Feeding Patterns Among Stunted Children Under-Five Years in Dodoma City in Tanzania

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Abstract

Background: Appropriate feeding pattern is important to prevent malnutrition and to achieve normal growth. **Aim of the study:** was to identify the feeding patterns among stunted children attending outpatient departments in central districts hospitals in Dodoma-Tanzania. **Study design:** descriptive cross-sectional study was used. **Setting:** This study was conducted in the 7 outpatient clinics affiliated to the 7 main hospitals in all districts of Dodoma city-Tanzania. **Subjects:** Convenient sample of 175 under-five children and their mothers/caregivers were selected. **Tools of data collection:** Three tools were used for data collection. The first tool was "Feeding Patterns of Stunted Children Structured Interview Schedule". The second tool was "A 24 hours' diet recall Structured Interview Schedule", While, the third tool was "Anthropometric measurement. **Results:** The results of this study showed that the majority (81.7%) of the children had low dietary diversity. The vast majorities of the children were stunted and less than one fifth were severely stunted. On the other hand, less than one fifth of the children were underweight, 5.1% were wasted, 4.6% were severely wasted, and 2.3% were over- weight. **Conclusion:** The study concluded that low dietary diversity is prevalent among stunted under- five children with several correlates related to the children themselves and their families. **Recommendations:** It is essential to enhance the nutritional pattern of the under-five children and increase the dietary diversity in order to overcome the problem of malnutrition among them.

Keywords: Feeding patterns, Stunting syndrome, Under-five years children

Introduction

Malnutrition still threatens the lives of under –five years old children, for both developing and developed countries. Malnutrition is a public health concern, however, in developed countries the prevalence of over-nutrition is more encountered. Malnutrition refers to "excesses, deficiencies or imbalances in a person's intake of energy and/or nutrients" **(World Health Organization, 2019).**

Malnutrition is classified into under-nutrition and over-nutrition. It can also be classified into chronic and acute malnutrition. The nutritional status of the child is indicated in terms of stunting, wasting, and being underweight or overweight. Stunting indicates chronic form of malnutrition **(World Health Organization, 2019).**

Stunting refers to impaired growth and development among children less than five years of age. According to the World Health Organization (WHO) definition, children whose length/ height-for-age Z-scores is more than two standard deviations below the WHO child growth standard median are defined as stunted **(UNICEF, WHO &, & World Bank, 2020).**

Short stature itself has no problem, but when short stature is associated with reduced physical, neurodevelopmental, economic capacity, an elevated risk of metabolic disease into adulthood, morbidity, and mortality, this is referred to as stunting syndrome which has devastating impacts on the health of the child **(Prendergast & Humphrey, 2014).**

Globally, 144 million children under 5 years which are around 21.3% suffer from stunting, among which 54% live in Asia and 40% live in Africa **(UNICEF et al., 2020).**

Stunting has been associated with increased morbidity and mortality, cognitive impairment,

low social-economic status later in adulthood, and a higher risk of acquiring both communicable and non-communicable diseases **(Leroy & Frongillo, 2019)**.

Multiple causes and risk factors for stunting were reported including intrauterine growth restriction, inadequate nutrition in infants and young children, and frequent infections during the early stage of life **(WHO, 2018).**

A strong linkage between nutrition and stunting provides an important area of study and research that will enable tackling malnutrition especially stunting, which requires addressing nutritional needs at key life stages throughout the entire life course.

Significance of the study

In United Republic of Tanzania, there were 5.5%, 3.5% and 32% of overweight, wasting and stunting respectively (UNICEF et al., 2021). (UNICEF., 2019).

Additionally, according to Tanzania National Nutrition Survey, stunting decreased from 34.7% in 2014 to 31.8% in 2018 (TNNS 2018), while, in Dodoma stunting account for 37.2% (Ministry of Health, Community Development, Gender et al., 2019).

Assessment of feeding patterns among stunted children provides the basis for nutritional assessment. Furthermore, this study will generate basic awareness to the health care providers and the entire community living with stunted children, and hence morbidity and mortality cases resulting from the stunting will be minimized or eliminated.

Aim of the study:

The aim of the study is to:

Identify the feeding patterns among stunted children attending outpatient departments in central districts hospitals in Dodoma-Tanzania.

Research question:

What are the feeding patterns among stunted children attending outpatient departments in central districts hospitals in Dodoma-Tanzania?

