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The influence of feeding practices on under-five nutrition status in Mbinga District, Tanzania

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Abstract

Background: Undernutrition is a universal public health problem for both children and adults globally. It is not only a public health concern but also an impediment to global poverty reduction, productivity, and economic growth. Under-five children are among the most vulnerable groups, although it affects both women, the elderly, and youth. This study assessed the influence of feeding practices on under-five nutrition status in Mbinga District, Tanzania. This paper unveils the contribution of feeding practices to under-five nutrition status in Tanzania.

Methods: A cross-sectional study involved 150 heads of households whose children aged 0–59 months were assessed to determine their anthropometric measurements. Weigh for age Z-scores, height for age Z-scores, and weight for height Z-scores. A structured questionnaire was administered to collect data from the heads of households. Data were coded and analyzed by ENA for the SMART, Statistical Package for Social Sciences (SPSS), and STATA programs.

Results: It is revealed that 90.7% of under-five children in the surveyed households initiated breastfeeding within one hour of life, 72% of the children were given complementary foods before six months, maize porridge was a major complementary food, and 80% of the children consumed three to four meals per day. Their diets were not diverse as starchy staple foods were dominant. It was further found that 42% of the children were stunted, 33% were wasted, and 25% were underweight. Moreover, the results of the ordered probit regression model showed that exclusive breastfeeding, meal frequency, and food dietary diversity were positively influencing nutrition status, while household size was negatively influencing the nutrition status of the under-five.

Conclusion: The study concludes that inappropriate complementary feeding, children did not receive the minimum dietary diversity, and poor child feeding practices have a positive influence on the anthropometric status of the under-five. It was recommended that education be provided to community members on appropriate child feeding practices and family planning.

Keywords: Feeding practices; The under-five; Nutrition status; Undernutrition

1. Introduction

Undernutrition is a universal public health problem for both children and adults globally. It is not only a public health concern but also an impediment to global poverty reduction, productivity, and economic growth (Dukhi, 2020). Under-five children are among the most vulnerable groups, although it affects both women, the elderly, and youth (WHO and UNICEF, 2018).

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Globally, in 2020, about 149 million children under 5 were estimated to be stunted (too short for their age), 45 million were estimated to be wasted (too thin for their height), and 38.9 million were overweight or obese (World Bank, 2021). Thus, around 45% of deaths among children under five years of age are linked to undernutrition. These mostly occur in low- and middle-income countries, especially in Africa and Asia. At the same time, in these same countries, rates of childhood overweight and obesity are rising (FAO *et al.*, 2018).

The manifestation of under-five malnutrition is multifold, but the paths to addressing prevention are key and include appropriate feeding practices such as exclusive breastfeeding for the first two years of life, diverse and nutritious foods during childhood, healthy environments, access to basic services such as water, hygiene, health, and sanitation, as well as pregnant and lactating women having proper maternal nutrition before, during, and after the respective phases, that is, levels and trends (Ajao *et al.*, 2010).

Moreover, the rates of breastfeeding remain lower than what is required to protect the health of women and children. In 2013–2018, about 43% of newborns initiated breastfeeding within one hour of birth. 41% of infants under six months of age were exclusively breastfed, and 70% of women continue to breastfeed their infants for at least one year by two years of age. The collective targets for these global rates by 2030 are estimated to be 70% for initiation in the first hour, 70% for exclusive breastfeeding, 80% at one year, and 60% at two years. This situation leads to inadequate breastfeeding rates, which results in an increased burden of undernutrition among children worldwide (WHO and UNICEF, 2019).

In 2002, a global strategy for infant and young child feeding (IYCF) was issued jointly by WHO and UNICEF to reverse the disturbing trends in infant and young child feeding practices (World Bank, 2018). The IYCF strategy provides guidelines for promoting appropriate infant feeding, including early initial breastfeeding within one hour of life, the optimal duration of exclusive breastfeeding (EBF) for the first six months of life, extended breastfeeding at two years, the introduction of complementary foods, food diversity, and meal frequency (WHO, 2017).

The guideline is based on evidence of the importance of good nutrition in the early months of life and the role it plays in achieving good health. The benefits include the prevention of disease and infection in childhood and improved cognitive and motor skill development (Carletto *et al.*, 2016).

Africa still experiences a malnutrition burden among children aged under five years (Jayne *et al.*, 2019). Sub-Saharan Africa bears one of the highest burdens of undernutrition. In 2016, more than one-third of stunted children (38%) and more than one-quarter of wasted children (27%) lived in sub-Saharan Africa. However, a more detailed look into the distribution of undernutrition within sub-Saharan Africa shows that Eastern Africa (36.7%) has a higher prevalence of stunting compared to Western Africa (21.4%), Central Africa (32.5%), and Southern Africa (28.1%). While Western Africa (8.5%) has a higher rate of wasting than Central Africa (7.3%), Southern Africa (5.5%), and Eastern Africa (6.5%) (FAO *et al.*, 2018).

