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PREVALENCE AND ASSOCIATED FACTORS OF MALNUTRITION AMONG SCHOOL CHILDREN IN MOROTO DISTRICT, KARAMOJA SUB-REGION, NORTHERN UGANDA

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DECLARATION

I David Mark Edimu declare that, to the best of my knowledge, this research entitled Prevalence and Associated Factors of malnutrition among school children in Moroto district, Northern Uganda is my original work and has never been presented to any academic institution for any award.

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Date.....23/SEPT/2026.....

APPROVAL

This dissertation has been written under our supervision and is ready for submission.

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DEDICATION

This work is dedicated to my family, whose love and sacrifices have made everything possible. To my parents, Mr. Edimu David Richard and Mrs. Akello Jessica Suzan, who have been my greatest teachers and role models whose support has been my strength. Thank you for believing in me every step of the way.

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OPERATIONAL DEFINITION

Nutrition:	The process of obtaining and utilizing food and its nutrients for the growth, maintenance, and overall health of an organism.
School-going children:	Children aged between 8 - 17 years attaining their education within Moroto district.
Nutritional Status:	Nutritional status refers to an individual's overall health condition influenced by their diet, intake of essential nutrients, and body composition indicated by Height for Age (HAZ) Z scores, Weight for Age (WAZ) Z scores, and BMI-for age Z-scores among adolescents.
Height-for-Age Z scores:	This compares the height or length of a child to the reference weight of another child of the same age. Children with HAZ of -2SD are considered stunted.
BMI-for-age Z-score (BAZ):	A measure obtained by comparing a child's body mass index with the WHO reference population for children and adolescents of the same age and sex. Among children and adolescents aged 5–19 years, a BAZ below -2 standard deviations is classified as thinness
Weight-for-Height Z scores:	This compares weight of a child with the reference weight of a child of the same height. All children with WHZ of -2SD are considered malnourished/wasted.
Household:	Household refers to people who live together in the same homestead / compound and operate as a unit, including unrelated servants and relatives who share food from the same pot and share other resources of livelihood and are answerable to the same household head.
Malnutrition:	This is the inadequate nutrients intake affecting growth, health, and development, evident through indicators like stunted growth, underweight, micronutrient deficiencies, or obesity.
Nutrients:	Chemical substances obtained from food and used in the body to provide energy, structural materials regulating agents to support growth, maintenance, and repair of body tissues.
Z-Score:	Number of standard deviations below or above the reference median value, (WHO 2007).

Severe stunting:	HAZ below −3 SD from the WHO reference median.
Thinness:	BMI-for-age Z-score (BAZ) below −2 SD from the WHO reference median.
Severe thinness	BAZ below −3 SD from the WHO reference median.
Overweight	BAZ above +1 SD from the WHO reference median.
Obesity	BAZ above +2 SD from the WHO reference median.

ABSTRACT

Background:

Malnutrition continues to pose a significant public health burden among primary school-aged children, leading to both physical and cognitive impairments. Affected children often experience weakened immunity and frequent absenteeism from school, limiting their academic performance and development potential.

Objective:

This study sought to determine the prevalence and associated determinants of malnutrition among primary school pupils in Moroto District, Eastern Uganda.

Methods:

A cross-sectional study design was employed using a multistage random sampling approach. Anthropometric measurements were taken, and structured questionnaires were administered for data collection. Data was cleaned and entered in Microsoft Excel before analysis using SPSS version 22 and WHO AnthroPlus version 1.0.4. Descriptive statistics were used to summarize participants' characteristics and feeding practices. Chi-square tests were used to assess associations between malnutrition and predictor variables, while Poisson regression was used to identify independent predictors, reported as adjusted prevalence ratios (aPRs) with 95% confidence intervals. Statistical significance was set at $p < 0.05$.

Results:

Among the 388 primary school children aged 8–17 years included in the study, 58 (15.1%; 95% CI: 11.8–19.0%) were stunted, including 21 (5.5%; 95% CI: 3.6–8.2%) who were severely stunted. Thinness was observed in 64 (16.5%; 95% CI: 13.1–20.5%) children, including 10 (2.6%; 95% CI: 1.4–4.7%) with severe thinness. Overweight and obesity were observed in 20 (5.2%; 95% CI: 3.4–7.8%) and 2 (0.5%; 95% CI: 0.1–1.9%) children, respectively. In multivariable analysis, higher family meal frequency was independently associated with stunting (aPR = 1.325, 95% CI: 1.010–1.739; p = .042). Having a greater number of children under five years in the household was independently associated with thinness (aPR = 1.300, 95% CI: 1.007–1.678; p = .044), while

reported reduction in the number of meals was inversely associated with thinness (aPR = 0.435, 95% CI: 0.223–0.849; p = .015).

Conclusion:

Malnutrition remains highly prevalent among school-going children in Moroto District. Age and female gender emerged as significant correlates of stunting and wasting. Targeted, gender-sensitive nutrition interventions and community-based programs are crucial to reduce these alarming rates and enhance child health and educational outcomes.

Keywords: Malnutrition, Stunting, Thinness, Underweight, School children, Moroto District

CHAPTER ONE: INTRODUCTION

1.1Introduction

This chapter provides an overview of the study, including the background, problem statement, research questions, objectives, justification, and conceptual framework guiding the research.

1.2 Background of study

Malnutrition among school-aged children has emerged as a pressing yet under-addressed health concern, particularly in low- and middle-income nations. While global nutrition programs have traditionally prioritized children under five years and pregnant women, the nutritional requirements of school-aged children — especially those in primary school — have often been overlooked. This age group undergoes rapid growth and heightened physical and mental activity, necessitating adequate nutrition for optimal development and learning performance (Black et al., 2013; WHO, 2020).

Worldwide, millions of school-going children experience chronic undernutrition manifested through stunting, wasting, and micronutrient deficiencies. Best et al. (2010) noted that many children in sub-Saharan Africa suffer from "hidden hunger," resulting from diets lacking in vital micronutrients such as iron, iodine, and vitamin A. A study in Ethiopia by Terefe et al. (2021) revealed that 20.7% of children were stunted and 14.7% were thin, underscoring malnutrition as a major issue. In Kenya, similar research found that more than 30% of school children were undernourished, primarily due to food insecurity, parasitic infections, and poor dietary diversity (Mwaniki & Makokha, 2013).

In Uganda, while national surveys mostly emphasize children below five years, local studies indicate worrying levels of malnutrition among older children. Research in Eastern Uganda by Bashaasha et al. (2022) reported that 26% of school-age children were stunted and 12% were thin, with low parental education, household food insecurity, and poor school feeding programs identified as contributing factors. Another study in Wakiso District revealed that 15% of children were underweight, with poor diet and worm infestations linked to malnutrition (Tumwine et al., 2019).

The Karamoja sub-region, including Moroto District, faces even greater challenges due to chronic poverty, recurrent droughts, and inadequate access to essential health and nutrition services. According to UNICEF (2022), Moroto District registers persistently high cases of severe acute malnutrition at its district hospital, reflecting broader community-level nutritional challenges. Many children attend school without breakfast or lunch and frequently suffer illnesses, which worsens their nutritional status (WFP, 2021).

Although some initiatives such as school feeding and community nutrition programs exist, their implementation in remote regions like Karamoja remains inconsistent and heavily reliant on donors. Consequently, gaps in sustainability and limited data availability hinder the design of focused interventions. This study, therefore, aimed to determine the prevalence and contributing factors of malnutrition among school-going children in Moroto District, Eastern Uganda.

1.3 Problem statement

Despite the growing recognition of malnutrition as a serious concern, minimal attention has been directed toward its occurrence among school-aged children in Uganda, particularly in Moroto District. Most nutrition interventions prioritize children under five, neglecting those in primary school. Although comprehensive data for this older age group are scarce, regional trends suggest a grave situation. Bashaasha et al. (2022) found that in Eastern Uganda, 26% of school-going children were stunted, and 12% were thin. Considering that Karamoja records the country's highest stunting rates among children under five (45%, UDHS 2016), school-aged children in this region likely face similar or even worse malnutrition challenges.

Malnourished children often struggle with low academic concentration, frequent illness, and reduced school attendance, which in turn perpetuate poverty cycles. The underlying drivers are multifaceted including insufficient food intake, poor dietary diversity, parasitic infections, and lack of safe water, limited healthcare access, and pervasive poverty. Schools in Moroto often lack reliable feeding programs, leaving many children hungry during lessons.

While national initiatives such as the Uganda Nutrition Action Plan (UNAP), and NGO interventions by UNICEF, WFP, and Action Against Hunger have provided vital support, most focus on children under five and pregnant women. Consequently, data gaps persist for school-

age populations. This study seeks to bridge that knowledge gap by identifying the prevalence and determinants of malnutrition among primary school children in Moroto District.

1.4 Research questions

1. What is the prevalence of malnutrition among primary school children in Moroto District?
2. What factors are associated with malnutrition among primary school-going children in Moroto District?
3. What are the predictors of malnutrition among primary school pupils in the district?

1.5 Objectives of the study

1.5.1 Main objective

To determine the prevalence and associated factors of malnutrition among primary school children in Moroto District.

1.5.2 Specific Objectives

1. To determine the prevalence of malnutrition among primary school children in Moroto District.
2. To establish the factors associated with malnutrition among school going children in Moroto.
3. To identify the predictors of malnutrition among school-going children in Moroto District.

1.6 Justification

The findings of this study provide essential insights into the nutritional challenges affecting school-age children in Karamoja. They will aid the Ministry of Health, Ministry of Education, and NGOs in formulating targeted interventions and evidence-based policies aimed at improving child nutrition. Furthermore, this study serves as a reference point for future research focused on understanding the unique nutritional needs of school-aged children in similar contexts.

1.7 Conceptual framework

Malnutrition among primary school children is influenced by multiple interacting factors. Socioeconomic constraints such as poverty and low education levels limit access to adequate

food, while environmental challenges like poor sanitation and unsafe water aggravate nutritional deficiencies. Additionally, lifestyle and psychological factors including eating behaviors and perceptions about body image contribute to inadequate dietary intake.

