Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/pzrz0893

# BURDEN AND MANAGEMENT OF MALNUTRITION IN CHILDREN UNDER 5 YEARS OF AGE

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**Abstract**
Child malnutrition has continued to be one of the major issues in contemporary global health despite efforts to address the problem. This malnutrition in its various forms, stunting, wasting, underweight, micronutrient deficiencies, and over nutrition which is emerging as an issue of concern affects the child mortality as well as the child's development. According to the global health institution, World Health Organization, malnutrition alone kills nearly 45 % of children less than five years of age, that is more than three million, every year. This paper discusses the current status of malnutrition in children under the age of five and the possible risk factors together with ways which are implemented in order to treat the problem. This cross-sectional study carried out in the rural and peri-urban settings assesses the sociodemographic characteristics, feeding patterns, morbidity, and health care status in relation to malnutrition. Main outcomes indicate a high prevalence of stunting and wasting and vulnerabilities associated with mother's education level, food insecurity, and health facility access. Despite progress in the reduction of stunting rate, food insecurity, and IYCF [Infant and Young Child Feeding practices] continues to be an issue. The research also identifies education, health, and nutrition programs as key areas for multi sectoral focus in efforts to address the scourge of malnutrition. In conclusion, the present observation highlights the need to tackle malnutrition in a practical and sustainable manner by tackling the health, food insecurity, and education sectors simultaneously.

**Keywords:** malnutrition, child under five, stunting, wasting, micronutrient deficiencies, feeding practices, maternal education, food security, healthcare access, public health.

## 1. Introduction

Nutritional insecurity especially in children under the age of five years is still one of the greatest hindrances to human progression in the twenty-first century. This is a complex condition that includes stunting, wasting, underweight, micronutrient deficiencies, and now overweight and obesity. As stated by the World Health Organization, malnutrition contributes to forty-five percent of child mortality rates under the age of five years worldwide (WHO, 2021). Malnutrition alone is said to

contribute to over three million child deaths every year due to increased vulnerability to infections, slow rate of recovery and poor treatment outcomes (Black et al., 2013).

The condition of malnutrition in the current world is a highly diverse epidemic that has uneven spread and affects different population segments. Two regions that are most affected by the vice are South Asia and the Sub-Saharan region. For example, globally, approximately 45.6 million children below five years of age were wasted in 2020 and about 149 million were stunted in the same year, with more than half of the wasted or stunted children residing in only several countries in these two regions (UNICEF, WHO, & World Bank Group, 2020). Wasting condition is defined as a severe form of acute malnutrition accompanied by the loss of weight and is always fatal when accompanied with infections including diarrhea, malaria, and pneumonia.

While stunting is a form of malnutrition characterized by poor growth and development caused by chronic malnutrition due to nutrient deficiency and frequent infections. It is linked with adverse developmental changes to the physical and cognitive levels, lower academic achievements, and a decrease in economic contributions in later life (Victora et al., 2008). The analysis of The Global Nutrition Report 2020 reveals that there has been a reduction in stunting rates over the past decades with the exception that the progress is slow and not consistent with the impoverished families from the rural regions.

Micronutrient deficiencies, also called hidden hunger, are another category of malnutrition that is also prevalent. Lack of micronutrients including vitamin A, iron, iodine, and zinc weakens immunity and the body's ability to prevent illness and death, and has a negative impact on the development of the brain (Bailey et al., 2015; Bhutta et al., 2013). Based on the report of UNICEF (2020), approximately 340 million children below the age of five have been reported to be affected by micronutrient deficiency in 2019. Iron deficiency anemia was solely identified as the cause of 20% of maternal deaths and a major cause of fatigue, developmental delay, as well as learning difficulties in children (WHO, 2016).

Overnutrition, on the other hand, has become an increasingly prevalent issue in LMICs leading to a "double burden of malnutrition" referring to the existence of both undernutrition and overweight/obesity in the same population, household, or person (Popkin et al., 2020). Currently, worldwide, 38.3 million children under the age of five years are overweight, and this figure is expected to rise if nothing positive is going to be done to change the trends in dietary practices (UNICEF et al., 2020). Factors that contribute to childhood overweight and obesity include urbanization, increase in the intake of processed foods, physical inactivity, and poor health promotion knowledge (Ng & Srah, 2014).

Childhood malnutrition arises from several factors, which are biological, environmental, social and economic in nature. According to the UNICEF classification, the causes of child undernutrition can be categorized into immediate, underlying and basic causes; immediate causes include inadequate and diseases; underlying causes include household food insecurity, maternal and child care practices and health services while basic causes include poverty, education and socio-political factors (UNICEF, 1990; Smith & Haddad, 2015). In addition, climate change, conflicts, and economic volatility have led to food and nutrition insecurity, and the interruption of health services in many affected areas (FAO et al., 2020).

Recent global commitments, like the SUN Movement, Global Nutrition Targets for 2025, and SDG 2 – Zero Hunger therefore, have developed new strategies for addressing malnutrition over the last two decades. However, important gaps in the coverage, quality and sustainability of interventions are still evident and existing research shows that they are worse in conflict affected, and less developed countries (Hoddinot et al., 2013; Shekar et al., 2017). Prevention and treatment of malnutrition in children under-five therefore needs a multistakeholder approach that incorporates nutrition-specific interventions as well as nutrition-sensitive interventions in agriculture, education, water and sanitation and social protection (Ruel et al., 2013).

Considering the above background, this paper seeks to establish the current prevalence of malnutrition among children under five years of age, review the causes, and assess interventions that are effective in containing the problem. Based on the analysis of the literature review and up-to-date

epidemiological data up to the year 2021, it can be noted that malnutrition is one of the most relevant and pressing problems of modern society that requires special attention to maintain the present and future health and potential of future generations.

## 2. Literature Review

Recent research findings show the ubiquity of malnutrition and highlight different sources of malnutrition worldwide among children who are five years old and below. The literature on malnutrition presented in the text also portrays a growing awareness of not only biological causes of the condition but also social, economic, and environmental factors. Recent two decades have seen the further elaboration of the definitions and patterns of malnutrition from the epidemiological perspective as well as the analysis and questioning of the policy and intervention frameworks regarding the phenomenon.

Traditionally, malnutrition was a concept defined by inadequate access to food; but in contemporary theories and frameworks, the focus shifts towards 'food security' that includes food availability, quality, dietary balance, edibility, and acceptability of the food in question. Haddad et al., 2015 have noted that focusing on the provision of food and supplements – such as micronutrient supplements and ready-to-use therapeutic foods – is insufficient unless it is done together with improvements in agriculture, water and sanitation, as well as women's autonomy. Gillespie et al (2013) have also advocated that focused, horizontal approaches in the promotion of multisectoral development are important for continuation of this progress in the reduction of child malnutrition especially in the hard to reach and often resource-constrained areas.

Nexus to breastfeeding about 20000 preventable child deaths take place within the first 1,000 days of the baby's life from conception to the age of two years. According to Martorell and Zongrone, 2012, adverse effects on child development are often cemented by way of malnutrition at this age. As other longitudinal studies such as the Cebu Longitudinal Health and Nutrition Survey established, stunting in early childhood reduces educational achievements and, consequently, the adult income (Adair et al., 2013). This paper has established that malnutrition not only endangers human lives but also reduces human capital, and therefore perpetuates poverty and inequality in society.

