?
In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
How often did this happen?

In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
How often did this happen?
In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?
How often did this happen?
In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?
How often did this happen?
In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?
How often did this happen?
In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?
How often did this happen?

Amharic translation question

የቤተሰብ የምግብ ዋስትና እጦት ተደራሽነት ልኬት (HFIAS) አጠቃላይ ጥያቄዎች በሚከተለው ሠንጠረዥ ውስጥ ያሉት እያንዳንዱ ጥያቄዎች የሚጠየቁት ከአራት ሳምንታት (30 ቀናት) የማስታወስ ጊዜ ጋር ነው። ምላሽ ሰጪው በመጀመሪያ አንድ ክስተት ጥያቄ ይጠየቃል - ማለትም በ ውስጥ ያለው ሁኔታ ጥያቄው ባለፉት አራት ሳምንታት ውስጥ ተከስቷል (አዎ ወይም አይደለም) ። ምላሽ ሰጪው "አዎ" ብሎ ከመለሰ የክስተት ጥያቄ፣ የድግግሞሽ ክስተት ጥያቄ ይጠየቃል። ሁኔታው አልፎ አልፎ (አንድ ወይም ሁለት ጊዜ) አንዳንድ ጊዜ (ከሦስት እስከ አሥር ጊዜ) ወይም ብዙ ጊዜ (ከአሥር በላይ) ተከስቷል። ጊዜ) ባለፉት አራት ሳምንታት ውስጥ.

ባህሪያት
ባለፉት አራት ሳምንታት ውስጥ የእርስዎ ቤተሰብ በቂ ምግብ አይኖረውም ብለሽ ተጨንቀሽ ነበር?
ይህ ምን ያህል ጊዜ ተከሰተ?
ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በግብአት እጦት ምክንያት የመረጡትን አይነት ምግብ መመገብ አልቻላችሁም?
ይህ ምን ያህል ጊዜ ተከሰተ?
ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በግብአት እጦት ምክንያት የመረጡትን አይነት ምግብ መመገብ አልቻላችሁም?
ይህ ምን ያህል ጊዜ ተከሰተ?
ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በግብአት እጦት ምክንያት የተወሰነ አይነት ምግብ መመገብ ነበረባችሁ?
ይህ ምን ያህል ጊዜ ተከሰተ?

ባለፉት አራት ሳምንታት ውስጥ፣ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በቂ ምግብ ስላልነበረ ከምትፈልጉት መጠን ያነሰ ምግብ መብላት ነበረባችሁ?
ይህ ምን ያህል ጊዜ ተከሰተ?
ባለፉት አራት ሳምንታት እርስዎ ወይም ሌላ የቤተሰብ አባል በቂ ምግብ ስለሌለ በቀን ውስጥ ጥቂት ምግቦችን መመገብ ነበረብዎት?
ይህ ምን ያህል ጊዜ ተከሰተ?
በአለፉት አራት ሳምንታት ውስጥ ምግብ ለማግኘት በሀብት እጦት ምክንያት በቤተሰብዎ ውስጥ ምንም አይነት የሚበሉት ምግብ አልነበረም?
ይህ ምን ያህል ጊዜ ተከሰተ?
ባለፉት አራት ሳምንታት እርስዎ ወይም ማንኛውም የቤተሰብ አባል በቂ ምግብ ስለሌለ በረሃብ ተኝተው ነበር?
ይህ ምን ያህል ጊዜ ተከሰተ?
ባለፉት አራት ሳምንታት ውስጥ እርስዎ ወይም ማንኛውም የቤተሰብ አባል በቂ ምግብ ስለሌለ ምንም ሳይበሉ ቀኑን ሙሉ ሄዱ?
ይህ ምን ያህል ጊዜ ተከሰተ?