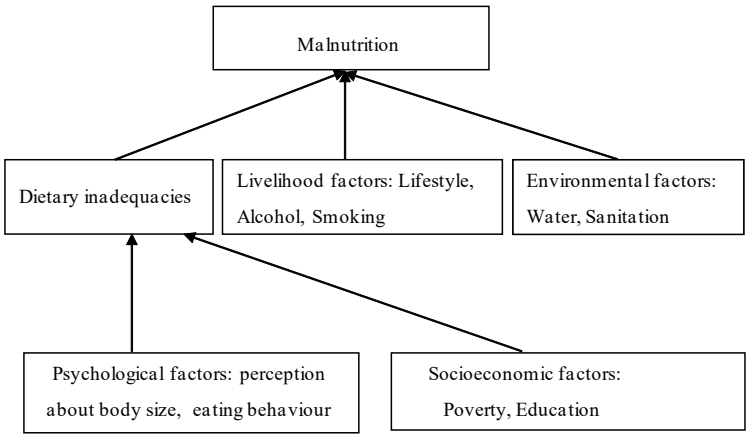


Figure 1: Conceptual framework modified from UNICEF (1992) and WHO (2005)

Narrative of the conceptual framework

Several factors influence malnutrition among primary school-going children. Livelihood factors like lifestyle, are associated with malnutrition among school age children.

Dietary inadequacies stemming from socio-economic factors, poverty, education, physiological factors like eating behaviors are associated with malnutrition among school going children.

Environmental factors like poor Water Sanitation and Hygiene are associated with malnutrition among primary school going children.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literature on the prevalence, associated factors and predictors of malnutrition among school-aged children. It draws from regional, national, and global studies to highlight existing evidence and knowledge gaps, especially in the context of Moroto District within the Karamoja sub-region of Uganda.

2.1 Prevalence of malnutrition

Malnutrition has remained a persistent global health issue, especially among children. It primarily affects physical growth, cognitive function, and immune response, posing a significant barrier to achieving optimal health and development. According to joint estimates by UNICEF, WHO, and the World Bank (2021), approximately 149.2 million children under five years suffer from stunting, 45.4 million from wasting, and 38.9 million are overweight, highlighting the multiple dimensions of undernutrition worldwide.

Low- and middle-income countries bear the greatest burden, with Sub-Saharan Africa ranking among the most affected regions. Contributing factors include household poverty, limited food security, poor dietary practices, inadequate healthcare, and sanitation deficiencies. These conditions hinder access to adequate nutrition and increase vulnerability to disease.

For school-aged children, malnutrition manifests in delayed growth, poor concentration, and reduced academic performance. A cross-sectional study conducted by Aguayo and Paintal (2017) in Bangladesh, Pakistan, and India found that many children aged 10–19 years in low-resource settings suffer from stunted growth, anemia, and frequent infections conditions often underreported due to limited data collection focused on this age group.

The World Food Programme (2020) emphasized that school meals remain the sole reliable source of nutrition for millions of children, particularly in conflict-affected and low-income areas. In the absence of such programs, children face worsened health outcomes and compromised learning capacity.

In Uganda, malnutrition continues to be a significant challenge. The Uganda Demographic and Health Survey (UDHS, 2022) reported that 29% of children under five are stunted, 4% are wasted, and 11% are underweight. Even among adults, 2.1% of women and 3.8% of men

experience moderate to severe thinness. These figures illustrate the continuing severity of the issue and its far-reaching implications for public health and national productivity. Stunting, a key indicator of chronic malnutrition, affects nearly one in three Ugandan children under five, while wasting a marker of acute undernutrition remains a persistent problem, especially during food crises.

In Uganda, national nutrition data have predominantly focused on children below five years of age. The Uganda Demographic and Health Survey (UDHS) 2022 reported that 26% of children aged 6–59 months were stunted, 2.9% were wasted, 10.2% were underweight, and 2.8% were overweight (UBOS & ICF, 2023). The burden of childhood undernutrition varies across the country, with Karamoja remaining a nutritionally vulnerable sub-region. However, the UDHS estimates for children aged 6–59 months cannot be directly compared with nutritional outcomes among school-aged children and adolescents because of the differences in age groups and anthropometric indicators. Nevertheless, these findings provide important regional context and highlight the need for greater attention to the nutritional status of older school-aged children, for whom population-level evidence remains limited.

A WFP and Government of Uganda (2022) baseline survey found that 32% of school-aged children (6–12 years) in Karamoja were stunted, 12% were underweight, and anemia prevalence exceeded 40%. These figures underscore a critical need for sustained interventions. However, district-specific data for Moroto remain scarce, which justifies the relevance of the present study in addressing this knowledge gap.

2.2 Factors Associated with Malnutrition

Numerous studies across Africa and globally have identified several determinants of child malnutrition, including socioeconomic, demographic, environmental, and cultural factors.

2.2.1 Socioeconomic Status

Household wealth significantly influences a child's nutritional status. The Kenya Demographic and Health Survey (2014–2022) found that children from the poorest households were 2.67 times more likely to be stunted than those from wealthier families (AOR = 2.67; 95% CI: 1.92–3.72). Male children also had higher odds of stunting (AOR = 1.50; 95% CI: 1.35–1.67) (Okutse & Athiany, 2025). Similarly, research from Ethiopia revealed that children in the

lowest wealth quintile were at significantly greater risk of stunting and underweight than those from higher-income households (Gebregergis, 2024).

2.2.2 Parental Education

Parental, especially maternal, education plays a vital role in shaping children's nutritional outcomes. An analysis of the 2016 Ethiopia Demographic and Health Survey (Sheferaw et al., 2025) demonstrated that children of mothers with higher education levels had markedly lower odds of being underweight — 25% lower for primary-educated mothers (AOR = 0.75; 95% CI: 0.657–0.855), 48.6% lower for those with secondary education (AOR = 0.514; 95% CI: 0.386–0.683), and 63.9% lower for tertiary-educated mothers (AOR = 0.361; 95% CI: 0.225–0.579). Educated parents are more likely to understand the importance of balanced diets, hygiene, and preventive health practices.

2.2.3 Household Size and Dietary Diversity

The number of household members and dietary diversity are additional determinants. A study in Ethiopia by Abdu Hailu Shibeshi and Zeytu Gashaw Asfaw found that children consuming diets meeting the Minimum Dietary Diversity (MDD) standard had significantly lower risks of malnutrition: Stunting: AOR = 0.68 (95% CI = 0.45–0.96), Underweight: AOR = 0.51 (95% CI = 0.27–0.99), Wasting: AOR = 0.40 (95% CI = 0.17–0.97). Households with more children often experience food sharing constraints, limiting dietary adequacy and meal frequency.

2.2.4 Access to Healthcare

Limited access to medical care also correlates with poor nutritional outcomes. A Kenyan study (Abuya et al., 2012) showed that children with infrequent health visits and poor access to nutritional counseling were more likely to be malnourished. Likewise, Thapa et al. (2016) in Nepal found that children who routinely visited healthcare facilities had better growth indicators compared to those who did not.

2.2.5 Cultural and Dietary Practices

Cultural norms and beliefs influence food selection and preparation methods, affecting nutrient intake. In some societies, certain foods are reserved for specific age groups or genders, while others are avoided based on traditional beliefs. These cultural perceptions can lead to inadequate consumption of essential nutrients, contributing to malnutrition.

2.2.6 Food Availability and Affordability

Food availability and cost are central determinants of nutrition, especially in regions affected by poverty or geographical isolation. In Karamoja, for instance, the World Food Programme (WFP), supported by Irish Aid, provides food to over 100,000 students annually in both primary and secondary schools, offering one meal per day. This intervention has proven to be an effective "pull factor," increasing school attendance and retention while enhancing children's nutritional outcomes. However, such programs remain vulnerable to funding shortages, affecting their continuity

2.3 Feeding practices of primary school going children

2.3.1 Dietary Adequacy

The nutritional adequacy of a child's diet depends not only on the amount of food available but also on its quality and frequency. According to Haider and Bhatia (2006), dietary sufficiency hinges on two main factors: the availability of nutritious foods and the body's capacity to digest and utilize nutrients, which can be impaired by infections or metabolic conditions.

In many developing countries, particularly rural areas, diets are predominantly starchy with minimal protein and micronutrient content. Such monotonous diets lack diversity and often fail to meet children's nutritional needs. Gender disparities further exacerbate the problem — in some cultures, male children receive larger portions or better-quality food compared to females (Maziya, 2014). Studies in South Asia, such as India and Bangladesh, show that girls may also face dietary restrictions linked to cultural beliefs or early marriage traditions (Haider & Bhatia, 2006).

Adolescents, particularly those in urbanizing communities, often consume fast foods and sugary snacks due to affordability and convenience. These foods are energy-dense but nutrient-poor, leading to obesity and other health complications (Thompson & Manore, 2012). Skipping breakfast, a common habit among adolescents, has been associated with increased BMI and decreased cognitive performance (St-Onge & Keller, 2014).

2.3.2 Major Nutritional Problems During Adolescence

Undernutrition (Stunting and Thinness) Short stature and low body mass during adolescence are linked to long-term functional impairments, including reduced muscle strength and endurance. Chronic undernutrition in childhood can also lead to obstetric complications in adulthood, particularly among females with small pelvic structures (WHO, 1995; 2005). Studies in Nepal revealed that 21% of adolescents were thin and 25% were stunted (Thapa et al., 2011), while research in Kavreplanchok District found 31.9% underweight, 21% stunted, and 15% thin adolescents (Mansur et al., 2015).

Overnutrition (Overweight and Obesity) While undernutrition remains prevalent in developing countries, overweight and obesity are rising rapidly, particularly in urban areas undergoing dietary transitions. Paradoxically, obesity and stunting can coexist within the same population, indicating the "double burden" of malnutrition (WHO, 2005). The CDC (2017) reports that in the United States, one in five children aged 6–19 years is obese. In China, the prevalence of overweight and obesity among 7–18-year-olds was 19.2% in 2010 (Sun et al., 2014). In India, obesity among adolescents remains below 5% but is increasing in urbanized states (NNMB, 2012). Early onset obesity contributes to cardiovascular risks and psychosocial challenges later in life.