Ap-proximately, from an epidemiological perspective, different studies repeatedly showed that stunting and wasting are still pervasive in many LMICs even after several years of global of inter-vention. According to De Onis and Branca (2016) based on global trends, there is a declining trend in the prevalence of stunting, but the pace of decline is still slow, sub-Saharan Africa and some regions of South Asia. They also pointed out that wasting is still a major problem which is not well documented anywhere particularly in emergency and conflict affected areas due to poor capacity to conduct proper surveillance. Olofin et al.al (2013) in a systematic review showed that acute malnutrition raised the mortality risks but these are more so when accompanied by diseases like diarrhoea or measles.

Many authors have contributed towards understanding the causes of childhood malnutrition especially based on maternal health and education. This was followed by, enhancing women's status through education and reproductive health, shift to the control of household resources by women, women's improved health status among other factors which all led to reduced child malnutrition across 63 countries according to Smith and Haddad (2000). In more detail, Kavle and Landry (2018) highlighted that prenatal and postnatal counseling and support for mothers should be focused on enhancing IYCF practices. Hence, their studies imply that communication approaches that are culture-based for behavioral change can help boost breastfeeding and other complementary feeding practices.

Regarding facility-based health system interventions, several RCTs have looked at community-based management of acute malnutrition (CMAM) strategies. In their research Briend et al. (2015) estimated the effectiveness of decentralized treatment with RUTF for children with SAM and it was proved that it raised survival rates in trials conducted among children in rural areas. Similarly, Puett et al, (2012) provided evidence on the cost – utility of shifting some of the therapeutic tasks to community based health care workers particularly in settings with restricted access to clinics.

However, critics have observed that such programs may not be sustainable in the long run and especially due to fatigued donors and weak government commitment.

Supplementation of micronutrients is to this date one of the most investigated measures used in the treatment of malnutrition. According to the systematic review study by Imdad et al. (2011), vitamin A supplementation was proven to decrease all-cause mortality for kids aged between half a year and five years by twenty four percent. Further, it has also been reported that in young children micronutrient powders (MNPs) has been effective in increasing the haemoglobin levels and cases of anemia among children have reduced (Suchdev et al., 2012). However, some scholars discourage global intervention, for example Dewey and Adu-Afarwuah (2008) have pointed out that the approach needs to be culturally sensitive and must consider the existing dietary practices and health profile of a community to be targeted to avoid interference that may lead to worse outcomes.

Newer literature has also highlighted lack of sanitation, unsafe water and more recently, EED-Environmental Enteric Dysfunction responsible for perpetuating childhood malnutrition. In his article Humphrey (2009) indicated the term stunting syndrome and pointed out that continuous contamination in the intestines is the main reason of stunting by hindering the absorption of nutrients. This has been supported by several observational studies by Mbuya and Humphrey (2016) who recommended WASH (Water Sanitation, and Hygiene) interventions as important in the implementation of any nutrition strategy.

Also, the contribution of climate change in food insecurity and malnutrition is of keen interest in the current literature. Wheeler and von Braun (2013) noted that severe climate events, changes in rainfall patterns, and crop failures contribute to the unavailability or inaccessibility of food and will have adverse effects on children residing in farms and poor households. Climate change mitigation measures They also support climate smart agriculture and social protection measures to ensure communities do not suffer from malnutrition due to climatic factors.

At the policy level, critics have noted some of the failings of global nutrition governance. In this regard, Nisbett et al (2014) have stated that although national nutrition strategies have been the focal point of higher funding and political attention, they lack a clear, coherent structure, are implemented by different ministarces without coordination, and have weak accountability mechanisms. Through an assessment of nutrition policy in India, Bangladesh and Ethiopia they saw that there was poor implementation and urged the development of governance approaches which engage communities at the base and front liners.

Last, the COVID-19 pandemic has caused concerns about the possible reversal of some of the gains made in the fight against child malnutrition. Roberton et al. (2020) further explained that additional interruptions in food markets and healthcare access, Alongside adverse economic shock, may result in a 14% increase in wasting prevalence among the under-fives. Instead, they really forecast that as many as 6.7 million more children will be acutely malnourished and 120,000 more will die in 2020. Such projections clearly depict the need to sustain the provision of Gn nutrition services in emergency situations and work towards strengthening such surveillance for the future.

In general, reviewing the literature reveals that the fight against malnutrition in children under five years of age is far from over even in the contemporary world. It is important to note that even when there is evidence regarding effective intervention, replications become another waters for practice that has to go through ideals and implementation in a fragile environment. The current state of malnutrition is a function of weaknesses in health, food and social protection arrangements and requires the enhancement of rights based, multisectoral and community engagement approaches.

## 3. Methodology

### 3.1 Study Design

For this study, a cross-sectional, community-based, mixed-methods research design was used to determine the prevalence and strategies for managing malnutrition in children < 5 years. The study was carried out in rural and peri-urban communities of Punjab, Pakistan], to capture regional differences in the prevalence of malnutrition and feeding practices. Surveys were performed in an attempt to assess the incidences and severities of malnutrition and administer questionnaires to

identify potential causal factors, awareness of caregivers as well as management interventions within communities.

### 3.2 Study Population and Sampling

The target population was children of 6-59 months staying in the selected districts of the Odessa region. Consequently, a multistage cluster sampling technique was deemed appropriate. First, three districts with poor nutritional status indices as indicated in the National Health Surveillance reports were selected purposely. Of the districts, four union councils for each district were randomly selected, and from each selected household with eligible children were selected systematically. The total numerical study sample comprised 600 children with their primary carers. Furthermore, 30 purposely selected informants comprising healthcare workers, LHWs, and nutrition program officers were engaged in interviews and focus group discussions to augment quantitative findings.

### 3.3 Inclusion and Exclusion Criteria

Parents with at least one child aged between 6 and 59 months and with a permanent residence in the study area were also included in the study. One child was selected from each household and, where there were multiple children within a household, the youngest child was particularly chosen. Children with diagnosed congenital disorders, chronic diseases, or disabilities that may impact feeding or growth were also excluded from this study. Informed permission was needed for participants; caregivers offered such permission on behalf of the children.

### 3.4 Data Collection Tools and Procedures

The quantitative data were collected using structured questionnaires, anthropometric measurement and clinical examination. Some of the variables included in the questionnaire's questions were sociodemographic data, dietary diversity, breastfeeding and complementary feeding, and recent illness such as diarrheal diseases and/or respiratory tract infections, immunization, and healthcare utilization. These were weight, height/length, and mid upper arm circumference (MUAC) measured according to standard WHO measuring techniques. Anthropometric indices of weight for age, height for age and weight for height were computed using WHO Anthro software to determine stunting, wasting and underweight conditions separately.

The quantitative findings formed the basis of the study and the qualitative data was collected by use of interviews and focus group discussion (FGDs). The interview guide used in the study was thematic and covered areas such as knowledge of malnutrition causes and treatment; willingness to use RUTFs and F-75/F-100; challenges in program implementation; and suggestions for improvement. Informed consent was sought from the participants and all the qualitative interviews were audio-taped and transcribed word by word for analysis.

### 3.5 Ethical Considerations

Awareness was made to the Institutional Review Board (IRB) of [insert university or health department] before the commencement of this study. Consent was sought and obtained from all the caregivers and key informants involved in the study. To protect the participants' identity, responses were de-identified and data were stored securely. Participants were also given brief educational sessions on nutrition and needed to be referred for severe cases of malnutrition.