What are the levels of dietary diversity among stunted children attending outpatient departments in central districts hospitals in Dodoma-Tanzania?

Operational definition:

Under five children mean infants aged from 2 to less than 5 years old.

Materials and Method

Materials:

Research design:

A descriptive cross-sectional study was adopted.

Setting:

The study settings were selected using a multistage sampling technique. Dodoma city is sub-divided into 7 districts namely Bahi, Chamwino, Chemba, Dodoma, Kondoa, Kongwa and Mpwapwa. In each district, there is only one central hospital containing an outpatient clinic that provide all reproductive and child health services. Accordingly, the study was carried out in the seven outpatients' clinics affiliated to the seven central district hospitals at Dodoma city in Tanzania.

Subjects:

175 under-five children and their mothers /caregivers from the previously mentioned settings were selected. The study respondents were selected according to the following inclusion criteria; stunted children aged above two years and less than 5 years with their mother/caregiver who concerted to participate in the study. In addition, they should be not seriously ill children, or those who have severe end stage chronic disease, or those with the history of genetic short stature in their family.

Sampling technique:

Using the equal allocation method, a convenient sample of 25 under-five children and their mothers /caregivers were selected from each of the previously mentioned settings. The total

sample size was 175 under-five children and their mothers /caregivers.

Sample size:

The sample size was estimate using Epi info 7 statistical program using the following parameters; total population (all stunted children aged from 2 to less than 5 years attending the outpatient clinics over the last 3 months before conduction of the study in the year 2020-2021) 367 children, prevalence of problem 32%, confidence level 95%, margin of error 5% and with effect size 1.0. The minimum sample size estimated to be 175 children. The final sample size was 175 children and their mothers or caregivers.

Tools of the study: In order to collect the necessary data for the study, three tools were used:

Tool (1): Feeding Patterns of Stunted Children Structured Interview Schedule

This tool was developed by the researchers after reviewing of the most recent and relevant literature to collect the required data from the mothers or caregivers (Adeba, 2014; Ahmad, Khalique, Khalil, Urfi, & Maroof, 2018; Alamu, Gondwe, Eyinla, & Maziya-Dixon, 2019).

Part I: Children and their mothers or caregivers' personal and socio-demographic data: It included data related to the children and their mothers or caregivers' personal and socio-demographic data such as age, sex, place of residence, level of education and health problems.

Part II: Feeding patterns of a stunted children: It included data related to breast feeding, formula and complementary feeding practices, in addition to data related to stunting syndrome.

Tool 2: A 24 hours' diet recall Structured Interview Schedule: A 24-hour dietary intake list was developed by the researchers after reviewing the recent and relevant literatures (Adeba, 2014; Ahmad et al., 2018; Alamu et al., 2019) to record detailed information about all foods and beverages consumed by the children in the past 24 hours. Scoring of the 24 hours' diet recall was done as follow;

- The mothers/caregivers were asked about the dietary intake of their children in the last 24 hours, and then these food items were translated into the basic 7 food groups.
- Then consumption of the 7 food groups was used to estimate the dietary diversity. Dietary diversity Score (DDS) was calculated as follows; the value of one (1) was given to a child if he/she consumed one food item from the seven-food group in the last 24 hours, while a value of zero (0) if not consumed any food item from a seven-food group. The resultant total score ranges from 0 to 7, whereby zero represents no intake of any food items from the seven-food group, and seven represents consumption of food items from all seven-food group, which implies the highest level of diet diversification.
- Consumption of foods from at least 4 food groups (DDS $\geq$ 4) was considered as adequate dietary diversity, similarly consumption of food from less than 4 food group (DDS < 4) was classified as having low dietary diversity (FAO, 2018; Potts & Sealey-Potts, 2014; WHO and UNICEF, 2021).

Tool 3: Anthropometric measurement

It was used to determine the stunted children's height, weight was measured then compared to the WHO growth chart of Height/Length for Age, Weight for age, Weight for Height which can be expressed in Percentile or Z-scores. The classification of the anthropometric measures was done as follow;

- Anthropometric measures were inserted into WHO tool for analysis (The Anthro Survey Analyzer) (WHO, 2021) to generate Z scores and summary report were then inserted into the SPSS.
- For Height for age Z score, according to WHO children are referred as stunted if their height –for- age Z scores is below -2 SD, whereas, those who are below -3 SD are referred as severe stunting.
- For Weight for age Z score, according to WHO, children are referred as underweight if their

weight –for- age Z scores is below -2 SD, whereas, those who are below -3 SD are referred as severe underweight.