2.4 Dietary Intakes and Behaviour Among Adolescents

Dietary practices at household level play an important role in determining the nutritional outcomes of school-aged children and adolescents. The frequency, diversity and quality of foods consumed are influenced by household livelihoods, food security, income and seasonal food availability. In Karamoja, households commonly depend on a combination of livestock keeping, crop production, casual labour and petty trade, while recurrent drought and food insecurity can constrain access to adequate and diverse foods (FAO, 2017; FAO, 2018).

The diet in Karamoja is largely based on staple foods, particularly cereals and legumes, while consumption of more diverse and nutrient-dense foods may be limited by household economic circumstances and food availability. Evidence from Karamoja indicates that inadequate dietary diversity and nutrient intake remain important nutritional concerns (Muggaga et al., 2023; WFP, 2021). These household conditions can influence the frequency and quality of meals available to children and, consequently, their growth and nutritional status.

School feeding provides an additional source of food for children in Karamoja. Through its school meals programme, WFP, in collaboration with the Government of Uganda, provides staple foods including maize, beans and vegetable oil to support school meals. More recent approaches have also promoted local procurement of these commodities and other locally available foods through home-grown school feeding initiatives (WFP, 2020; WFP, 2024). During periods of school closure or heightened food insecurity, food assistance has also included take-home rations to support children's access to food (WFP, 2020).

The availability of food at school, however, complements rather than replaces the child's household food environment. Therefore, this study collected information on household dietary and feeding practices because these practices represent an important component of children's usual food environment and may contribute to differences in nutritional status. Information on meal frequency, dietary practices and household food-related coping strategies was collected to assess the relationship between household feeding conditions and nutritional outcomes among children aged 8–17 years in Moroto District.

2.5 Gaps in Literature

Although extensive research exists on malnutrition among children under five, limited attention has been paid to school-aged populations, especially in Uganda and Sub-Saharan Africa. National datasets like the UDHS and WFP baseline assessments provide useful insights but are often aggregated at regional levels, masking district-specific variations such as those in Moroto.

Moreover, while socioeconomic and dietary factors have been widely studied, the combined influence of cultural, environmental, and healthcare-related determinants among school-aged children in Karamoja remains underexplored. Therefore, this study addresses a critical gap by

examining the prevalence and associated factors of malnutrition specifically among primary school children in Moroto District.

CHAPTER THREE: METHODS

3.0 Introduction

This chapter outlines the research design, study area, target population, participant selection, data collection techniques, variables, analysis methods, and ethical considerations. It also highlights measures undertaken to maintain data quality and minimize limitations encountered during the research.

3.1 Study design

A cross-sectional study design was utilized. This design enabled the researcher to capture information on the prevalence and factors associated with malnutrition at a single point in time, providing a snapshot of the nutritional status among primary school children in Moroto District.

3.2 Study area

The study was conducted in Moroto District, located in the Karamoja sub-region of Northern Uganda. The district is characterized by a mountainous and semi-arid landscape, experiencing low and erratic rainfall. It consists of three counties — Bokora, Matheniko, and Moroto Municipality. The predominant ethnic group is the Karimojong, known for their pastoral and

agro-pastoral livelihoods. Moroto borders Kaabong to the north, Kenya to the east, Amudat to the south, Nakapiripirit to the southwest, Napak to the west, and Kotido to the northwest. The district headquarters lie at the foot of Mount Moroto (Wikipedia, 2017). As of 2023, there were 42 primary schools spread across its three counties (MoES, 2025).

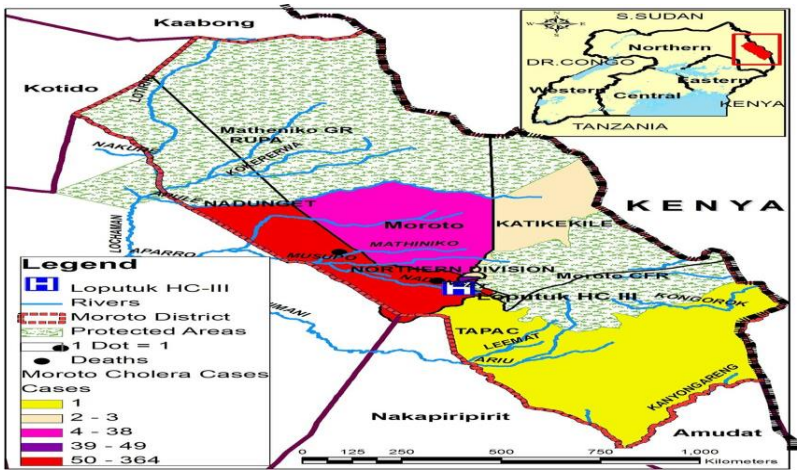


Figure 2: Map of Moroto district.

3.3 Study population

The research focused on primary school children aged 8 - 17 years enrolled in schools within Moroto District. This age group was chosen because it marks a critical period of growth and development, making children particularly vulnerable to the effects of poor nutrition.

The study included 33 primary schools in Moroto District. The schools were selected from the primary-school population identified through the Uganda Bureau of Statistics (UBOS) education and population administrative framework. The selected schools were distributed across six sub-counties represented in the study dataset: South Division, North Division, Nadunget, Katikekile, Rupa and Tapac.

For geographical representation, the study classified participants according to their residential setting. Of the 388 participants, 320 (82.5%) were from rural areas, 6 (1.5%) from peri-urban areas and 62 (16.0%) from urban areas. The urban component was concentrated mainly within North and South Divisions of Moroto Municipality, while the other participating sub-counties predominantly represented rural communities. This distribution is consistent with the

predominantly rural character of Moroto District, while capturing children living in the municipal urban setting. UBOS's 2024 census identifies North and South Divisions within Moroto Municipality and provides the sub-county-level geographical framework used for describing the district.

The schools were selected using probability proportional to size (PPS), with school enrolment used as the measure of size. This sampling approach gave larger schools a proportionately greater probability of selection while ensuring representation of children from different geographical areas of the district. Following school selection, eligible children aged 8–17 years were selected for participation according to the predetermined sampling procedure, resulting in 388 completed observations.

The UBOS Baseline Education Census 2025 provides an official national school census and permits analysis of schools and learners down to sub-county and parish level, including urban/rural and district-level classifications.

3.4 Selection of participants

3.4.1 Inclusion Criteria

- Primary school pupils in Moroto District whose parents or guardians provided informed consent and who themselves assented to participate.
- Children are currently enrolled and attend school within the district during the study period.

3.4.2 Exclusion Criteria

- Children who were critically ill or medically unfit at the time of data collection. Children with mental or physical disabilities that could interfere with anthropometric assessment.
- Participants whose parents or guardians did not consent to inclusion.

3.5 Study Variables

The study variables were grouped into dependent and independent variables. The dependent variables were nutritional status indicators, namely stunting, thinness, overweight and obesity, determined using WHO 2007 growth standards. The independent variables included child socio-demographic characteristics, household characteristics, feeding and dietary practices,

household food-security and coping practices, water, sanitation and hygiene (WASH) characteristics, and supplement use.

Key socio-demographic and household variables included age, sex, residence, age and sex of the household head, household-head education, number of children under five years and number of siblings. Feeding variables included meal frequency and dietary practices, while food-security variables included household food availability and food-related coping practices. WASH variables included access to water, sanitation and hygiene practices. These variables were assessed to determine their potential association with the nutritional status of children aged 8–17 years.

3.6 Sample size estimation

The minimum sample size was estimated using Cochran's formula for estimating a population proportion:

$$n_0 = \frac{Z^2 p\,(1-p)}{e^2}$$

where n is the minimum required sample size, Z=1.96 at the 95% confidence level, p=0.127, based on the 12.7% prevalence of stunting reported among Ugandan schoolchildren by Comandini et al. (2019), and d=0.05 is the desired precision. The initial sample size was therefore approximately 170 participants.

A multistage sampling procedure involving selection of pupils within schools was used, the sample size was adjusted for clustering using a design effect of 2.0, resulting in a minimum sample of 340 participants. Allowing for a 10% non-response rate increased the required sample size to approximately 378 participants. The study ultimately enrolled 388 participants, which exceeded the minimum required sample size; therefore, all eligible participants were retained in the final analysis.

3.7 Sampling procedure

Stage 1: Define the sampling frame

The study was conducted among primary school children enrolled in primary schools in Moroto District. The district was organized into three sub-counties, and the available primary schools were listed.

Stage 2: Selection of schools

The number of schools selected from each sub-county was determined using Probability Proportionate to Size (PPS). Larger sub-counties/school populations had a greater probability of contributing to the sample than smaller ones. This helped prevent a situation where a small area is overrepresented simply because the same number of schools was selected from every area.

Stage 3: Selection of pupils within the selected schools

Once the schools were selected, a list of enrolled pupils was obtained from each selected school. From each school, 12 pupils were selected using simple random sampling. The dissertation reports that this resulted in 388 respondents.

3.8 Data collection methods and tools

Nutritional status data

Data was collected using semi-structured questionnaire and anthropometric measurement. Interview was done after consent from parents is obtained. Height and weight were be measured by using stadiometer and digital weighing balance as below:

Height: This was assessed using a height board. To measure height subject was first asked to stand straight without shoes on horizontal platform with heels together and hanging the arms loose. Head, buttocks, and shoulder blades in contact with vertical surface of stadiometer. He was asked to take deep breath and stand tall to aid the straightening of the spine and shoulders relaxed. Movable headboard was lowered until it touches crown of head. Height measurement was taken at maximum inspiration, with examiner's eyes in level with headboard to avoid parallax error. Reading was taken to nearest millimetre. For reading falling between two values, lower reading was recorded (Gibson, 1993a).

Weight: This was performed using a weighing scale. Measurement was taken after and minimal clothing. The balance was placed on hard, flat surface and the scale was made zero. Subject was asked to stand unassisted, in the centre of the platform and look straight ahead standing relaxed but still. Body weight was recorded to nearest 0.1 kg (Gibson, 1993b).

Food practices of children: Dietary intake data was collected using a the 24- hour recall method. The 24-hour recall involved asking the participants to report on all the foods and drinks consumed in the previous 24 hours (the previous day), from the first foods in the morning to the last foods before going to bed.

3.9 Quality control

To ensure reliability and validity, research assistants were trained prior to data collection. The tools were pretested on 5% (≈19 pupils) in Moroto to assess clarity and consistency. Adjustments were made accordingly. All anthropometric instruments were calibrated daily, and completed questionnaires were cross-checked for accuracy at the end of each day. Data were anonymized by assigning unique identification codes to each participant to maintain confidentiality.