In Tanzania, under-five malnutrition remains one of the country's greatest human development challenges (Khamis *et al.*, 2019). Despite displaying a seemingly 'low' and 'acceptable' rate of acute malnutrition, the burden of undernourished under-five children is one of the highest in the East African region (Agho *et al.*, 2019).

The causes of undernutrition are multifaceted, but failure to adhere to under-five feeding practices remains a strong predictor, especially in most of the areas where food is secure in Tanzania (Khamis *et al.*, 2019; Mtoi and Nyaruhucha, 2019; Aloyce, 2018; Kulwa *et al.*, 2006). Furthermore, there is little information regarding the influence of feeding practices on under-five nutrition status, especially in the southern agricultural zones of Tanzania. Therefore, this current study contributes to the generation of new knowledge regarding the association between feeding practices such as the initiation of breastfeeding and complementary feeding, as well as meal frequency and dietary diversity, and the nutrition status of under-five children. Moreover, this study was set to explore the influence of feeding practices on under-five nutrition status in Mbinga District, Tanzania.

Nutritional interventions have been developed and implemented in Tanzania by the Ministry of Health (MOH) to reduce child undernutrition such as IYCF protocols, sanitation, deworming, vitamin A supplementation, and health education (TFNC, 2012). Thus, despite these interventions, child undernutrition still remains a developmental challenge in Tanzania (Khamis *et al.*, 2020). This is evidenced by the Tanzania Demographic and Health Survey report, which revealed that the prevalence of chronic undernutrition (stunting) was 34.4%, acute malnutrition (wasting) was 4.5%, and underweight was 13.6% (Kashaija *et al.*, 2018; Khamis *et al.*, 2019; URT, 2019). The most affected regions with a prevalence of stunting exceeding 40% are: Ruvuma (41.0%), Iringa (47.1%), Rukwa (47.9%), Kigoma (42.3%), Njombe

(53.6%), and Songwe (43.3%). However, these regions are among the biggest food crop producers in Tanzania, such as maize and legumes (URT, 2019).

Under-five malnutrition reduces life expectancy, causes poverty, and impairs physical and mental growth, leading to poor brain and school development, hence affecting community and national development (USAID, 2017). Previously, studies have been conducted in Tanzania regarding undernutrition, for instance (Kulwa *et al.*, 2016). However, these focused more on the institutional determinants, nutritional status, and food security at the household level. It is not clear to what extent feeding practices can contribute to addressing the under-five nutrition status in Mbinga district, Tanzania.

2. Material and method

2.1. Study Area

This study was conducted in Mbinga district from January to March, 2022. Mbinga is one of the six districts in Ruvuma region, namely: Nyasa, Mbinga, Songea Urban, Tunduru, Songea Rural and Namtumbo districts (URT, 2012). Mbinga was strategically selected for this study from a number of reasons, among others, are;

- It is found within the regions which are highly affected by undernutrition of the under-five with the stunting rate of 41% in Tanzania (URT, 2019), and
- It is important and occupies the largest area for growing food crops such as maize, beans, cassava, millet and potatoes in Ruvuma region however childhood undernutrition is not yet controlled (Wineman *et al.*, 2020).

Furthermore, a large proportion of the population live in houses which are in good conditions. Most houses are constructed by burned bricks, roofed by corrugated iron sheets with floors made up of stone/gravel, sand and cement. However, few households located in the remote rural areas have houses in poor conditions. Most houses (60-80%) have basic furniture and majority of the households own cell phone (ACET, 2017).



Figure 1 A map of Mbinga District

2.2. Research design

The author employed non-experimental design particularly cross sectional research design to collect both qualitative and quantitative data. Primary data were collected from household heads in the field using questionnaires structured with couple of questions and the key informants were interviewed using checklist containing relevant questions. Potential secondary data was collected by reviewing relevant documents including strategic plan, journals, and water research reports and published papers.

Furthermore, this study explored the relationship between independent variables and the dependent variable. The independent variables were feeding practices (breastfeeding, complementary feeding and dietary diversity) and the dependent variable was under-five nutrition status as indicated by number of stunted, wasted, underweight and normal children.

Similarly, the testable hypothesis with respect to objective four was;

H₀: There is no relationship between feeding practices and under-five nutrition status in Mbinga District.

2.3. Sampling and Sample Size

2.3.1. Sampling techniques

Purposive sampling was used to select three wards; Mpapa, Maguu and Nyoni which had relatively higher prevalence of stunting. One village was randomly selected from the wards including Mitawa, Wanyu and Likwera. At village level the study sampled 150 households in which number of households differed from one village to another depending on the population size as received from the Village Executive Officer. Thereafter, households were selected by using snow ball sampling technique whereby few households having under-five children were purposively selected and heads of the households were asked to recommend other households that meet the prescribed criteria.