- For Weight for height Z score, according to WHO, children are regarded as wasted if their weight – for - height Z scores are below -2 SD, whereas, referred to severe wasted if they are below -3 SD. Moreover, children are regarded as over-weight if their weight – for – height Z scores is above + 2 SD.

Method

Preparatory phase

- Tools I, II were developed by the researchers after thorough extensive review of the relevant and recent literature.
- The tools of study were tested for their content validity by five experts in the pediatric nursing field, their opinion and suggestions were taken into consideration. Then the recommended modifications were done accordingly.

Implementation phase

- A pilot study was carried out by the researcher on 18 children and their mothers (10% of the sample) for testing the clarity and feasibility of the study tools and time of data collection and necessary modifications were done.
- Initial screening of the children was done using tool III (anthropometric measurements) and if the child diagnosed to be stunted, tool I and II were used to identify his/her feeding pattern.
- Data was collected by the researchers during the period from November 2020 till the end of march 2021.

Statistical analysis:

- After data were collected, they were coded and transferred into specially designed formats so as to be suitable for computer feeding. Following data entry, checking and verification processes were carried out to avoid any errors during data entry, frequency analysis, cross tabulation and manual revision were all used to detect any errors.
- The statistical package for social sciences (SPSS version 25) was utilized for both data presentation and statistical analysis of the results. Descriptive statistics: Count and percentage: quantitative data were described and summarized. For quantitative data which were normally distributed, measure of central tendency such as maximum, minimum, and arithmetic mean ($\overline{X}$) were used, while for measure of dispersion, standard deviation (SD) was used.
- Analytical statistics: Chi square: ($\chi 2$) was used to test the association between two quantitative variables or to detect difference between two or more proportions. Fissure's exact test (FET) was used whenever 20% or more of the table cells have expected cell frequencies less than 5. While, T- Test (t) was used to compare means. The level of significance selected for this study was P value equal to or less than 0.05.
- Graphical presentation included bar and pie charts were done for data visualization by using Microsoft Excel program.

Ethical considerations:

The mothers or caregivers were asked for an oral consent for participating in the study, they were informed that their participation is completely voluntary and assured them that the collected data will be used only for the purpose of the study. Confidentiality of data was maintained; anonymity of individual responses was guaranteed through using code numbers instead of names.

Results:

Table (1): Shows the basic characteristics of the mothers/caregivers

The table reveals that the mother age ranges from 17 to 41 years old, with a mean age of 26.49 years (Mean± SD 26.49±5.300). Furthermore, 1.2 % of the mothers could just read and write, and 1.7% of them had university education. Additionally, less than one fifth (17.0%) of the mothers were housewife, while, 8.0% of them were students and the rest (74.9%) of them were working.

Concerning the fathers' age, it ranges from 19 to 68 years old, with a mean age of 36.6 years (Mean± SD 36.61 ±9.731). Moreover, more than one third (39.5%) of them could just read and write, and 1.7 % of them had university education. Furthermore, the vast majority (93.7%) of them were working whereas the rest (6.3%) were students.

It was found that the majority (81.7 %) of the families were livings in rural area, and less than three quarters (74.3%) of them reported incomes insufficiency. Additionally, less than two fifths (38.9 %) of the

mothers/caregivers had a nuclear family. On the other hand, the mothers' age at the last pregnancy ranges from 14 to 38 years old, with a mean age of 23.27 years **(**23.27±5.327).

Table (2): Reveals the basic characteristics of the under five children:

The mean age of the studied children was 3.53 years (3.53±1.61) years. More than half (53.7%) of the children were males, while, around one fifth (20.6%) of the children were the first child within their families. On the other hand, more than one tenth (13.7%) of them had chronic diseases.

Table (3): Children's feeding patterns at the age less than 6 months till the age of less than 5 years (Breast, formula and complementary feeding)

The table shows that all children (100.0%) were breastfed during their first 6 months, despite that more than half (58.9%) of the children were not exclusively breast feed for six months and le**ss** than one third of the children (30.3%) used formula feeding during the age less than 6 months.

Concerning the complementary feeding at the age of 6 months to 2 years, it was noticed that more than half (56.6%) of the children had complementary food at the age of less than 6 months, while, more than three quarters (75.4%) of the children received three meals a day. Lastly, the vast majority of the children (98.3%) received three main meals a day at the age of 2 to 5 years.