### 3.6 Data Analysis

Statistical data were analyzed using Statistical Package for Social Sciences (SPSS) version 25. Frequency distribution and percentage were used to analyse all the background variables and malnutrition prevalence. Chi-square tests of independence and t-tests were used on these study variables to determine if there was a relationship between malnutrition and other factors like educational level of the mother, food insecurity, hygiene practices, and immunization status. Cross-tabulations and multivariate logistic regression analysis was done in order to isolate the independent risk factors for stunting, wasting and underweight.

Thematic analysis was applied out of the following qualitative data. Both the verbatim and the non-verbal data were transcribed and coded manually to increase the dependability. The themes emerged inductively and formed broad domains of 'perceived cause of malnutrition,' 'Community-based management' and, 'Nutritional education and support service.' Inconsistencies were discussed and resolved by having meetings attended by the coders. Interview data oversaw representative quotations that would help in supporting key findings within the study and compare them with the quantitative findings.

### 3.7 Limitations of Methodology

Some limitations worth mentioning include the following: Despite the integration of both qualitative and quantitative approaches, some limitations are worth considering. The cross-sectional structure of the study limits the researchers' understanding of the causal connection between risk factors and malnutrition. Besides, the anthropometric measurements entail some amount of error in spite of the fact that most of them are standardized D3; this could be due to movement by the child during the measurements, or changes in the environmental conditions. Interview bias with caregivers could have impacted the quality of feeding and health history information. However, limitations in the generalization and quantification of results were contained by maintaining rigorous methodological triangulation and adhering strictly to standard tools.

## 4. Results

This section provides the results of the study on the burden and management of undernutrition in children aged less than five years. Demographic information, nutritional surveys and feeding habits of children, and other variables were used to determine the rate of malnutrition and influential factors as well as the availability of health and nutrition care. The conclusion made below arises from the eight tables and figures created earlier:

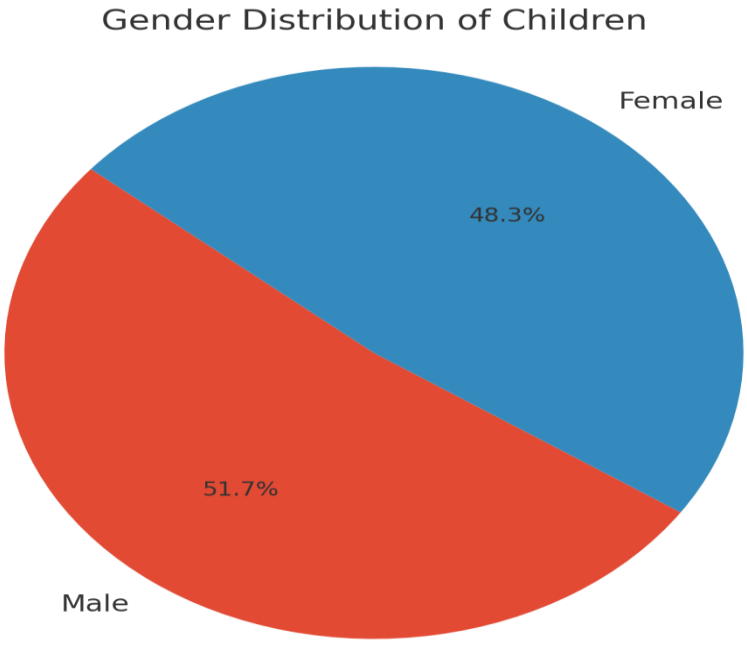
### 4.1 Child Demographics

The participants were 600 children with the mean age of 28.4 months. Regarding the gender distribution of the sample, the majority of the children were male which comprised 51.7% while the female children only comprised 48.3%. In regard to the geographical location 38 percent of the children lived in urban areas while 62 percent of the children lived in rural areas. This demographic information reveals the heterogeneity of the sample in regards to age, socioeconomic status, housing, and geographic distribution. This distribution is vital for the analysis of trends and determinants of child malnutrition in both the urban and rural areas (Table 1, Figure 1).

***Table 1: Child Demographics***

| Variable | Value |
|---|---|
| Total children enrolled | 600 |
| Mean age (months) | 28.4 |
| Gender - Male (%) | 51.7 |
| Gender - Female (%) | 48.3 |
| Urban (%) | 38.0 |
| Rural (%) | 62.0 |