2.3.2. Population sample

The sample size (n) of the study was 150 heads of the households who were obtained by using Cochran's (1977) for unknown population basing on the fact that the population size of the households with under-five children in the study area was not known;

$$n = \frac{z^2 qp}{e^2}$$

Where:

n = sample size when population is greater than 10,000

z = Standard normal deviation, set at 1.225 corresponding to 95% confidence level,

p = proportion in target population estimated to have a particular characteristic; if it is not known, 50% is used.

q = 1.0 - p = 0.5

d = degree of accuracy desired, set at 0.05

Thus, $n = 3.0^2 (0.5 \times 1 - 0.5) / 0.05^2 = 150$

2.4. Data collection, processing, analysis and presentation

The quantitative data was collected using household survey whereby semi-structured questionnaires as a tool with items containing both closed-ended and open-ended questions were administered to heads of the households. The questionnaire was used to elicit factual information on background variables (age, sex, marital status, education, household size, occupation and head of household), child characteristics such as; age, sex, height and weight. Further, it was used to obtain information regarding breastfeeding practices, complementary feeding, dietary diversity and meal frequency for the under-five at household level.

The justification of using questionnaire was because it was appropriate for collecting views from a substantial number of household heads (150) on the influence of feeding practices on under-five nutrition status. The questions were asked in as logical order as possible in order to avoid misleading the minds of the respondents. Moreover, the researcher ensured that the questions flow in the sequence of the objectives of the study and the research questions so that the responses answer the research questions clearly. Unlike other methods, the household survey speeds up data collection process because the researcher reached a large number of respondents in a fairly short period of time (Nnko, 2017).

Interview was used in order to collect profound information from Nutrition Officer, Ward Health Officer and Ward Executive Officer. Checklist was used to collect information related to adherence of breastfeeding practices, complementary feeding as well as dietary diversity in Mbinga District. The justification of using interview lies in the potential of this data collection method to serve the quest of obtaining in-depth information about the influence of feeding practices on under-five nutrition from the identified key informants. Ruel (2013) asserts that interview provides

rich information that is particularly useful in providing insights for description of social reality which no other method of data collection can provide.

Furthermore, The data were then edited, compiled, classified and summarized. This process was conducted using ENA for SMART and IBM-SPSS through which the author applied descriptive statistics and inferential statistics where by ordered probit regression model was used to identify the existing influence of feeding practices on under-five nutrition status, which is an ordinal variable. The analyzed data results have been presented by using graphs, charts and tables to convey a meaningful interpretation and discussion of the findings.

2.5. Data Validity and Reliability

The instruments for this study (questionnaire and interview checklist) were pre-tested. The pre-test was aimed at determining whether the questions are clear, unambiguous to the study respondents. Some adjustments to the questions in terms of language used, content and flow were made in response to the observed weaknesses of the tools.

A pilot test was done to 20 respondents randomly selected in Luhangarasi Ward, which was not sampled for the study. Therefore, the respondents who were involved in the pilot test were not included in the actual household surveys. To ensure reliability of the responses, the questionnaire was made simple and strait forward. In this study, the researcher was careful in collecting data, analyzing and processing data from respondents. He maintained ambiguity, less complications and relevance when formulating a questionnaire.

Similarly, the use of both primary and secondary sources of data by using different types of data collection instruments such as Questionnaire, interview and documentary sources was designed to measure the same thing in order to check reliability. Furthermore, the use of non-probability sampling techniques such as purposive and snow ball sampling allowed the researcher to select the respondents based on the knowledge of the population its elements and research objectives.

2.6. Ethical Considerations

Adherence to ethics is a crucial element in a research process. Thus with this knowledge, the researcher followed various rules throughout the entire process. In this study the researcher secured letter of introduction from TICD which enabled acquisition of permission from all possible authorities in Mbinga District Council allowing him to conduct this research.

Further, the study promoted voluntary participation where by respondents and the informants were subjected to choosing to participate in the research project in their will and consent (Nnko, 2017). Similarly, in this study, ethics included maintaining dignity, privacy, confidentiality, informed consent, being honest, transparent, and adherence to human rights. This is very important as it enhanced a maximum cooperation, willingness and freedom of respondents in expressing their thoughts regarding the influence of community participation on under-five nutrition status in Mbinga district, by May 2022.

3. Results and Discussion

3.1. Characteristics of respondents

The study involved 150 heads of households from three wards of Mbinga District. The study was conducted in a manner that both men and women having different age, sex, education, occupation and economic status were involved.

3.1.1. Sex of respondents

The research involved households of different categories in terms of family size, age, sex, years of schooling, marital status and occupation of household head. Moreover, sex of respondents was taken into account in order to avoid bias in responses. However, female respondents were more numerous than male respondents because the latter are demographically fewer than the former. Table 2 indicates that about 64.7% of the respondents were female and 35.3% were male in the surveyed area. Similarly, in Tanzania female and male population was 51.3% and 48.7% respectively (URT, 2013b). Sex in the surveyed area of the study was considered to be one of the determinants of under-five nutrition status since it is a common cultural reality in most Tanzanian families whereby community entrusts a woman with responsibilities of feeding and taking care of the under-five children as compared to men (Mtoi and Nyaruhucha, 2019).