3.10 Data analysis

Data collected from the study participants were checked for completeness and consistency, coded and entered into Microsoft Excel for cleaning and backup. The cleaned dataset was then exported to Statistical Package for the Social Sciences (SPSS) version 22 for statistical analysis. WHO AnthroPlus version 1.0.4 was used to generate age- and sex-specific anthropometric indices and classify the nutritional status of participants according to the appropriate WHO growth reference standards for children and adolescents aged 8-17 years.

For Objective 1, descriptive statistics were used to determine the prevalence of malnutrition. Height-for-age Z-scores (HAZ) were used to classify stunting, while BMI-for-age Z-scores were used to classify thinness. Weight-for-age Z-scores were used to assess underweight where applicable within the age range for which the WHO reference provides the indicator. Nutritional status outcomes were summarized using frequencies, percentages and corresponding 95% confidence intervals.

For Objective 2, descriptive statistics were used to summarize feeding and dietary practices based on information obtained from the 24-hour dietary recall and additional questions on family meal frequency, dietary supplement use and household food-security coping practices. Categorical variables were summarized using frequencies and percentages, while quantitative dietary variables were summarized using appropriate measures of central tendency and dispersion.

For Objective 3, bivariate analysis was conducted to assess the association between selected independent variables and the nutritional status outcomes. The Chi-square test was used for categorical variables, while Fisher's exact test was applied where the assumptions for the Chi-square test were not met. Variables showing evidence of association at the bivariate level were considered for multivariable analysis. Modified Poisson regression with robust variance was used to determine factors independently associated with stunting, thinness and underweight. Results were presented as adjusted prevalence ratios (aPRs) with corresponding 95% confidence intervals and p-values. Statistical significance was considered at $p < 0.05$.

All statistical analyses were conducted using SPSS version 22, while WHO AnthroPlus version 1.0.4 was used specifically for the generation and classification of anthropometric indices.

3.11 Ethical considerations

Ethical approval was obtained from the Gulu University Research and Ethics Committee (GUREC). Further authorization was sought from the District Health Officer (DHO) and District Education Officer (DEO). At the school level, head teachers granted permission for fieldwork.

Prior to data collection, informed consent forms were sent home with the selected pupils for their parents or guardians to review, sign and return to the school. Only pupils who returned duly signed parental/guardian consent forms were approached for participation. The study was explained to the eligible pupils, and assent was obtained from them before the interview and anthropometric measurements were conducted. Consent forms were available in both English and Ngakarimojong for inclusivity.

3.12 Study limitations

Potential recall bias was anticipated when respondents reported past feeding practices. This was mitigated by employing standardized questionnaires and trained interviewers who used

probing techniques to improve recall accuracy. Additionally, reliance on self-reported household data may have introduced social desirability bias; participants could provide responses they deemed acceptable rather than accurate. This was addressed by explaining the study's purpose and assuring participants of confidentiality.

CHAPTER 4: RESULTS

4.0 Introduction

This chapter presents the findings of the study on nutritional status and associated factors among primary-school children aged 8–17 years in Moroto District, Karamoja Sub-region, Uganda. The results are presented according to the study objectives and include participants' socio-demographic characteristics, household and feeding-related characteristics, nutritional status, and factors associated with stunting and thinness.

Categorical variables are presented using frequencies and percentages, while continuous variables are summarised using medians and interquartile ranges (IQR). Nutritional status was assessed using the WHO 2007 growth reference for children and adolescents aged 5–19 years. Stunting was defined as height-for-age z-score (HAZ) below −2 standard deviations, while thinness was defined as BMI-for-age z-score (BAZ) below −2 standard deviations.

A total of 388 children were included in the analysis. Three observations with biologically implausible HAZ values were excluded from the stunting prevalence denominator, resulting in 385 participants for the HAZ analysis. All 388 participants were included in the BMI-for-age analysis. The anthropometric z-scores was verified using the official WHO AnthroPlus software before final submission.

4.1 Socio-demographic characteristics of study participants

A total of 388 primary-school children aged 8–17 years participated in the study. Of these, 206 (53.1%) were female and 182 (46.9%) were male. The median age was 13.0 years (IQR: 11.0–14.4).

The majority of participants were from rural areas (320; 82.5%), followed by peri-urban areas (62; 16.0%) and urban areas (6; 1.5%).

Table 4.1: Socio-demographic characteristics of study participants

Characteristic	Category	n	%
Sex	Female	206	53.1
	Male	182	46.9
Residence	Rural	320	82.5
	Peri-urban	62	16
	Urban	6	1.5
Age, years	Median (IQR)	13	11.0–14.4

4.2 Household and familial characteristics

Female-headed households accounted for 230 (59.3%) participants, while 158 (40.7%) participants were from male-headed households. The median age of household heads was 31.0 years (IQR: 29.0–37.3).

Regarding educational attainment of household heads, 99 (25.5%) had some primary education, 112 (28.9%) had completed primary education, 127 (32.7%) had some secondary education, 44 (11.3%) had completed secondary education, and 6 (1.5%) had post-secondary education.

The median number of children under five years in the household was 2 (IQR: 0–2), while the median number of siblings was 4 (IQR: 3–5). The number of children under five years in the household was assessed as a household-level characteristic and did not refer to the index child, who was aged 8–17 years. This variable was included to assess whether the presence and number of younger children in the household could influence household resource and food allocation and, consequently, the nutritional status of the school-going child.

Table4. 2: Household and familial characteristics of participants

Characteristic	Category	n (%) / Median (IQR)
Sex of household head	Female	230 (59.3)
	Male	158 (40.7)
Household-head education	Some primary	99 (25.5)
	Completed primary	112 (28.9)
	Some secondary	127 (32.7)
	Completed secondary	44 (11.3)
	Post-secondary	6 (1.5)
Age of household head, years	Median (IQR)	31.0 (29.0–37.3)
Children under five	Median (IQR)	2 (0–2)
Number of siblings	Median (IQR)	4 (3–5)

4.3 Feeding practices and food-security coping strategies

Among the 358 participants with valid responses on family meal frequency, 228 (63.7%) reported that their families ate meals seven days per week. A further 56 (15.6%) reported six days per week, while the remaining participants reported family meals between one and five days per week.

Supplement use was reported by 21 (6.1%) participants, while 324 (93.9%) reported no supplement use among those with valid responses. Among the supplement types recorded, folic acid was the most frequently reported. Other reported supplements included vitamin A, zinc, iron–folic acid (IFA), iron supplements, vitamin C with zinc, and iron with zinc.

Reduced food portion size was the most frequently reported coping strategy, reported by 164 (42.3%) participants. This was followed by reducing the number of meals (103; 26.5%), consuming less preferred or less expensive foods (83; 21.4%), borrowing food (58; 14.9%), and restricting adult consumption to allow children to eat (56; 14.4%).

These coping strategies represent individual reported behaviours and were not combined into a composite household food-insecurity measure.

Table 4.3: Feeding practices and coping strategies

Indicator	Response	n	%
Family meal frequency	7 days/week	228	63.7
	6 days/week	56	15.6
	5 days/week	27	7.5
	4 days/week	21	5.9
	3 days/week	19	5.3
	2 days/week	6	1.7
	1 day/week	1	0.3

Supplements	Yes	21	6.1
	No	324	93.9
Coping strategy	Reduced portion size	164	42.3
	Reduced number of meals	103	26.5
	Less preferred/less expensive foods	83	21.4
	Borrowed food	58	14.9
	Restricted adult consumption	56	14.4

4.4 Nutritional status of study participants

Among the 385 participants with biologically plausible HAZ measurements, 58 were classified as stunted, giving a prevalence of 15.1% (95% CI: 11.8%–19.0%). Severe stunting was observed in 21 (5.5%; 95% CI: 3.6%–8.2%) participants.

Thinness was observed in 64 of the 388 participants, corresponding to a prevalence of 16.5% (95% CI: 13.1%–20.5%). Severe thinness occurred in 10 (2.6%; 95% CI: 1.4%–4.7%) participants.

In addition, 20 (5.2%; 95% CI: 3.4%–7.8%) participants were classified as overweight, while 2 (0.5%; 95% CI: 0.1%–1.9%) were classified as obese.

Table 4.4: Nutritional status of study participants

Indicator	Classification	n/N	%	95% CI
HAZ	Stunting (<−2 SD)	58/385	15.1	11.8–19.0
	Severe stunting (<−3 SD)	21/385	5.5	3.6–8.2
BMI-for-age	Thinness (<−2 SD)	64/388	16.5	13.1–20.5

	Severe thinness (<−3 SD)	10/388	2.6	1.4–4.7
	Overweight (>+1 SD)	20/388	5.2	3.4–7.8
	Obesity (>+2 SD)	2/388	0.5	0.1–1.9

4.5 Bivariate analysis of factors associated with nutritional status

At bivariate analysis, stunting was statistically associated with household-head education (p=0.015) and family meal frequency (p=0.047).

For thinness, statistically significant associations were observed with household-head age group (p=0.026), number of children under five years in the household (p=0.020) and reported reduction in the number of meals (p=0.020).

These findings represent unadjusted associations and therefore do not establish independent relationships between the variables and nutritional outcomes.

Table 4.5: Variables significantly associated with nutritional outcomes at bivariate analysis

Outcome	Variable	p-value
Stunting	Household-head education	0.015
Stunting	Family meal frequency	0.047
Thinness	Household-head age group	0.026
Thinness	Children under five years	0.02
Thinness	Reduced number of meals	0.02

4.6 Multivariable analysis of factors associated with nutritional status

Modified Poisson regression with robust variance was used to estimate adjusted prevalence ratios (aPRs). The stunting model included 358 participants and 57 stunting cases, while the thinness model included all 388 participants and 64 thinness cases.

4.6.1 Factors associated with stunting

After adjustment, family meal frequency was the only factor statistically associated with stunting. Each additional reported day of family meals per week was associated with a higher prevalence of stunting (aPR=1.325; 95% CI: 1.010–1.739; p=0.042).