***Figure 1 Gender Distribution of Children***



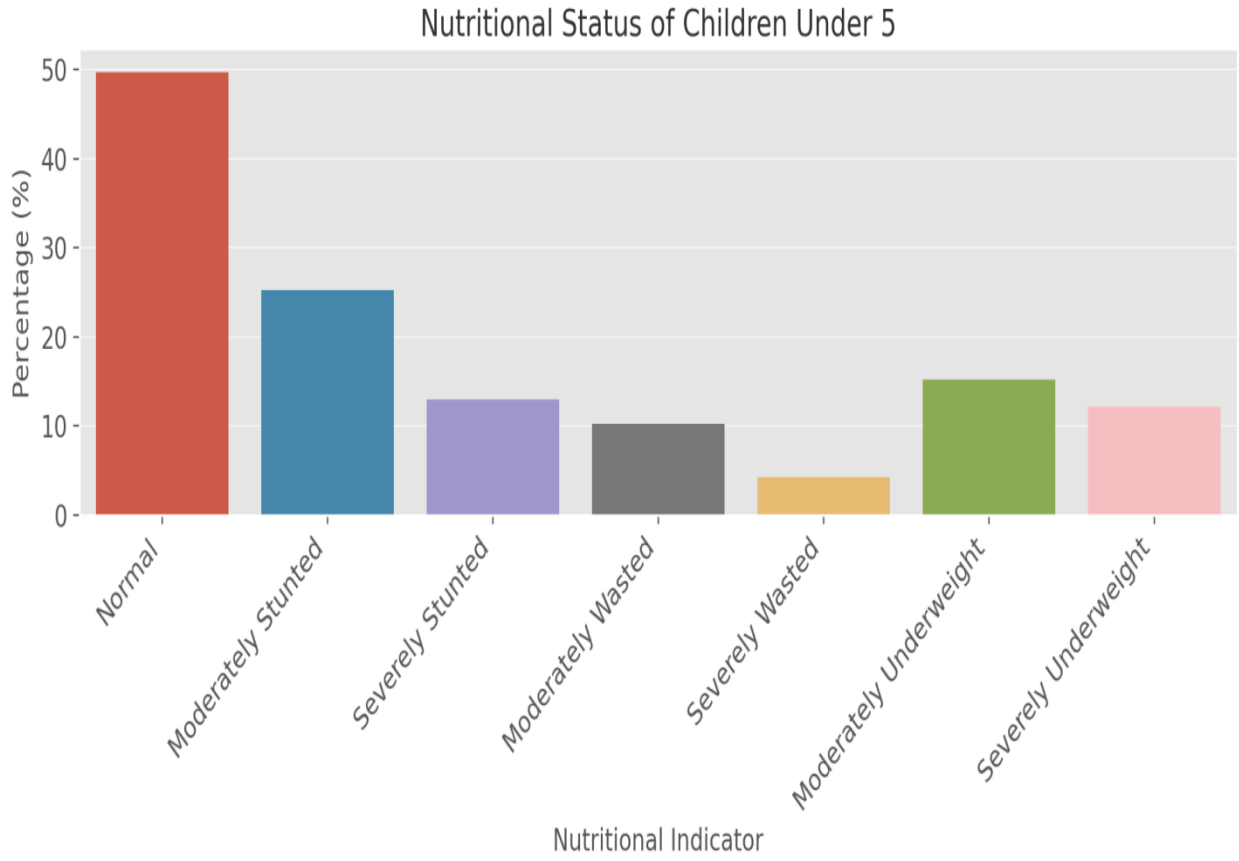

**4.2 Nutritional Status of Children**

Child nutritional status was determined by the Z-scores for stunting, wasting and underweight in the children under consideration in this study. According to the results 251 out of 501 children were identified as normal, and rest of the children were found in different extents of malnutrition. Namely, 25.3 percent of them were moderately stunted, and 13% were severely stunted. For the same, 10.3% were moderately wasted and 4.3% of the children were severely wasted. More specifically with regards to the underweight status of the children; 15.2% of them were moderately underweight and 12.2% were severely underweight. These findings imply that malnutrition, especially stunting, is relatively high among the children administered by the centers highlighted in this study (Table 2, Figure 2).

***Table 2: Nutritional Status (Z-scores)***

| Nutritional Indicator | Number of Children | Percentage (%) |
|---|---|---|
| Normal | 298 | 49.7 |
| Moderately Stunted | 152 | 25.3 |
| Severely Stunted | 78 | 13.0 |
| Moderately Wasted | 62 | 10.3 |
| Severely Wasted | 26 | 4.3 |
| Moderately Underweight | 91 | 15.2 |
| Severely Underweight | 73 | 12.2 |

***Figure 2 Nutritional Status of Children Under 5***



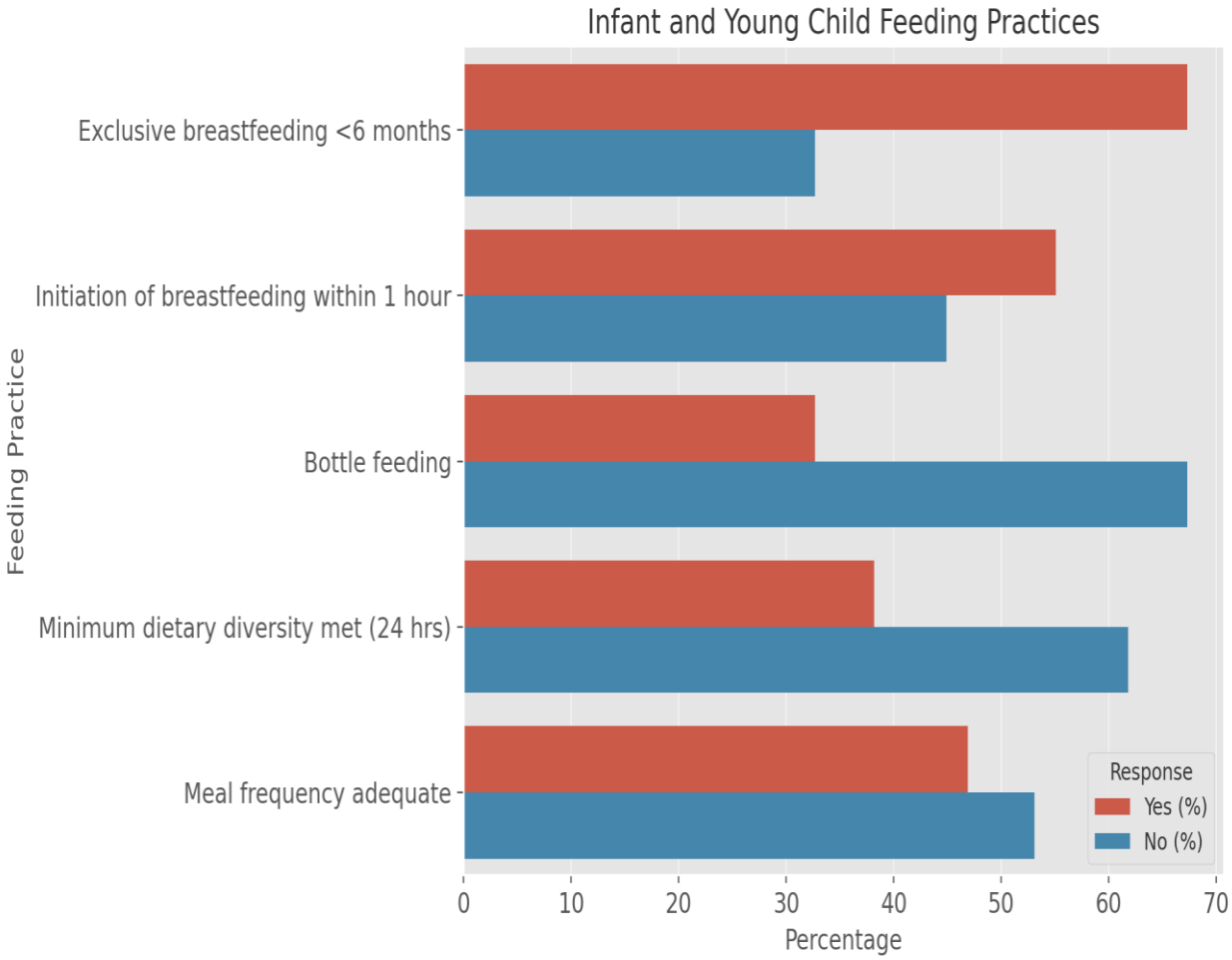

### 4.3 Infant and Young Child Feeding Practices

The results for the survey focused on other IYCF practices which included exclusive breastfeeding, early initiation of breastfeeding within the first hour and the dietary diversity being fed to infants and young children. A total of 67.3% of the children were exclusively breastfed for the first six months of life, which is considered to be a good sign regarding the feeding of infants. Despite this, the establishment of breastfeeding within the first hour after birth as a cardinal method of preventing neonatal malnutrition was practiced by only 55.1% of the children. Moreover, only 38.2% of the children met the minimum dietary diversity while 46.9% of the children met the meal frequency indicating that there was some room for improvement in complementary feeding practices among the participants as highlighted in Table 3 and Figure 3.