3.1.2. Age of respondents

Generally, age is a fundamental measure of population structure (Agwanda and Amani, 2014). Demographers and other social scientists have special interest in the age structure of a population because several social relationships within the community depend on age. The significance of age of caregivers on feeding practices on under-five nutrition status has been examined extensively.

Mbela (2009) found the influence of age of mother on under-five nutrition status is very diverse. Some studies have found that age has a positive effect on food productivity, livelihood improvement strategies, household food storage, size of household, knowledge on nutrition issues as well as their willingness to participate in adhering to appropriate breastfeeding and complementary feeding for under-five children (Carletto *et al.*, 2016; Chipungahelo, 2015).

Table 1 indicates that age distribution of the household heads ranged from 18 to 55 years, with concentration between 19 and 45 years and an average age of 32 years. The concentration of the age-cohort of the heads of household imply that members of their age group had strong command in food production, managing under-five feeding practices and hence higher possibility of improved under-five nutrition status.

3.1.3. Household size

Likewise, household size is an important determinant of food requirements and availability per household based on dietary energy consumption *per capita* per day and per under-five equivalent per day (Ngongi, 2013). The significance of household size in food security hinges on the fact that the availability of labour for farm production, the total area cultivated for different crops, the amount of food crops retained for domestic consumption and the marketable surplus are all determined by household size. It also affects mother's ability to take care of under-five children in terms of breastfeeding at the same time being available to other members for food and other domestic services.

Likewise, Table 1 indicates that about 30% of the households had family size of 3 members, 19.3% of households had 4 members, 14.7% of households had 5 members, 14.7% of households had 6 members, 7.3% had 7 members, 6% of respondents had 8 members, 3.3 % of households had 9 members, 2% of households had 10 members and 2.7% of respondents had 11 members. In addition, the minimum household size was 3 members while the maximum size was 11 members in extended families. The mean household size was 5.1, which was above the national average of 4.7 (URT, 2013b). Ajao *et al.*, (2010) pointed out that large families are not food security and nutrition friendly; this is because people with more household members can devote less time and resources to each individual member. This shows that under-five children from large household are likely to be more prone to undernutrition than members living in smaller households.

Table 1 Descriptive statistics of the household size and age of respondents (n=150)

Statistics	Max	Min	Mean	Mode	Median	Std. Deviation
Household size	11	3	5.1	5	5	2.1
Age of respondents	55	18	35.3	33	34.5	3.3

It can be observed from the table that the mean age of respondents was 35 years with median age of 34 years showing that the two measures of relationship are closely linked where as the Standard Deviation was 3.3.

Likewise, the mean household size was 5 members and the median indicated almost the same number indicating the concretization of the variable in the sense that it is effectual that the family size of households in the study area is higher than the national average of 4.8 (URT, 2012).

3.1.4. Marital status of respondents

The influence of marital status on under-five nutrition status can be explained in terms of food availability, feeding practices and household size. It is expected that family labour would be more available where the households are married however the probability of large size of the household is high in a household whose head is married. In addition, nutrition status in monogamous and polygamous households is significant due to the reality that the latter tends to have large family size which sometimes the heads may encounter some difficulties in providing appropriate care and feeding services especially for the under-five children.

Table 2 Characteristics of respondents and their households (n=150)

Characteristics	Categories	f	%
Sex of respondents	Female	53	35.3
	Male	97	64.7
Marital status	Not married	16	10.7
	Married (monogamy)	60	40
	Married (polygamy)	62	41.3
	Widowed	12	8
Education	Never gone to school	14	9.3
	Primary education	123	82
	Secondary education	13	8.7
Head of household	Male	85	56.7
	Female	65	43.3
Occupation	Peasant	139	92.7
	Government employee	7	4.7
	Business	4	2.7

Generally, the percentage of polygamous household was high as compared to monogamous in the surveyed area. This implies that the surveyed households were culturally male dominated (Gibore *et al.*, 2019). Table 2 shows that 10.7% of the respondents in the surveyed area were not married, 40% of respondents were in a monogamous marriage, 41.3% of respondents were in a polygamous marriage and 8% of respondents were widowed.

3.1.5. Education level of respondents

Education level of respondents was one of the social characteristics which were assessed in terms of number of years of schooling. Many studies have revealed that the level of education helps household members to acquire and use information efficiently in food production and appropriate feeding of under-five children. So as a more educated person acquires more information and, to a large extent, is a better producer (Mustaf, 2007). Similarly, the level of education of household heads determines the level of opportunities available to improve livelihood strategies, enhance food security, and reduce the level of poverty. It affects the level of exposure to new ideas on their involvement in enhancing under-five nutrition and the importance of appropriate care and feeding practices for the under-five children. Educated heads of households are expected to participate effectively in ensuring household food security and adherence to initial breastfeeding, exclusive breastfeeding and complementary feeding for the under-five. Further, they are able to adopt and integrate innovations into the household's survival strategies.