Household-head education was not statistically significant after adjustment (aPR=1.587; 95% CI: 0.946–2.662; p=0.081). Age, sex, residence, sex of household head, number of children under five years, consumption of less preferred or less expensive foods, and reduced portion size were also not statistically associated with stunting.

Table 4.6: Adjusted factors associated with stunting

Variable	aPR	95% CI	p-value
Age, years	1.02	0.922–1.127	0.702
Female sex vs male	0.882	0.555–1.402	0.596
Urban/peri-urban vs rural	0.647	0.309–1.357	0.25
Female household head	0.981	0.578–1.663	0.942
Secondary+ education vs primary	1.587	0.946–2.662	0.081
Children under five	1.099	0.834–1.448	0.503
Family meal days/week	1.325	1.010–1.739	0.042

Less preferred/less expensive foods	0.687	0.296–1.595	0.382
Reduced portion size	1.274	0.735–2.208	0.388

4.6.2 Factors associated with thinness

After adjustment, the number of children under five years in the household and reported reduction in the number of meals were statistically associated with thinness.

Each additional child under five years in the household was associated with a higher prevalence of thinness (aPR=1.300; 95% CI: 1.007–1.678; p=0.044).

In contrast, reporting a reduction in the number of meals was inversely associated with thinness (aPR=0.435; 95% CI: 0.223–0.849; p=0.015).

Age, sex, residence, sex of household head, household-head education and number of siblings were not statistically associated with thinness after adjustment.

Table 4.7: Adjusted factors associated with thinness

Variable	aPR	95% CI	p-value
Age, years	1.074	0.980–1.176	0.127
Female sex vs male	0.894	0.574–1.393	0.621
Urban/peri-urban vs rural	0.936	0.528–1.658	0.82
Female household head	1.265	0.759–2.110	0.367
Secondary+ education vs primary	1.457	0.909–2.335	0.118
Children under five	1.3	1.007–1.678	0.044

Number of siblings	0.941	0.808–1.096	0.434
Reduced number of meals	0.435	0.223–0.849	0.015

The inverse association between reduced meal frequency and thinness was contrary to the expected direction. This finding is presented as an observed statistical association and should be interpreted cautiously. The cross-sectional design does not permit determination of temporality or causality

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This study assessed the prevalence and factors associated with malnutrition among primary school children aged 8–17 years in Moroto District, Karamoja Sub-region, Uganda. The study used height-for-age and BMI-for-age based on the WHO 2007 growth reference for school-aged children and adolescents. Geographically, the study covered rural and municipal settings, with North and South Divisions representing the predominantly urban/municipal component, while Nadunget, Katikekile, Rupa and Tapac predominantly represented rural settings. At participant level, 82.5% were from rural areas, 16.0% from peri-urban areas and 1.5% from urban areas. Overall, 15.1% of participants were stunted, 16.5% were thin, 5.2% were overweight and 0.5% were obese, while severe stunting and severe thinness were observed in 5.5% and 2.6%, respectively.

These findings demonstrate the coexistence of undernutrition and excess weight among school-going children across the geographical settings represented in Moroto District.

5.2 Prevalence of malnutrition

5.2.1 Prevalence of stunting

The prevalence of stunting in this study was 15.1%, indicating that approximately one in every seven school-going children assessed had evidence of chronic undernutrition. This finding demonstrates that impaired linear growth remains an important nutritional concern among school-aged children in Moroto District. Stunting generally reflects the cumulative effects of prolonged inadequate dietary intake, recurrent infections and adverse household and environmental conditions experienced over time.

The prevalence observed in this study was somewhat higher than the 11.9–12.7% reported by Comandini et al. (2019) among Ugandan schoolchildren. The difference may reflect variation in the geographical and socioeconomic characteristics of the study populations. The present study was conducted in Moroto District in the Karamoja Sub-region, where households may experience challenges related to food availability, dietary quality and access to essential services. However, these explanations should be interpreted as possible contextual factors rather than direct causal mechanisms because the cross-sectional design of the present study cannot establish causality.

The finding should also be considered within the broader nutritional context of Karamoja. National surveys and previous studies have consistently documented a substantial burden of undernutrition within the sub-region. Nevertheless, direct numerical comparison with the Uganda Demographic and Health Survey should be made cautiously because UDHS anthropometric estimates primarily concern children under five years of age, whereas the present study assessed school-going children aged 8–17 years. The UDHS findings are therefore more appropriately used to demonstrate the broader nutritional vulnerability of the region rather than as an age-equivalent prevalence comparison.

The persistence of stunting into school age is of particular concern because linear growth deficits may represent nutritional deprivation accumulated earlier in childhood and continuing nutritional constraints during later growth. The observed prevalence therefore highlights the importance of extending nutrition assessment and interventions beyond the under-five

population to include school-aged children and adolescents, particularly in nutritionally vulnerable settings such as Moroto.

The prevalence of stunting in this study was 15.1% among participants with valid height-for-age measurements, while 5.5% had severe stunting. Stunting reflects impaired linear growth resulting from prolonged exposure to nutritional inadequacy, recurrent illness, and other adverse environmental conditions. Although much of the global evidence on stunting focuses on children below five years, impaired linear growth may persist into school age and adolescence, making continued attention to this age group important (Black et al., 2013; Akombi et al., 2017).

The finding therefore supports the need for interventions that extend beyond the under-five period and incorporate school-age nutrition within broader maternal, child, adolescent, and household nutrition programming.

5.2.2 Prevalence of thinness

Thinness was observed in 16.5% of participants, while severe thinness was present in 2.6%. Thinness among school-aged children and adolescents is generally assessed using BMI-for-age. The WHO 2007 reference classifies thinness as BMI-for-age below −2 SD and severe thinness as below −3 SD (World Health Organization [WHO], 2007).

The prevalence of thinness observed in Moroto was higher than the 3.3%–3.7% reported among Ugandan schoolchildren in the study by Comandini et al. (2019). The difference may be related to the contrasting socioeconomic and food-security environments in which the populations were studied. Moroto District is exposed to recurrent food shortages and other livelihood-related challenges that may affect household food access and dietary adequacy.

However, the prevalence was lower than the pooled prevalence of approximately 22% reported among Ethiopian schoolchildren in a systematic review and meta-analysis (Hailegebriel, 2020). Similarly, studies among school-age children in other sub-Saharan African settings have reported considerable variation in thinness prevalence, reflecting differences in household food security, dietary diversity, infection burden, socioeconomic status, and environmental conditions (Akombi et al., 2017).

The observed prevalence nevertheless indicates that acute or current nutritional inadequacy remains relevant among school-going children in Moroto. Unlike stunting, which reflects long-term growth impairment, thinness may be more responsive to recent changes in food availability, illness, and energy requirements. School-aged children and adolescents experience periods of increased nutritional requirements because of growth and physical activity, and inadequate dietary intake during these periods may contribute to low BMI-for-age.

5.2.3 Overweight and obesity

The study identified overweight in 5.2% of participants and obesity in 0.5%. These findings demonstrate that the nutritional profile of school-going children in Moroto includes not only undernutrition but also excess weight.

The presence of overweight and obesity alongside stunting and thinness illustrates the coexistence of different forms of malnutrition within the same population. This is consistent with the broader global nutrition transition in which undernutrition continues to affect vulnerable populations while overweight and obesity are increasingly observed among children and adolescents (Black et al., 2013).

The WHO 2007 growth reference defines overweight as BMI-for-age above +1 SD and obesity as above +2 SD among children aged 5–19 years (WHO, 2007). Although the prevalence of overweight and obesity in the current study was relatively lower than the prevalence of undernutrition, their presence is important for nutrition programming because childhood excess weight is associated with increased risk of obesity and non-communicable diseases later in life (WHO, 2025).

The findings therefore support an integrated approach to school nutrition that does not focus exclusively on undernutrition. School-based nutrition education, healthy food environments, physical activity, and appropriate dietary practices should be considered alongside interventions addressing food insecurity and undernutrition.

5.3 Factors associated with malnutrition

5.3.1 Family meal frequency and stunting

Family meal frequency ranged from one to seven meals per week, with a median of seven meals per week (IQR: 6–7)

In the adjusted analysis, family meal frequency was independently associated with stunting (aPR = 1.325, 95% CI: 1.010–1.739; p = 0.042). This indicates that the distribution of meal frequency within the household was statistically related to the prevalence of stunting after adjustment for the other variables included in the model.

The association is biologically plausible because household meal patterns may reflect the availability and regularity of food within the household. Where household food resources are inadequate, children may experience reduced access to sufficient energy and nutrients, particularly when food must be shared among several household members. Previous studies among schoolchildren have reported relationships between meal frequency and nutritional status. A systematic review and meta-analysis among Ethiopian schoolchildren found that children consuming three or fewer meals per day had higher odds of stunting compared with those consuming more than three meals per day (Hailegebriel, 2020). Similarly, Berhanu et al. (2022) reported an association between low meal frequency and stunting among school-aged children in Ethiopia.

The direction and magnitude of the association in the present study should nevertheless be interpreted cautiously because family meal frequency is not a direct measure of the nutritional adequacy or dietary diversity of meals. The number of meals consumed does not necessarily indicate the quantity, nutrient composition, or quality of foods consumed. Furthermore, because this study was cross-sectional, the temporal relationship between household meal patterns and stunting cannot be established.

5.3.2 Number of children under five and thinness

The number of children under five years in the household was independently associated with thinness (aPR = 1.300, 95% CI: 1.007–1.678; p = 0.044). This suggests that children living in households with a greater number of young children had a higher prevalence of thinness.

One possible explanation is that households with several young children may face greater demands on food, caregiving time, and household resources. Where food availability is constrained, competition for household resources may affect the quantity and quality of food available to school-aged children. Evidence from sub-Saharan Africa indicates that household socioeconomic circumstances and family characteristics are important contributors to childhood undernutrition (Akombi et al., 2017). Similarly, evidence from schoolchildren in

Ethiopia has identified larger family size as a factor associated with stunting and thinness (Hailegebriel, 2020).

The finding should, however, not be interpreted as demonstrating that having more young children directly causes thinness. Household composition is closely related to other factors such as household income, food availability, caregiver workload, and resource allocation, which may not have been fully captured in the analysis.