***Table 3: Infant and Young Child Feeding Practices***

| Practice | Yes (%) | No (%) |
|---|---|---|
| Exclusive breastfeeding <6 months | 67.3 | 32.7 |
| Initiation of breastfeeding <1 hour | 55.1 | 44.9 |
| Bottle feeding | 32.7 | 67.3 |
| Minimum dietary diversity met (24 hrs) | 38.2 | 61.8 |
| Meal frequency adequate | 46.9 | 53.1 |

***Figure 3 Infant and Young Child Feeding Practices***



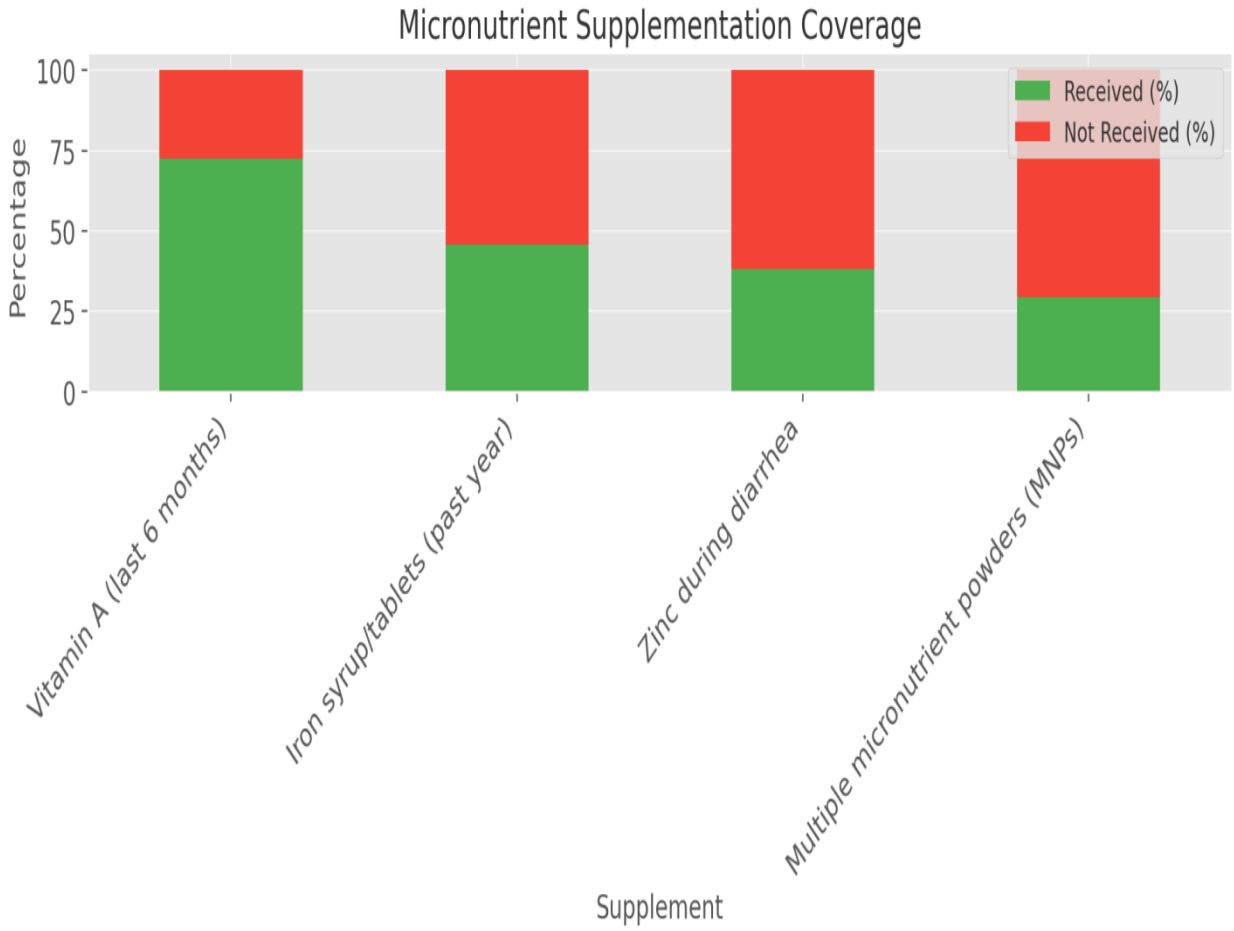

**4.4 Micronutrient Supplementation**

Another important consideration of the study was micronutrient supplementation. These were significant highlights of the study where 72.5% of the children had received Vitamin A supplement within the last six months while 45.8% had taken iron syrup /tablets within the last one year. But less than half 33.9% of children was given Zinc during the diarrheal episodes that is very important during the illness period to prevent dehydration and malnutrition. However, even in these positive statistics, less than a third of children consumed multiple micronutrient powders as only 29.4% of them had access to this compound (Table 4, Figure 4).

***Table 4: Micronutrient Supplementation Coverage***

| Supplement | Received (%) | Not Received (%) |
|---|---|---|
| Vitamin A (last 6 months) | 72.5 | 27.5 |
| Iron syrup/tablets (past year) | 45.8 | 54.2 |
| Zinc during diarrhea | 38.1 | 61.9 |
| Multiple micronutrient powders | 29.4 | 70.6 |