Table 2 indicates that about 82% of respondents had attained primary education, 8.7% of respondents had secondary education and 9.3% of respondents never gone to school in their lifetime. In view of these results, the majority of heads of households have primary education and some have never gone to school, so this affects their knowledge and participation in enhancing appropriate care and feeding practices for the under-five children at household level (Kejo *et al.*, 2018b; Mtoi and Nyaruhucha, 2019).

3.1.6. Head of household

Household headship was taken into account by including female headed households (FHHs) and male-headed households (MHHs), in order to avoid gender bias in responses. However, MHHs were more numerous than FHHs because the latter are naturally fewer than the former. Table 2 shows that 56.7% of the households were male headed and 43.3% were female headed in the surveyed area. However, in Tanzania FHHs and MHHs are 24.4% and 75.6% respectively (World Bank, 2018). Household headship in rural areas of Mbinga district was considered to be one of the determinants of food security and under-five feeding practices since FHHs were less endowed with land entitlement compared to MHHs. The third quarter proportion of the FHHs was widows. The situation of MHHs being much more numerous than FHHs is a common cultural reality in most African families whereby the community entrusts a man with

the responsibility of bringing food for the family, protecting them against social injustice, clothing them and making shelter for them (Peneza and Maluka, 2018).

3.1.7. Occupation

Main occupation of the heads of households influences education and knowledge on under-five nutrition status. Significantly, it affects the household's livelihood strategies which directly influence food production and availability as well as adherence to initial breastfeeding, exclusive breastfeeding and complementary feeding for the under-five at household level since occupation determines income level and entitlement to materials such as food and land which are very essential for under-five nutrition (Alwang *et al.*, 2019; Jayne *et al.*, 2019; Legesse *et al.*, 2020). Results in Table 2 indicate that 92.7% of respondents were peasants, 4.7% were government employees and only 2.7% were business persons. In view of these results it can be concluded that majority of households in the study area were engaging in production of food and cash crops such as maize, millet, cassava and coffee so the expectation is that food is secured however it is not well reflected to under-five children's nutrition status.

3.1.8. Breastfeeding practices for the under-five children

Breastfeeding practices for the under-five children in the surveyed households were determined using three indicators which are early initial breastfeeding, extended breastfeeding at one year and extended breastfeeding at two years. These findings are clearly presented and discussed under this section.

Findings show that 90.7% of the households their under-five children were initially breastfed within one hour of birth while 9.3% of children were breastfed late in more than one hour after birth (Table 3). This implies early initial breastfeeding reduces the risk of a newly born child to be affected by nutritional disorders as compared to those who were initially breastfed within an hour after birth. These findings are supported by Kejo *et al.* (2008) who found that prevalence of stunting among the under-five in Arusha district was associated by late initiated breastfeeding among other factors.

In examining prevalence of exclusive breastfeeding among the under-five in Mbinga district, Table 3 indicates that only 28% of under-five children were exclusively breastfed while 72% of under-five children were not exclusively breastfed. This implies that most of the under-five children are not exclusively breastfed within six months after birth thus making them prone to nutritional problems as opposed to those who are exclusively breastfed within the first six months.

During the interview, The District Nutritional Officer from Mbinga reported that;

"...most of lactating mothers in Mbinga District breastfed their babies for three to four months. Consequently after post-natal period infants are being given soft and plain porridge early at the age of before six months..." (KII, 15th March, 2022).

This implies that majority of under-five children did not continue breastfeeding within the recommended two years after birth. This was later proved after the heads of the households to have answered the question that required them to state if they continued breastfeeding their children within two years after birth. In addition, Table 3 also shows that 25.3% of children continued breastfeeding at two years after birth while 74.7% of children stopped breastfeeding before the recommended two years after birth. These findings are supported by Carletto *et al.* (2016) who found that undernutrition in India was associated with inappropriate infant feeding practices specifically failure of caregivers to adhere to initial breastfeeding, exclusive breastfeeding and extended breastfeeding within two years after birth.

Table 3 Breastfeeding practices among the under-five children (n=150)

Breastfeeding practices	Categories	f	%
Early initiation of breastfeeding	Within one hour of birth	136	90.7
	More than one hour of birth	14	9.3
Prevalence of exclusive breastfeeding	Exclusive	42	28
	Non-exclusive	108	72
Child continued breastfeeding at two years	Yes	38	25.3
	No	112	74.7

3.1.9. Complementary feeding practices for the under-five children

The study aimed at examining the breastfeeding practices for the under-five children in the surveyed households in the study area. The indicators include prevalence of complementary feeding as well as consumption of nutritious food types after six months of birth.