5.3.3 Reported reduction in the number of meals and thinness

An inverse association was observed between reporting a reduction in the number of meals and thinness (aPR = 0.435, 95% CI: 0.223–0.849; p = 0.015). This finding was unexpected because reduced meal frequency would generally be expected to reflect household food constraints and potentially increase nutritional vulnerability.

Similar research has generally reported that lower meal frequency is associated with greater risk of undernutrition. For example, Hailegebriel (2020) found that lower meal frequency was associated with increased risk of stunting among schoolchildren, while research in East Dembia, Ethiopia, reported greater odds of thinness among children consuming fewer meals per day (Sisay et al., 2022).

The discrepancy between these findings and the present study may be explained by several possibilities. First, the variable captured reported household coping behaviour rather than objectively measured individual dietary intake. Second, reverse causation may have occurred, whereby households experiencing nutritional or health concerns among children changed their reported meal practices. Third, reporting differences and residual confounding may have influenced the observed relationship. It is also possible that households reducing meal frequency compensated through larger portions or more energy-dense foods during the meals that were retained.

Therefore, the inverse association should not be interpreted as evidence that reducing meal frequency protects against thinness. The cross-sectional study design prevents determination of the temporal sequence between household coping behaviour and nutritional status. Prospective studies using repeated dietary measurements would be more appropriate for investigating this relationship.

5.3.4 Age, sex and other demographic characteristics

Age was not independently associated with stunting or thinness in the adjusted analysis. This finding differs from evidence from several school-based studies in which nutritional status varied significantly with age. For example, Hailegebriel (2020) reported increased odds of stunting among older schoolchildren, while Comandini et al. (2019) demonstrated the importance of accurate age determination when estimating nutritional status among Ugandan schoolchildren.

The absence of an independent association in the present study may reflect the relatively narrow age range of the participants, differences in the underlying nutritional environment, or adjustment for household characteristics that may have accounted for part of the observed variation.

Similarly, sex was not independently associated with either stunting or thinness. This contrasts with some evidence from sub-Saharan Africa, where sex differences in nutritional outcomes have been reported. Akombi et al. (2017), for example, identified child sex as one of the factors associated with undernutrition across studies in sub-Saharan Africa. Differences between studies may reflect variations in cultural practices, dietary allocation, physical activity, disease exposure, and the socioeconomic context of the study populations.

Place of residence, sex of the household head, educational level of the household head, and number of siblings were also not independently associated with the nutritional outcomes after adjustment. The absence of statistical significance does not necessarily mean that these factors have no relevance to nutritional status. Rather, their effects may be mediated through other household, socioeconomic, dietary, environmental, or health-related pathways.

5.4 Strengths of the study

This study provides district-specific evidence on nutritional status among school-going children aged 8–17 years in Moroto District, an age group and geographical setting for which empirical nutritional data are relatively limited.

The study used standardized anthropometric measurements and the WHO 2007 growth reference for school-aged children and adolescents. The WHO reference provides standardized methods for assessing height-for-age and BMI-for-age among children aged 5–19 years (WHO, 2007).

The study also assessed both undernutrition and excess weight, allowing the nutritional profile of the study population to be considered more comprehensively rather than focusing on a single form of malnutrition.

In addition, the study collected household and dietary information, allowing nutritional outcomes to be examined in relation to selected household characteristics and food-related coping practices.

5.5 Limitations of the study

The cross-sectional nature of the study limits the ability to establish temporal or causal relationships between household characteristics, dietary practices and nutritional status. Therefore, the associations identified in this study should be interpreted as statistical relationships rather than evidence of causality.

Information on household food practices and coping strategies was largely self-reported and may have been subject to recall and reporting bias. Similarly, the 24-hour dietary recall reflected food consumption during the preceding day and may not fully represent the participants' usual dietary intake.

The study did not collect detailed information on parental employment, occupation or household income. Consequently, their potential influence on the nutritional status of participating children could not be directly assessed. Although household-head education and other household characteristics were evaluated, these variables may not fully represent the socioeconomic circumstances of the households.

In addition, the study did not specifically assess the nutritional quality and diversity of family meals or school feeding practices. Family meal frequency represented the number of times per week a child reported eating with the family and should therefore not be interpreted as a measure of dietary adequacy.

Finally, anthropometric indicators provide important measures of physical growth and nutritional status but do not directly assess micronutrient deficiencies, infection or other underlying biological factors. The findings should therefore be interpreted within the broader household, dietary, socioeconomic, environmental and health context of Moroto District.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study assessed the prevalence and factors associated with malnutrition among primary school children aged 8–17 years in Moroto District, Uganda.

The findings demonstrated the coexistence of undernutrition and overnutrition, with stunting affecting 15.1% and thinness 16.5% of participants, while overweight and obesity affected 5.2% and 0.5%, respectively.

Family meal frequency was associated with stunting, while the number of children under five years was associated with thinness.

An unexpected inverse association was observed between reduced meal frequency and thinness, which should be interpreted cautiously given the cross-sectional design.

Overall, the findings highlight the multifaceted nature of malnutrition among school-going children and the need for integrated interventions addressing household food access, dietary practices, and broader socioeconomic factors.

6.2 Recommendations

- Nutrition interventions targeting school-going children in Moroto District should consider both household and school-age nutritional needs, with particular attention to the prevention of stunting and thinness. Nutrition education should be strengthened among children, parents and caregivers to promote adequate meal frequency, dietary diversity and nutritionally balanced meals using locally available foods.
- Given the observed household food-related coping practices, interventions should also address household food insecurity and strengthen access to adequate and diverse foods, particularly among vulnerable households.
- Strengthen household nutrition education and dietary practices. Nutrition education targeting parents, caregivers, and communities should emphasize adequate meal frequency, dietary diversity, appropriate food allocation within households, and the nutritional requirements of school-aged children. Particular attention should be given to households with young children and other characteristics associated with increased demands on household food resources.

- Strengthen nutrition-sensitive school feeding and food security interventions in Karamoja. School feeding programmes should continue to be strengthened and adapted to the local context, with emphasis on adequate nutrient content, dietary diversity, food safety, and sustainable local food systems. Where feasible, linkages with household food production, local procurement, and community-based nutrition interventions should be promoted.

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APPENDICES

Appendix 1: Activity Plan

Activity		February	March	April	May

	January																			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Approval from GUREC																				
Pretesting questionnaires																				
Data collection																				
Data entry																				
Analysis and interpretation																				
Report writing																				
Dissemination of results																				
Submission																				
Report final																				

Appendix 2: Budget

Items		Quantity of item	No. of days	Unit cost	Total cost
1	Supervisor	1		100,000	100,000
2	Lunch	2	20	25,000	500,000

3	Paper	1 ream		30,000	300,000
4	Pens	1 box		45,000	45,000
5	Internet	1		100,000	100,000
6	Proposal printing	4			300,000
7	Proposal binding	4			50,000
8	Questionnaire printing	384		800	614,000
9	Laptop 1	1		3,400,000	3,400,000
10	Consent printing	384			614,000
12	PPE				200,000
13	Transport refund for the study participants.	384		10,000	3,840,000
14	Thesis				
15	Printing	4			320,000
16	Binding	4			50,000
Total					15,073,000

Appendix 3: COVID 19 Mitigation plan

Study Title: **Prevalence and associated factors of malnutrition among school children in moroto district, karamoja sub-region, nothern uganda**

Principal Investigator: Edimu David Mark

Introduction.

The novel Coronavirus is transmitted from human to human through droplets and direct or close personal contact with an infected individual.

Novel Coronavirus signs of infection include respiratory symptoms, fever, cough, shortness of breath and breathing difficulties. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death.

In light of the COVID-19 pandemic, the study will ensure safety of the research team and the study participants using the standard operating procedures set up by ministry of health Uganda which include the following.

Personal screening. The PI and the research assistant and the participants was screened for daily temperature during the engagement, and anyone found with an elevated temperature of greater than 37.20 C shall be referred to the covid-19 team for further assessment and management; these participants can be allowed to be involved in the study provided they come back when they are cleared.

Face mask and hand washing. The PI and the research team will ensure that facemasks are put on properly, covering the nose and the mouth and using the hand washing facility.

Data collection: The PI and the research assistant will ensure that a private room is identified with adequate spacing for the counselling and interview with both putting on a face mask. Soap and water plus sanitizer are available and physical contact is strictly not allowed except during consent writing and taking off the blood sample.

During the consent writing the PI and research assistants will observe a 2-meter distance and both the PI and team will wash hands on arrival and the pens used shall be sanitized after every participant.

Appendix 4: Informed assent form English version 3.0

For children 8 years to 17 years and persons incapable of self determination

I am Edimu David Mark, Nutritionist by profession and master's in public health student at Gulu University. I am conducting a study on the Prevalence and associated factors of malnutrition among school children in Moroto district.

Objectives of the study

This study seeks to determine the prevalence and associated factors of malnutrition among school children in Moroto district and this information lies in its potential to unveil the prevalence of malnutrition among school children in Moroto District and uncover the underlying factors contributing to this issue. The findings provide a foundation for evidence-based interventions and policies that address the unique needs of primary school-going children

in the region. You have been identified as a participant for this study, and I am kindly requesting you to take part.

Study procedure: You were chosen to participate in this study because you receive your education from one of the sampled schools in this location. An overall 384 participants. Assessment for anthropometry will involve taking height, weight and MUAC for children.

Benefits: This information lies in its potential to unveil the prevalence of malnutrition among school children in Moroto District and uncover the underlying factors contributing to this issue. The findings provide a foundation for evidence-based interventions and policies that address the unique needs of primary school-going children in the region.

Compensation: In this study, participants, including both caretakers and children, was compensated to ensure their participation is valued and facilitated effectively. Compensation will cover various aspects to address their needs comprehensively. Provisions was made for food and refreshments during the study sessions to ensure participants are comfortable and nourished throughout their involvement. This ensures that participants do not face any inconvenience or financial strain while participating in the study, fostering a conducive environment for their engagement and cooperation.

Risks There is no foreseeable risk of harm or discomfort that will arise from your participation in this study. The only risk or discomfort was the inconvenience in terms of time.

Confidentiality: Any information obtained from you that identifies you by name was kept private and secure in a locked place and was accessed only by the principal investigator, the research team or Gulu University Research and Ethics Committee (GUREC) members. We will not identify you by your name. The soft copy of the information obtained from you was kept in a password- protected computer that is only accessible by the research team and the GUREC members.