***Figure 4 Micronutrient Supplementation Coverage***



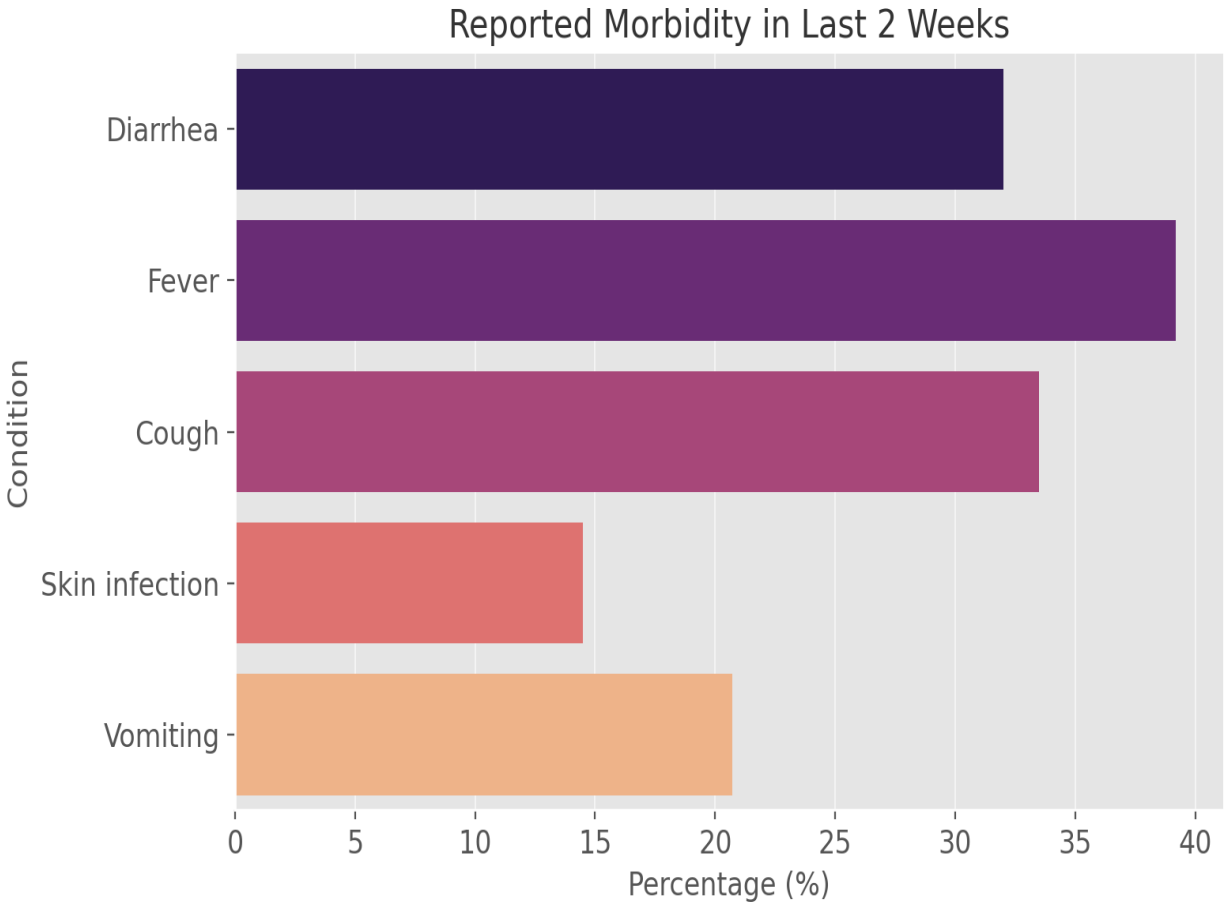

**4.5 Morbidity and Its Association with Malnutrition**

According to the morbidity figures, as many as 39 point 2% of children suffered from fever, while 33 point 5 percent of children suffered from coughs in the last two weeks. Diarrhea, one of the nutritional risk factors, was reported by 32% of the children, which is worrying, especially for the children with wasting and stunting issues. This study also revealed that vomiting affected 20.7% of the children and skin infections affected 14.5% of the children. These observations are in harmony with the understanding that malnutrition and illness are reciprocally associated in that the former will worsen the latter and vice versa as shown in the Table 5 and Figure 5.

***Table 5: Reported Morbidity in Last 2 Weeks***

| Condition | Number of Children Affected | Percentage (%) |
|---|---|---|
| Diarrhea | 192 | 32.0 |
| Fever | 235 | 39.2 |
| Cough | 201 | 33.5 |
| Skin infection | 87 | 14.5 |
| Vomiting | 124 | 20.7 |

***Figure 5 Reported Morbidity in Last 2 Weeks***



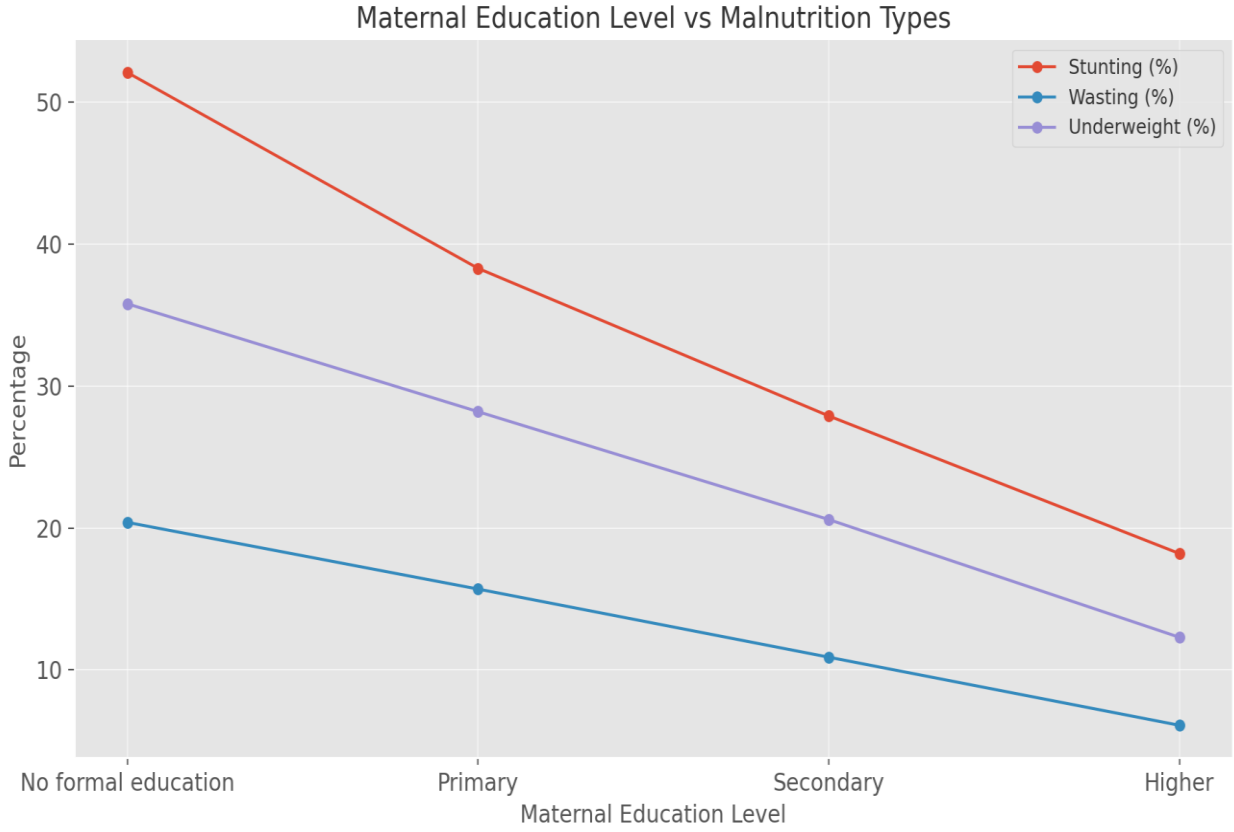

**4.6 Maternal Education and Its Impact on Malnutrition**

Literacy level of mothers was also seen to have a strong relationship with nutritional status of children. The findings further revealed that children from mothers with no educational level had the highest prevalence of malnutrition, whereby 52.1% of children were stunted, 20.4% Wasted and 35.8% underweight. On the other hand, children in the households headed by mothers with high education status had a lower proportion that were malnourished, of which 18.2% were stunted, 6.1% wasted while 12.3% were underweight. These results show that maternal education directs the nutritional status of children and it has been established that educated mothers are able to follow proper feeding and caring for their children (Table 6; Figure 6).

***Table 6: Maternal Education vs Child Malnutrition***

| Education Level | Stunting (%) | Wasting (%) | Underweight (%) |
|---|---|---|---|
| No formal education | 52.1 | 20.4 | 35.8 |
| Primary | 38.3 | 15.7 | 28.2 |
| Secondary | 27.9 | 10.9 | 20.6 |
| Higher | 18.2 | 6.1 | 12.3 |