Findings indicate that 72% of the surveyed households started giving their children complementary foods before 6 months after birth with the majority starting giving their children at 3 months after birth and 28% of the surveyed households started giving their children complementary foods at 6 and 7 months after birth (Table 4).

During the interview, Health Officer from one of the surveyed wards reported that;

“...majority of parents/caregivers start giving complementary foods to their children before six months after birth, mostly at three to four months. The most common weaning food is plain porridge made of maize flour.” (KII, 17th March, 2022).

This signifies that majority of households start giving complementary foods to the under-five children before six months after birth thus making them prone to stunting, wasting and under nutrition. These findings are contrary to WHO and UNICEF recommendations; children should initiate breastfeeding within the first hour of birth and be exclusively breastfed for the first 6 months of life (Mdimu *et al.*, 2017).

Further, the types of complementary foods were assessed in order to understand the dietary intake of the under-five after the period of exclusive breastfeeding. The results indicated that the majority of households depend on maize porridge as a major complementary food for the under-five children.

Table 4 shows that 60% of households gave plain porridge to their children, 4.7% household gave their children porridge with cow milk, 10% households gave their children ugali (*sembe*), 12.7% households gave their children cow's milk only, 1.3% household gave their children fresh or industrial juice and 11.3% household gave their children powdered milk as complementary food.

These findings imply that plain porridge and ugali were the dominant complementary foods for the under-five in the study area while foods like cow milk, juice and fresh milk were less likely to be consumed as complementary foods.

Table 4 Complementary feeding practices among the children (n=150)

Breastfeeding practices	Categories	f	%
Prevalence of complementary feeding	One month	2	1.3
	Two months	20	13.3
	Three months	64	42.7
	Four months	7	4.7
	Five months	15	10
	Six months	40	26.7
	After six months	2	1.3
Types of complementary foods	Plain porridge (<i>sembe</i>)	90	60
	Porridge with milk	7	4.7
	Ugali (maize)	15	10
	Cow's milk only	19	12.7
	Fresh or industrial juice	2	1.3
	Powdered milk	17	11.3

The findings in this study were similar to those found by Kulwa *et al.* (2016) who reported that, infants were mostly fed by maize porridge and that of Mdimu *et al.* (2020) who reported that more than half infants in South Africa were fed

with maize porridge, Whereas, Gardner and Grillo (2012) reported that 80% of children were fed by maize porridge in Jamaica.

3.1.10. Household dietary diversity for the under-five children

The study intended to assess the household dietary diversity for the under-five children in Mbinga District, using two indicators which are food utilization and meal frequency of the under-five children at household level especially from two to five years of birth. These findings are clearly presented and discussed under this section.

Table 5 Food groups consumed by under-five in the past seven days (n=150)

Frequency/times per week	6-7	3-5	1-2	Never
Food groups	f (%)	f (%)	f (%)	f (%)
Cereals, roots and tubers	148 (98.7)	0	0	2 (1.3)
Vitamin A fruits and vegetables	112 (74.7)	30 (20)	8 (5.3)	0
Other fruits and vegetables	102 (68)	38 (25.3)	15 (10)	3 (2)
Eggs	5 (3.3)	8 (5.3)	11 (7.3)	126 (4.7)
Milk and Dairy products	21 (14)	15 (10)	38 (25.3)	76 (50.7)
Flesh foods	2 (1.3)	2 (1.3)	11 (7.3)	135 (90)
Legumes, nuts and seeds	130 (86.7)	9 (6)	9 (6)	2 (1.3)

The heads of households were asked to comment on food groups consumed by their children within seven days before the inquiry. Table 5 indicates the most and least food group consumed by the children. Starchy staple foods were the most consumed food group while the least consumed food group was eggs. Cereals, roots and tubers were the most common staple foods in the studied community and it had the highest score of 98.7%, whereas eggs scored 3.3%. It was further reported during the interview with Ward Executive Officer from one of the surveyed wards that;

“...historically, ugali with beans and vegetables and some food types like cassava and potatoes are mostly consumed by majority of people in our district. Unfortunately, even the under-five children are mostly fed with these food types than other groups such as eggs and meat which is sometimes costly for ordinary households to afford...” (KII, 15th March, 2022).

This implies that under-five children eat the same food groups as adults and share the same food plate with them. Although they lack important nutrients from other food groups such as eggs, fruits, fish and meat, the frequently consumed food type is of less dietary diversity thus hampering their nutrition status.