Participants' rights: Your participation in this study is entirely voluntary and refusal to participate will not in any way make you be discriminated against. You are free to withdraw from the study at any stage in case you feel that your rights are not being respected or if you are not comfortable with the study procedure. If you choose to withdraw, all your information previously collected was destroyed and not used as part of the data analysis or dissemination. In case you still have more questions regarding this study, you may call **Mr. Edimu David Mark** on **0783022081**. In case of any questions regarding confidentiality or your rights as a study participant please contact the Chairperson of Gulu University Research and Ethics Committee, Dr. Gerald Obai on +256772305621.

Assent statement: I have been informed of this study on the prevalence and associated factors of malnutrition among school children in Moroto district. I have been given enough explanation about the study procedures, benefits, risks, and my rights as a participant in this study. I am aware that participation in this study is entirely voluntary and that I can withdraw, without prejudice, from the study at any stage in case I do not feel comfortable with the procedure or study. I understand that it will not affect my access to the healthcare that I will receive from this health facility or any other social services/facilities that I intend to access/visit. I therefore accept to take part in this study as a study participant.

Name of child/Respondent	**Signature/ thumbprint**	**Date**
……	……	…….
Investigator 's/ research assistant's name	**Signature**	**Date**
……	……..	…….
Name of Witness	**Signature/thumbprint**	**Date**
…….	…….	……

Appendix 5: Informed Assent form Ngakaramojong version 3.0

Arai ayong Edimu mark, Nutritionist ka arai ayong akasioman a masters alotooma Gulu university torai cho nguna etapito angaleu. Ayai ayong akitiya akisiom nguna etapito epite ngolo eyakar akorod alotooma ngikathiomak alo edistrict amoroto.

Alosikinet ka akisiom ana: Erai akisiom na ngina etapit ngakiro nguna ka akorod alotooma ngidwe ngulu ethiomete alo buku ngolo amoroto ka erai ngiyemuto lu ngulu etodunete etiai ka akorod alotooma ngidwe ngulu ethiomete alotoma edistrkit amoroto ka akitodun nguna ikamanara ka ngakiro nu. Akiro nguna erukauno ngesi ingarakini anyun epite ngolo esubakinere ngikisila nguna ingarakinete ngakiro nguna etapito ngidwe ngulu ethiomete a lo Moroto.

Epite ngolo alosio akisiom na: Aponi ikiseun yong alomar na kisiom na kotore irai iyong ngini esiomit alotooma epei sukul ngolo eseuntai ane. Ngitunga 384 ngesi eseuntai. Elosio akisitiya ngakiloi, awoyau ka MUAC akipimia ngidwe.

Ngajokisio: Kotoma o study a lo, eduwe kada ewuriaka lu echamunete abongonikin akosi akiro nesu ebeit ka dumu e lunch kada ebore yen aimat. Teter engarakin etunga abongonokin angisi ngiseta ejok anu etunga mam e tumor o yarite kesi etenge dang!

Ngatokisio: Emam ngatiokisio kode arionis ngina eriamum alotooma akon lomar nakisiom na. Ationis ngina elomuni bon ngesi ngisai ngulu elosio akisitia.

Await ngakiro nguna imoruni iyong ka nyituan: Ngidi yemuto ngulu eriamuntai anenikon ka kisitiatete ekon kiror ngesi ingadario neni ajokan ka erauni ekeripiripan ngolo apolon, Ngikasiomak a Gulu kode University Research and Ethics Committee (GUREC) members. Mam ngelimorio ekon kiror. Ngiyimuto kon ngun iwakino na komputa ngina eyakar nginambai ka erauni ngitunga ka akisiom ka

Ngapedorosio ka akasioman: Alomar kon nakisiom na ngesi erai ngina ikwangin ka awoun kon alomar nakisiom na ngesi mam ngeinakini iyong alemario alotooma idi bore daadang. Ipedori tar iyong aisikin akisiom na edi saat daadang kirukau iyong atemar ebe emam ngekeritai ngakon pedorosio kode emam ngikitalakarit iyong epite ngolo elosio akisiom na. Kicamak iyong aisikin akisiom na, ngiyemuto kon ngulu athir keraraun ngesi elosio acakar ka ngisitiao nabo. Ke ya ngakingisingiseta nguna iyakar iyong totapito akisiom na, ipedori iyong aramakin Mr Edimu David Mark alo namba lo 0783022081. Ke ya ngakingisingiseta nguna iyakar iyong totapito ngakon pedorosio ikwa ituan ngini eyai nakisiom na, toramak e chairman ngolo Gulu University Research and Ethics Committee, Dr Derald Obai alo namba lo 0772305621.

Alimokinet ka acamakinet: Aponi akalimokin ayong nguna ka akisiom ana kotere ngakiro nguna etapito akorod alotooma ngidwe ngulu ethiomete alo buku a Moroto. Aponi akalimokin ayong daadang epite ngolo elosio akisiom na, ngajiokisio, ketakanut nguna aronok, ka ngaka pedorosio ikwa nyituan ngini elosi alomar nakisiom na. ayeni da atemar ebe alomar nakisiom na erai ikwangin ka apedori da awosikin edi saat daadang kariam ayong atemar ebe emam ngejok epite ngolo elosio akisiom. Ayeni nabo dang atemar ebe emam ngekebukini ayong ariamun ngadi kingarakinet alotooma edakitar lo kode alodaktarin ngulu ce. Acamak ayong alomar nakisiom ikwa akasioman.

Ekiror ka ikoku/akabongonokinon	Akicemakin/Akikong	Ngirwa ke elap
……	……	…….
Ekiror ka ekeripiripan	Akicemakin/akikong	Ngirwa ke elap
……	……..	…….
Ekiror ka Esuda	Akicemakin/Akikong	Ngirwa ke elap
…….	…….	……

Annex 6: Data collection tools English version 2.0

SECTION A: IDENTIFICATION INFORMATION			
Household ID		**Enumerator ID**	
A1.	District Name	A2.	Sub-county Name:
A3.	Parish Name:	A4.	Village Name:
A5.	Residence: (circle one) Rural = 1 urban = 2 peri-urban=3		
SECTION B: SOCIODEMOGRAPHIC CHARACTERISTICS			
B1.	Sex of [CHILD]:		1. Male 2. Female
B2.	On what day, month and year was [CHILD] born?		
B3.	Parity of the INDEX child (Number in the order of birth)		
B4.	How many children under five years are there in this household?		
B5.	How many siblings does the INDEX child have?		
B6.	Is the INDEX child of multiple birth?		1. Yes 2. No
B7.	Does the child have any disability?		1. Yes 2. No
B7a	If yes, mention the disability.		1. Blind 2. Lame 3. Others Specify.....

B10.	What is the gender of the household head	1. Male 2. Female
B11.	What is the age of the household head	
B12.	What is the highest level of education of the head of the household?	1. Some primary 2. Completed primary. 3. Some secondary. 4. Completed secondary. 5. Post-secondary education.

24hr recall questionnaire: Kindly describe what you ate in the past 24 hours stating the time, meal given, types of food used, method of preparation, and estimated amounts/household measure.

PARTICIPANT ID:			VISIT CODE:		
Time (starting 24 hours ago)	Meal description (e.g., beans stew)	Food items contained (e.g., dry beans, tomatoes, onions, and cooking oil….)	Method of preparation (e.g., boiling, stewing, frying etc.)	Household measure (e.g., lado, tablespoon, teaspoon, handful, fistful etc.)	Estimated amount in grams or Liters

Q1. How many times per week do you eat meals with your family? ……..			
Q2. Are you taking any dietary supplements, vitamins, or minerals?.....……			
Q3. If yes	At least once / day	At least 2-3 times / week	At least once / week
Q4. Please specify the type of dietary supplements, vitamins, or minerals that you take.			

Assessment of household food insecurity using copying strategy index

During the last 7 days, were there days (and, if so, how many) when your household had to employ one of the following strategies (to cope with a lack of food or money to buy it)? **READ OUT STRATEGIES**	Yes	Number of days	No
1. Relied on less preferred, less expensive food			
2. Borrowed food or relied on help from friends or relatives			
3. Reduced the number of meals eaten per day			
4. Reduced portion size of meals			
5. Restricted consumption by adults in order for small children to eat			

Nutritional status of the child

Date of birth	
Sex of the respondent	1. Male 2. Female
Height	
Weight	

Annex 7: Data collection tools Ngakaramojong version 2.0

Abarua ngina iraraunere ngiyemuto.

ANGEUN : APOPLAI ANU AJENANAR			
Ajenar a lo ekai		**Ajenari a lo ewadikai**	
A1.	Ekiror a nyedistrikt:	A2.	Ekiror a nyesub:
A3.	Ekiror a nyeparish:	A4.	Ekiror a nyere:
A5.	Ere (toseu epei) Echalo= 1 Lotaun=2		
NIYAIREKINI			
B1.	inyona ikoku:		3. ikile: 4. ipethe:
B2.	Ani kolongit, elap ka Ekaru edounere inges (ikoku)?		
B3.	ngini angiai ikoku en.		
B4.	Ngiai ngidwe ngulu angilapio ngikan kwap eya lokeno lo?		
B5.	Ngikaitotoi ngiai eyakar ikoku en ?		
B6.	Erai ikoku en imut a ?		3. Eeee 4. Eee
B7.	Eyakar ikoku en adi ngwalu a ?		3. Eee 4. Emam
B7a	Kerai Eeee, Tolimo angwalu ngin.		4. Amudukanut 5. Engwalit 6. Ngulu che Tolimo……

B10.	Inyona Itunganan ngini epolokinit ekal	3. Ekile 4. Aberu
B11.	Ngiai ngikaru anyituan ngini epolokinit ekal	
B12.	Ngiai Ngakilathia edolit apolokinon a nyekal?	6. Ngadi kilathia nguna alokwap 7. Irikakinit ngakilsthia nguna a lokwap 8. Ngadi kilathia nguna a lo kuju 9. Irikikinit Ngakilathia nguna a lo kuju 10. Ngakilathia nguna a lo kuju

ANGISNGISETA ANU APARAN KERE

Tolimok so eboru lu ki nyamit jo akawulo na ikenyuna jo, enyamat lu egel gela, epono lo oponi epoyere kes, e sisin lu openo okori kada ainyam jik

Ajenut ka lo ingisngisi:	Lu ebunitor:

Essawa Ageun anu ekunyuna jo	Enyamat Tolimokinai	Enyamat lu ajasi arai enyanya, emutungulu arai awuto	Epono lo opni epoyere kara eidor,	Eponu lu maritotor akai kus kara aijiko, akan kere	Eimarit alu e grams

Q1. Ngarwa ngai alotooma esabit imori			
Q2. Immasi ediyo kia lo etogogoni ekur la kuwan?.....……			
Q3. Arai emasi jo	Erwani edope otoma aparan	Erwani eyare arai ewuni otama esabiti	Erwani edope otoma essabiti
Q4. Tolimok so eboro nu enyqmi jo qnu etogogon akuwan			

Ariprip ationis ka akimuj alotooma ngikalia isitiao ngiboro ngulu ka ariprip.