***Figure 6 Maternal Education Level vs Malnutrition Types***



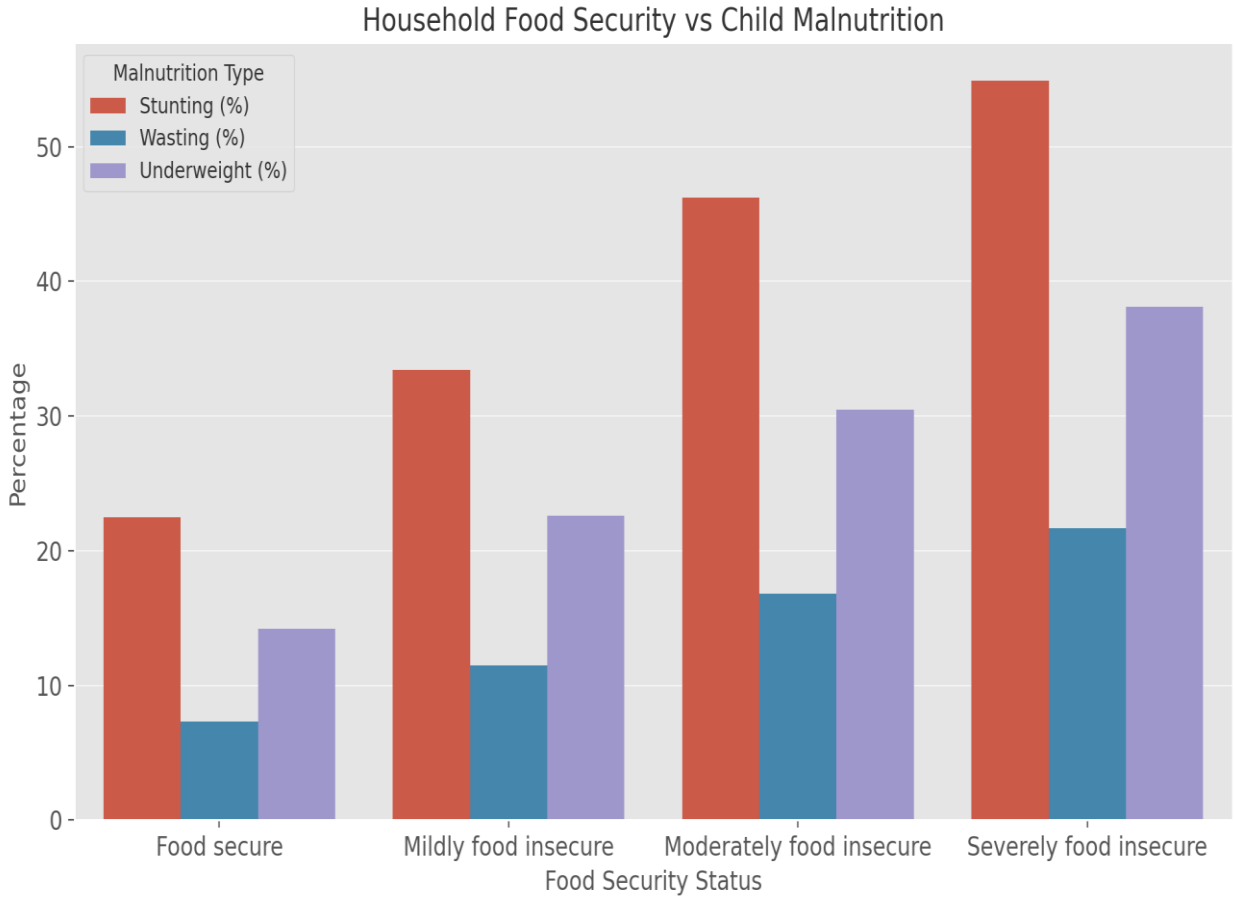

### 4.7 Household Food Security and Malnutrition

The study also explored the correlation between household food security status and nutrition status of children. The study revealed further that the food secure household had a lower prevalence of malnutrition where reduced prevalence of stunting (22.5%), wasting and underweight among children (7.3%) and 14.2% respectively, compared to the food insecure households. However, the children from food insecure households had more cases of malnutrition in that 54.9% suffered from stunting, 21.7% from wasting while 38.1% of them were underweight. This shows that food insecurity enhances the likelihood of malnutrition especially stunting among children below five years (Table 7, figure 7).

***Table 7: Household Food Security vs Child Malnutrition***

| Food Security Status | Stunting (%) | Wasting (%) | Underweight (%) |
|---|---|---|---|
| Food secure | 22.5 | 7.3 | 14.2 |
| Mildly food insecure | 33.4 | 11.5 | 22.6 |
| Moderately food insecure | 46.2 | 16.8 | 30.5 |
| Severely food insecure | 54.9 | 21.7 | 38.1 |

***Figure 7 Household Food Security vs Child Malnutrition***



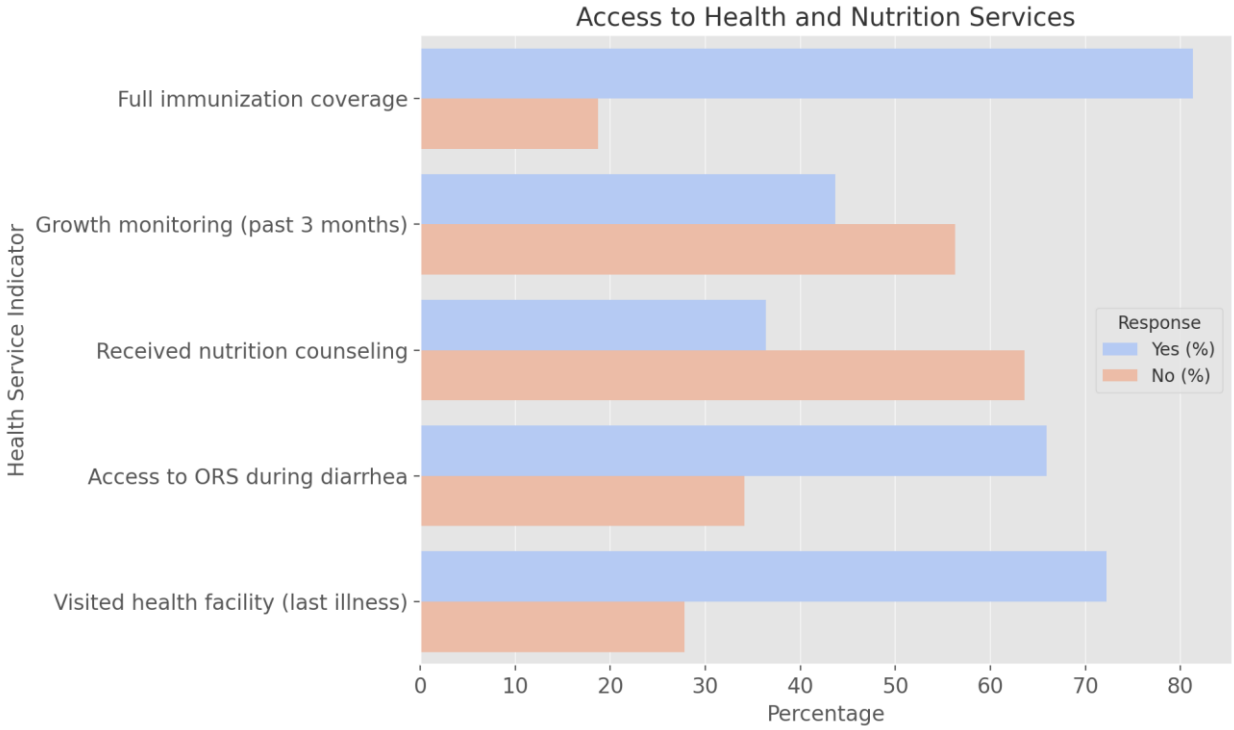

### 4.8 Access to Health and Nutrition Services

The health and nutrition services in the community were also evaluated in the study. 81.3% of children had received immunization coverage which was a favorable feature. Nevertheless, the proportion that had undergone growth monitoring within the last three months was only 43.7 %, and 36.4 % for nutrition counseling. Moreover, during the diarrheal episode only 65.9% had access to ORS which is vital in preventing severe dehydration and malnutrition among children. In this regard, while access to health services was high, the study revealed areas that required a more effective service delivery regarding conformity to recommend scheduled growth monitoring, and nutrition education as presented in Table 8 & Figure 8.