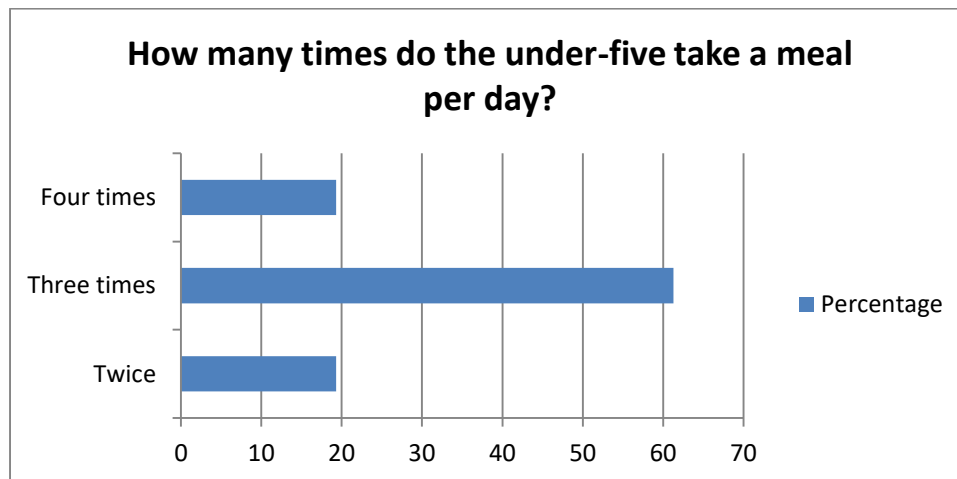


Figure 2 Number of meals for under-five children at household level (n=150)

These findings were similar to Isabirye *et al.*, (2020) who found that there was high consumption of cereal staple foods (88.3%), low consumption of eggs (16%) and more than 50% of the respondents had low dietary diversity (59%) in Uganda.

Apart from food diversity and utilization, the researcher intended to examine number of meals the under-five consume per day at household level. Figure 3 indicates that about 80.5% of the under-five children take meals three to four times per day while only 19.3% of under-five children take meals twice per day. Generally, the mean number of meals was three meals per day. These results are similar to Id (2019) who also found that more than 50% of under-five children in Majiri ward, Manyoni district do have three to four meals per day.

These findings adhere to WHO recommendations that the under-five children should have not less than three meals per day in order to improve their health and nutrition (Nyaruhucha *et al.*, 2006).

3.1.11. Determinants of feeding practices on under-five nutrition status

The nutritional status of the under-five children was determined in Mbinga District. Figure 4 shows the distribution of stunted, underweight, normal and wasted children. Out of 150 children who were studied, 42% were stunted, 33% were wasted, and 25% were underweight. Similar results were also revealed during the interview with District Nutrition Officer who asserted that;

“...childhood undernutrition involving stunting is perceived normal as one of the processes in child growth and development. It is sometimes perceived as a result of witchcraft from wicked people...” (KII, 18th March, 2022).

Generally, the prevalence of undernutrition in the studied sample was higher than the national prevalence rate which is 31.8% for stunted, 13.7% for underweight and 4.5% for wasting (URT, 2019).

Similarly, undernutrition was also higher than that reported in Africa. Agho *et al.* (2019) observed that, 30.7% of the children in Africa were stunted, 14.4% were underweight while 5.4% were wasted. In West Africa, 31.8% of the children were stunted, 20.1% were underweight while 10% were wasted. In Southern Africa, 30.6% of the children were stunted, 10.7% were underweight while 4.1% were wasted. In Central Africa, 28.8% of the children were stunted, 12.8% were underweight while 6.7% were wasted.

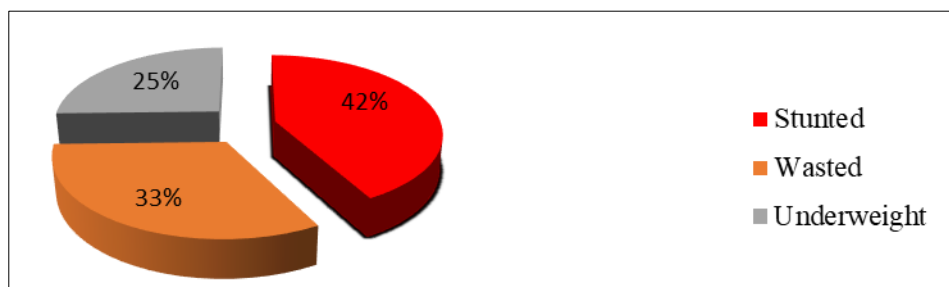


Figure 3 Distribution of stunted, underweight and wasted children (n=150)

Furthermore, the ordinal probit regression was used to analyse the determinants of the under-five nutrition status which is shown in figure 4. The signs of coefficients from ordinal probit regression analysis were used to discuss the direction of the relationship (positive/negative) between independent variables and the dependent variable.

As specified in the ordered probit regression model;

$$Y_i = a_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + e$$

The dependent variable was under-five nutrition status while the independent variables were age of a child, sex of a child, household size, early initial breastfeeding, exclusive breastfeeding, extended breastfeeding, complementary feeding, types of complementary foods, food dietary diversity and meal frequency.