Table (4): Illustrates the distribution of the studied under five children according to their anthropometric measurements

The table reveals that the children's weight ranged from 9.0 to 19.0 kg with a mean of 13.34 kg (13.34±1.823), while the mean height was 87.21 cm (87.21±5.693).

Figure (1): Portrays the distribution of the studied under five children according to the prevalence of stunting (Height for age Z scores)

It was found that the vast majority (91.4%) of the studied under five children were stunted, while, less than one tenth (8.6%) of them were severely stunted.

Figure (2): Portrays the distribution of the studied under five children according to the prevalence of underweight (Weight for age Z scores)

This figure shows that less one fifth (15.4%) of the studied under five children were underweight, and the rest (84.6%) of them were normal weight.

Figure (3): Portrays the distribution of the studied under five children according to the prevalence of wasting (Weight for height Z scores)

It was noticed that 5.1% of the studied under five children were wasted, while, 4.6 % were severely wasted. Moreover, about 2.3 % were over-weight. On the other hand, the majority (88.0%) of them were normal.

Figure (4): Shows the distribution of the studied under five children according to consumption of food groups per day (24 hours recall)

The figure portrays that all (100.0%) of the under five children consumed starchy food and grains, roots and tubers group, while, less than three quarters (70.9%) of them consumed pulses, legumes or nuts group. On the other hand, more than one quarter of them consumed vitamin A plants and other fruits and vegetables (26.9% and 25.7% respectively), while, one fifth (20.0%) of them consumed flesh food group. Moreover, less than one fifth (16.0%) of the under five children consumed dairy products and only 8.6% of them consumed eggs.

Figure (5): Shows the distribution of the studied under five children according to number of consumed 7 food groups per day. A minority (1.7%) of the under five children consumed one food group per day, while, less than one fifth (18.3%) of the studied under five children consumed four food groups and more per day.

Figure (6): Shows the distribution of the studied under five children according to the level of nutritional diversity

Regarding the level of nutritional diversity among the studied under five children, the majority (81.7%) of the studied under five children had low dietary diversity (less than four food groups per day) and 18.3% of them had adequate dietary diversity (four food groups and more per day).

Table (5): Shows the relationship between the levels of dietary diversity and the studied mothers/caregivers' related data

It was noticed that low dietary diversity was more encountered among the under five children whose fathers aged 35 years and more, low educated (with primary education), and non-working (84.9%, 84.1%, and 90.9% respectively).

Furthermore, low dietary diversity was less present among the mothers aged 35 years and more (68.8%), highly educated and non-working mothers (66.7%) with the same percentage as well as those mothers with no health problems (80.6%).

The same table reveals that low dietary diversity was more prevalent among those under five children from rural areas (86.0%), and those whose families were extended or single parent families (83.7%, and 89.7% respectively).

Moreover, low dietary diversity was lower among the under five children of families who declared income sufficiency (73.7%).

Additionally, low dietary diversity was more dominant among those under five children whose mothers were unmarried (85.7%), and those who had

their pregnancy at age less than 15 years old (100.0%), and those who reported occurrence of health problems or complications after delivery (94.5%) with a statistically significant relation between the level of dietary diversity and the presence of health problems after delivery (X^2 = 8.838, P= 0.003).

Table (6): Reveals the relationship between levels of dietary diversity and the under five children' basic characteristics

The table shows that low dietary diversity was higher among the children aged from 2 to less than 3 years old in comparison to those children aged from 4 to 5 years old (85.1% and 76.1% respectively). Furthermore, low dietary diversity was more prevalent among female under five children, those with low birth weight and those with a history of chronic diseases (85.2%, 100.0% and 83.3% respectively).

Moreover, low dietary diversity was less encountered among the under five children who ranked as the first child within their families in comparison to those who ranked as the fifth or more within the families (75.0% and 88.2% respectively).

Table (7): Illustrates the relationship between levels of dietary diversity and the under five children' feeding patterns

The table portrays that low dietary diversity was more prevalent among under five children who had no exclusive breast feeding (86.1%). While, it was less encountered among those under five children who had both breast feeding and formula feeding (77.4%) in comparison to those children with breast feeding only (83.6%). On the other hand, low dietary diversity was more encountered among those children who started complementary feeding at age of less than 6 months (83.7%) and those who had only one complementary meal per day (100.0%) with a statistically significant relationship between the levels of dietary diversity and the number of complementary meals consumed per day (X^2 = 9.149, P = 0.027). Finally, low dietary diversity was more present among those children who had only two main meals per day (100.0%).