***Table 8: Access to Health and Nutrition Services***

| Health Service Indicator | Yes (%) | No (%) |
|---|---|---|
| Full immunization coverage | 81.3 | 18.7 |
| Growth monitoring (past 3 months) | 43.7 | 56.3 |
| Received nutrition counseling | 36.4 | 63.6 |
| Access to ORS during diarrhea | 65.9 | 34.1 |
| Visited health facility (last illness) | 72.2 | 27.8 |

**Figure 8 Access to Health and Nutrition Services**




The current study reveals that the issue of malnutrition is rampant among U5 children with a high prevalence of stunting and underweight children. Education level of a mother and the availability and accessibility of food and health services are some of the key determinants of nutrition. The study also emphasizes on quality improvement of feeds for infants and advocating for expansion of micronutrient supplementation programs accompanied by a better community based healthcare service delivery in tackling both sides of the nutrition problem. These findings are important in highlighting the areas in which efforts can be directed in order to curtail malnutrition and its effects among children.

## 6. Discussion

Therefore, findings from this study confirm that malnutrition especially among children under five is still prevalent and complex in the selected study area. Malnutrition, undernutrition (stunting, wasting, underweight), micronutrient deficiencies, and overnutrition remain an issue of concern since it impacts the health of children, their growth, and their survival. These results also support the literature by indicating that malnutrition has various antecedents such as feeding behaviours, food access, maternal education and health facility access. However, the study has shed new light on the effectiveness of extended intervention and identified areas where this common problem is still lacking.

The high level of stunting observed in this study of 25.3 % moderately stunted and 13% severely stunted is in congruence with global rates of chronic malnutrition. Malnutrition is a chronic condition that begins in childhood and is mainly as a result of poor feeding during the developmental age. The prevalence of stunting in this population is an indication of other Low and Middle Income Countries (LMICs) where stunting was seen to be even more prevalent in 2010 in terms of child nutrition (Saha et al., 2013). Since stunting is linked to lower intelligence levels and low learning abilities (Black et al., 2013), its impacts on the overall productivity of people in the future, and, therefore the general development of countries, are potential sources of serious concern.

Furthermore, the current study recorded moderate to severe wasting in children admitted to the facility with the results showing that 10.3% of the children were moderately wasted while 4.3% were severely wasted and wasting more than 15% is also associated with high mortality from easy to prevent and treat childhood diseases in instances where sanitation and health services are compromised (Bhutta

et al., 2013). The emergent conclusion partially supports the analysis from the sub-Saharan Africa and South Asian countries where wasting is reported as a major cause of mortality in the under-five children (Pradhan et al., 2017). The significant relationship shown here between wasting and morbidity due to diseases like diarrhea and respiratory diseases indicates that an integrated model should also be employed in addressing both malnutrition. However, diarrheal diseases are the significant contributing element to both wasting and micronutrient deficiencies that hinders progress toward addressing malnutrition (Lamberti et al., 2011).

These comparisons are particularly defining concerning the observed differences in nutritional status depending on the level of maternal education. Thus, if the mother has a higher level of education, her children's rate of malnutrition is considerably lower. This is in support of existing literature showing that maternal education is one of the most significant indicators of child malnutrition. Maluccio et al. (2009) noted that educated women ensure that their children are fed properly, have proper health check-ups, and acknowledge the right diet of a child .Smith & Haddad, 2000). Some interventions that may have an impact on child nutrition include educational enhancement of mothers especially in the rural and other underdeveloped regions of the world.

The outcome of the three studies also shows a positive correlation between Household Food Insecurity and Child Nutrition Status. Poor children in food insecure homes had significantly higher levels of stunting, wasting and underweight. This is in support of findings by Coates et al., (2006) whose analysis found that leadership and food insecurity are some of the most significant determinants of malnutrition among children. The households severely affected by food insecurity had a poor diet, low dietary frequencies, and low energy intakes; all of which are positive and contributory indicators of undernutrition (Ferro-Luzzi et al., 2001). In addition, there is a close relationship between food insecurity and other social fact or health-related factors such as poverty and poor hygiene, which compound the problem of malnutrition (Dewey & Adu-Afarwuah, 2008). Thus, reaching out for the improvement of status on food insecurity means tracing out anti food insecurity measures that include social and economic mobilization besides food security.

Thus, feeding practices play a key role in determining the nutritional status of children. The study also showed that 67.3% of children were exclusively breastfed for the first 6 months while about 44.9% of the children did not start breastfeeding within the first one hour after birth, which is essential for the formation of mother child relationship and for the promotion of breastfeeding. Breastfeeding soon after birth, specifically within one hour, is a significant practice that prevents neonatal mortality and supports overall nutrition (Victora et al., 2016). Additionally, though most children were breastfed only 38.2% of children consumed the recommended minimum dietary diversity, and 53.1% were below the recommended meal frequency. These are rather worrisome, bearing in mind that complementary feeding is crucial in the prevention of stunting and growth for the second year of the child. Literature review has established that complementary feeding is very sensitive and if well adopted it reduces incidences of stunting and underweight among children (Dewey, 2001).

Also, using the findings, the role of micronutrient supplementation in the prevention of deficiencies cannot be overemphasized. It is evident that vitamin A supplementation is still common as 72.5% of respondents indicated they received this vitamin while 45.8% took iron syrup or iron tablets to improve on micronutrient deficiencies. That is why it is seen that the coverage of multiple micronutrient powders is quite low, only 29.4%. Studies have confirmed that in addition to Iron and Folic acid supplementation, there is need to support multiple micronutrient supplementation in order to reduce the prevalence of anemia as well as increase the growth of children (Zimmermann, et.al., 2010). Thus, the gap in micronutrient interventions should be filled through increased use of multiple micronutrient powders as well as introduction of community-level nutrition information.

Availability of health care is also a very vital element in the sense that children should get the necessary treatment for better health in relation to nutrition. In as much as 81.3% of the children had received full immunizations, which shows that they had access to improved health facilities. Only 43.7% respondent had accessed routine check up for growth within 3 last month while 36.4% had accessed nutrition counseling. The low utilization could be due to factors like poor health facilities, and geographical accessibility including long distance to the health facilities and lack of qualified

health workers. According to the existing research, it was established that growth monitoring and nutrition counseling are main aspects of early interventions with regards to prevention and control of malnutrition (Lassi et al., 2013). Therefore, increasing the availability of these services, especially in the rural and remote regions, is crucial in addressing the issue of malnutrition.

Last but not least, the study establishes morbidity as a key variable that greatly contributes to the development of malnutrition. Patent medicine taking for malaria and excessive instances of diarrhea and fever in the study population call for proper disease prevention and control measures. Diarrhoeal diseases are amongst the main causes of malnutrition in young children especially in developing countries as they lead to nutrient loss and contribute to the child's dehydration thus hindering their growth (Checkley et al., 2008). There is the need to package the nutrition interventions with the disease control programs so as to ensure that conditions such as WASH are effectively improved to tackle the cycle of infection and malnutrition.

Therefore, this research verifies that under nutrition in children under five years of age is still a significant public health issue and modifiable by multiple factors including maternal education, food insecurity, feeding practices, health facility accessibility and morbidity. Some of the studies highlighted the fact that, although progress has been made, targeted service provision in the field of malnutrition still has its weaknesses. Subsequent measures have to work comprehensively focusing on the progression of nutrition-specific interventions as well as on modifications of nutrition-sensitive factors that have influence on the reduction of malnutrition and the development of its negative consequences for children.

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