Table 6 Ordered probit regression results on the determinants of U/5 nutrition

Predictor	Coef.	Std. Err.	z	P>z
Household Size (in number)	-0.396	0.214	1.86	0.063
Early Initial breastfeeding (1=within 1 hr)	0.041	0.433	0.09	0.925
Exclusive Breastfeeding (1= 6 months and above)	0.925	0.424	2.18	0.029
Extended Breastfeeding (1=within 2 years)	-0.375	0.719	-0.52	0.602
Complementary Food (1=Yes)	-0.279	0.497	-0.56	0.575
Complementary Food Types (1=Recommended type)	0.410	0.703	0.58	0.560
Food Dietary Diversity (1=recommended groups)	1.009	0.574	-1.76	0.079
Meal frequency in number per day (1=4 meals and above)	0.585	0.306	1.91	0.056
<i>Number of observation</i>	149			
<i>Log likelihood</i>	-94.451			
<i>LR chi2(10)</i>	20.19			
<i>Prob > chi2</i>	0.027			
<i>Pseudo R2</i>	0.097			

The results from this study show that exclusive breastfeeding was statistically significant at the $p < 0.05$ level and positively influenced the under-five nutrition status (Table 6). This indicates that exclusively breastfed children were more likely to have good nutrition status, while non-exclusively breastfed children were more likely to be stunted, wasted, and underweight. These findings coincide with Chipungahelo (2015), who found that the most undernourished children were those who had never exclusively breastfed.

Results from Table 6 show that meal frequency was statistically significant at the $p < 0.1$ level and positively influenced the under-five nutrition status. This implies that children who consumed four meals or more per day were more likely to have good nutrition status, while those who were taking less than four meals per day were more likely to be stunted, wasted, and underweight. These findings are supported by Megersa *et al.* (2015), who found that under-five nutrition status in Borana, Southern Ethiopia, was positively associated with meal frequency consumed by under-five children per day.

Household size was statistically significant at the $p < 0.1$ level and negatively influenced the under-five nutrition status (Table 6). This indicates that an increase in household members decreases the likelihood of children being stunted, wasted, and underweight. These findings imply that the size of the household determines food availability and the ability of caregivers to ensure appropriate feeding of the under-five children. These findings are supported by Minja *et al.* (2021), who found that the risk of a child being undernourished increases significantly with an increasing number of siblings within the household.

Food dietary diversity is a measure of food consumption that reflects household access to a variety of foods and is also a proxy for the nutrient adequacy of the diet of under-five children. Table 6 shows that food dietary diversity was statistically significant at the $p < 0.1$ level and positively influenced the under-five nutrition status.

This indicates that consumption of a diverse diet was significantly associated with a reduction in stunting, wasting, and being underweight in children. The likelihood of being stunted, wasted, and underweight was found to decrease as the number of food groups consumed increased in the study area. The study findings concur with Khamis *et al.* (2019), who found that children who did not receive the MDD had a significantly higher likelihood of being stunted and underweight.

Therefore, based on these findings, we reject the null hypothesis, which stated that there is no relationship between feeding practices and under-five nutrition status, and accept the alternative hypothesis that there is a positive relationship between feeding practices and under-five nutrition status.

4. Conclusion

There were inappropriate breastfeeding practices among children in the study area, as exclusive breastfeeding is not well adhered to. There was inappropriate complementary feeding in the study area as mothers and caregivers started giving complementary food to their children before the age of six months, and plain porridge was the major food. Further, there was appropriate consumption of a number of meals in the study area; however, the minimum dietary diversity of four out of seven recommended groups was not adhered to by households as ugali was the dominant meal. The prevalence rate of stunting, wasting, and underweight was high in the study area. Poor child feeding practices have a positive influence on anthropometric status, while family size has a negative influence on the anthropometric status of the under-five.

It is further recommended that Tanzania's Ministry of Health and other stakeholders formulate strategies for educating mothers both in the health facility and in the community on the importance of adhering to the recommended age of introduction of complementary feeding, meal frequency, and dietary diversity. Also, health care providers should be informed of the low proportion of adherence to the recommended complementary feeding practices so that they can discuss with mothers and caregivers the importance of optimal complementary feeding practices during ANC, delivery, postnatal visits, and also during child growth monitoring and vaccination visits.

Likewise, community members should be empowered economically so that they can achieve minimum dietary diversity, diverse complementary foods, and sufficient meal frequency for under-five children at the household level. In addition, lactating mothers, husbands, or any other caregivers should adhere to exclusive breastfeeding for the under-five within the recommended six months of birth, start giving complementary foods after six months, observe continued breastfeeding within two years of birth, and improve dietary diversity and meal frequency in order to improve under-five nutrition status.

Moreover, there is a need to educate community members on the use of family planning methods in order to control household size. It is because this study found that, large household size increases the likelihood of under-five children to be stunted, wasted or underweight.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors have no any conflict of interest for publishing this article.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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