Alotooma ngirwa ngikankare nguna alunyar, aya ngarwa (kerai Eeee, ngarwa ngai) isitiai ekon kal ngipitesio nu (kotere amamkauno ka akimuj kode ngisilinga ngulu egelunere akimuj)? **TOSIOM NGIPITESIO**	Eeee	Ngarwa ngai	Emam
1.Arai cha arukaun akimuj ngina mam ngeminai kode ngina epatana etiai.			
5. Elipunio akimuj kode arai akidareun a kingarakinet aneni angikonei kode ateker.			
6. Aponi kinyipunai ngarwa nguna emujere akimuj alotooma aparan			
7. Kitiditeunai etiai ka akimuj			
11. Apon kimikai ngitunga ngulu apolok a kimuja kotere kimuji ngidwe ngulu chichik.			

Angaleu a ikoku

Ngirwa ngulu edounere	
Inyona akabongonokinon	3. Ekile 4. Ngapethe
Awoyau	
Ngakiloi	

Annex 8: Informed consent form for the recruitment of research participants English version 2.0

Title of the study: **Prevalence and associated factors of malnutrition among school children in moroto district, Karamoja sub region.**
Investigator(s): Mr. Edimu David Mark

Institution(s): Gulu University, Faculty of Medicine

Introduction: My name is Edimu David Mark a student pursuing a master's in public health at Gulu University. This informed consent explains the study to you. After the study has been explained, any questions you may have been answered. When you have decided to permit you child to participate in the study, you was asked to sign a consent, which you was given a copy to keep.

A brief description of the sponsors of the research project

Purpose: The study seeks to determine the prevalence and associated factors of malnutrition among school children in Moroto district. The findings of this study will help in its potential to unveil the prevalence of malnutrition among school children in Moroto District and uncover the underlying factors contributing to this issue. The findings provide a foundation for evidence-based interventions and policies that address the unique needs of primary school-going children in the region.

Procedures: Your child's participation in this study will involve anthropometric measurement which will involve taking their height, weight and MUAC estimation.

Who will participate in the study?

Your child has been chosen to participate in this study because your child is learning in the school which has been sampled out for the study. The interview will last for approximately 30 minutes and an overall 384 participants will take part in the study.

Risks/discomforts: There is no foreseeable risk of harm or discomfort that will arise from your participation in this study. The only risk or discomfort was the inconvenience in terms of time spent during the interview.

Benefits: This study seeks to determine the prevalence and associated factors of malnutrition among school children in Moroto district.

Confidentiality: Your child's identity will not be revealed to any one as we shall only use codes to identify participants. Information obtained will only be accessible by the research team. Soft copies of the data was protected by password and hard copy files was kept under lock and key. Confidential information will only be accessed by the principal investigator.

Alternatives: Your child does not have to participate in this study if he/she is not interested. Your child will not lose any benefit in case of no participation.

Cost: There will not be any additional cost incurred as a result of participating in this study.

Questions: If you or your child has any questions related to the study as a research participant, you or your child can contact the principal investigator, Edimu David Mark on telephone number 0783022081/0701407064 or via email on mjeff31@gmail.com

Statement of voluntariness: Participation in the research study is voluntary and your child may join on his or her own free will. Your child has a right to withdraw from the study at any time without penalty.

If you have any issues pertaining to your rights or your child's rights and participation in the study, please contact the Chairperson, Gulu University Research Ethics Committee, Dr. Gerald Obai Tel: No. 0772305621; E-Mail: lekobai@yahoo.com/lekobai@gmail.com; or the Uganda National Council for Science and Technology, on plot 6 Kimera Road, Ntinda, Kampala on Tel 0414705500.

Statement of consent: ..... has described to me what is going to be done, the risks, the benefits involved and my rights and child's rights as a participant in this study. I understand that my decision to permit my child to participate in this study will not affect me or my child in any way. In the use of this information, my child's identity was concealed. I am aware that I my child may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights or my child's legal rights but merely indicate that I have been informed about the research study in which my child voluntarily agrees to participate. A copy of this form was provided to me.

Nam……. Signature/thumbprint of participant…… Date ……

Name…… Signature of witness…… Date……

Name…… Signature of interviewer…… Date……

Annex 9: Informed consent form for the recruitment of research participants Ngakaramojong version 2.0

Akou ka akisiom: ETIAI KA NGAKIRO NGUNA ETAPITO AKOROD ALOTOOMA NGIDWE NGULU ETHIOMETE ALO BUKU AMOROTO, KARAMOJA.

Ekiripiripan: Mr Edimu David Mark

Esukul: Gulu University, faculty of angikito

Akitodun; Erai Ekakiror Edimu David Mark akasioman lo Masters totapite Angaleu alo Gulu University. Acamakinet na ngesi ekilimokini iyong nguna etapito akisiom na. Kirikakin alimokin iyong nguna etapito akisiom na, ebongokin ngakingingiseta. Kicamak iyong ikon koku alomar nakisiom na, ikingitakinio iyong Akikong acamakinet kon, doco ikienakin akon karatas akingadakin.

Nguna etapito ngulu ikangito eproject ka akisiom na.

Alothikinet: Erai akisiom na ngina etapit ngakiro nguna ka akorod alotooma ngidwe ngulu ethiomete alo buku ngolo amoroto ka erai ngiyemuto lu ngulu etodunete etiai ka akorod alotooma ngidwe ngulu ethiomete alotoma edistrkit amoroto ka akitodun nguna ikamanara ka ngakiro nu. Akiro nguna erukauno ngesi ingarakini anyun epite ngolo esubakinere ngikisila nguna ingarakinete ngakiro nguna etapito ngidwe ngulu ethiomete a lo Moroto.

Epite ngolo elothio: Ayakau ikonkoku nakisiom na ngesi alosio Akipim awoyau, ngakiloi ka ake kan (MUAC)

Ngai elosi alomar nakisiom na: Aseun ikon koku alomar nakisiom na kotere ethiomi ikon koku alo sukul ngolo eseuntai anakisiom na. elosio akisitia ngadakikai 30 ka erai ngitunga 384 eyakaun nakisiom na.

Ngatokisio: Emam ngatiokisio kode arionis ngina eriamum alotooma akon lomar nakisiom na. Ationis ngina elomuni bon ngesi ngisai ngulu esitiao a nakingitigit.

Ngajokisio: Esaki akisiom na epite ngolo etodunete etiai ka akorod alotooma ngidwe ngulu ethiomete alotooma edistrkit amoroto.

Await ngakiro nguna imoruni iyong ka nyituan: Iwario eyenutoi a ikon koku ka elosio akisitia nginambai ngulu eyenitere ngikathiomak. Ngiyemuto ngulu eriamuno ngesi erukaunete ngikeripiripak bon. Ngiyimuto kon ngesi iwakino na komputa ngina eyakar nginambai ka erauni Ekapolon ka ariprip bon ngesi eyakaunor apedor ka angar.

Ngisilinga: Emam ngisilinga ilosi iyong akitac kotere alomar nakisiom na.

Ngakingisingiseta: Kiyakar iyong kode ikon koku ngadi kingisingiseta nguna etapito akisiom na ikwa akasioman, ipedori iyong kode ikonkoku aramakin Ekapolon ka aripirip , Edimu David Mark alo namba 0783022081/0701407064 kode kiyakia Abarua alo mjeff31@gmail.com.

Alimokinet ka acamakinet mam pa akareinkintai: Alomar nakisiom na ngesi erai ngini mam ngereikintai ka epedori ikon koku alomar anacamakinet keng. Eyakar ikon koku apedor ngina wosikinet akisiom na edi saat daadang emam akicanet.
Kiyakar iyong ngadi kiro nguna etapito akon pedor ka ngina ikon koku kotere alomarit ngesi nakisiom na, Toramak, Ekapolon ka Gulu University Research Ethics Committee, Dr Gerald Obai alo namba 0772305621, Abarua: lekobai@yahoo.com/lekobai@gmail.com; kode Uganda National Council for science and Technology alo namba ka plot 6 Kimera Road, Ntinda Kampala alonamba 0414705500

Alimokinet ka acamakinet: ……..akalimoki ayong ibore ngini alosio akitiakin, ngatiokisio, ngajokisia nguna eyakasi ka ngakapedorosio ka nguna anyikakoku ikwa etuan ngini aloma na kisiom na. ayeni dang atemar ebe akacamin ika koku alomar na kisiom na ngesi ngelosi akimik ayong kode ikakoku ngajokisio nguna ce. Alotooma akisitia ngiyemuto nu, ingadario aenut anyi kakoku. Ayeni dang atemar ebe, epedori ikakoku aisikin edi saat daadang. Ayeni dang atemar ebe akikong ayong akaratas na ngesi etodunit atemar ebe ngacakarit ayong ngakapedorosio kode nguna anyikakoku, etodunit atemar ebe akalimokin ayong nguna etapito akisiom ngina acamakin ikakoku. Akainakino dang ekawai ngina ekongit ayong.

Ekiror ……Akikong/Akicemakinet ka ekasioman……. Ngirwa ke elap…….

Ekiror……Akikongokinet ka esuda……..Ngirwa ke elap…….

Ekiror……Akikongokinet ka ekekingingitan…….Ngirwaka elap……