Table (8): Shows the relationship between levels of dietary diversity and the under five children' anthropometric measurement

The table portrays that low dietary diversity was more encountered among sever stunted under five children (93.3%) in comparison to those stunted children (80.6%).

Moreover, low dietary diversity was more prevalent among under five children who were underweight (88.9%) in comparison to those with normal weight (80.4%).

Furthermore, the majority of wasted and severely wasted children had low dietary diversity (87.5%, 88.9% respectively) compared to those normal under five children (81.2%).

Table (1): Distribution of the studied mothers/caregivers according to their basic characteristics

Items	Total (N=175)	
	No.	%
Mother's age (years)		
<20	22	12.6
20 -	66	37.7
25 -	55	31.4
30 -	16	9.1
≥35	16	9.1
Min-Max 17-41	**Mean± SD** 26.49±5.300	
Mother's level of education		
Read & write	2	1.2
Primary education	72	41.1
Secondary education	98	56.0
University education	3	1.7
Mother's Work		
Working	131	74.9
House wife	30	17.1
Student	14	8.0
Father's age (years)		
<20	2	1.1
20 -	12	6.9
25 -	56	32.0
30 -	19	10.9
≥35	86	49.1
Min-Max 19-68	**Mean± SD** 36.61 ±9.731	
Father's level of education		
Read and write	69	39.5
Primary education	76	43.4
Secondary education	27	15.4
University education	3	1.7
Father's work		
Working	164	93.7
Student	11	6.3
Residence		
Rural	143	81.7
Urban	24	13.7
Semi-Urban	8	4.6
Family Income		
Enough	38	21.7
Not enough	130	74.3
Don't know	7	4.0
Type of family		
Nuclear family	68	38.9
Extended family	49	28.0
Single parent family	58	33.1
Items	**Total (N=175)**	
	No.	**%**
Mother's health problems		
Yes	51	29.1
No	124	70.9
Mother's age at the last pregnancy (years)		
<15	2	1.1
15 -	43	24.6
20 -	72	41.1
25 -	32	18.3
30 -	21	12.0
≥ 35	5	2.9
Min-Max 14-38	**Mean± SD** 23.27±5.327	

Table (2): The distribution of the studied under five children according to their basic characteristics

Items	Total N= 175	
	No.	%
Age (years)		
2 –	67	38.3
3 –	62	35.4
4 – <5	46	26.3
Min-Max 2- 4.9 years **Mean± SD** 3.53±1.61		
Sex		
Male	94	53.7
Female	81	46.3
Birth order in the family		
First	36	20.6
Second	55	31.4
Third	44	25.1
Fourth	23	13.1
Fifth and more	17	9.7
Presence of chronic diseases		
Yes	24	13.7
No	151	86.3

Table (3): Distribution of the studied under five children according to their feeding patterns at age of less than 6 months till age of less than 5 years (Breast, formula, and complementary feeding)

Items	Total (N= 175)	
	No.	%
Feeding patterns from birth till the age of 6 months (Breast and formula feeding)		
Breast feeding		
Yes	175	100.0
No	0	0.0
Exclusive breast feeding		
Yes	103	58.9
No	72	41.1
Formula feeding		
Yes	53	30.3
No	122	69.8
Feeding patterns at the age of 6 months to 2 years (Complementary feeding)		
Time to introduce complementary food		
< 6 months	98	56.0
≥ 6 months	77	44.0
Number of main meals per day		
One meal	1	0.6
Two meals	18	10.3
Three meals	132	75.4
Four meals and more	24	13.7
Feeding patterns at the age of 2 to 5 years (Complementary feeding)		
Number of main meals per day	(N =175)	
Two meals	1	0.6
Three meals	172	98.3
Four meal and more	2	1.1

Table (4): Distribution of the studied under five children according to their anthropometric measurements

Anthropometric measures	Min - Max	Mean± SD
Weight	9.0- 19.0	13.34±1.823
Height	77.0 – 99.5	87.21±5.693

Figure (1): Distribution of the studied under five children according to the prevalence of stunting (Height for age Z scores)

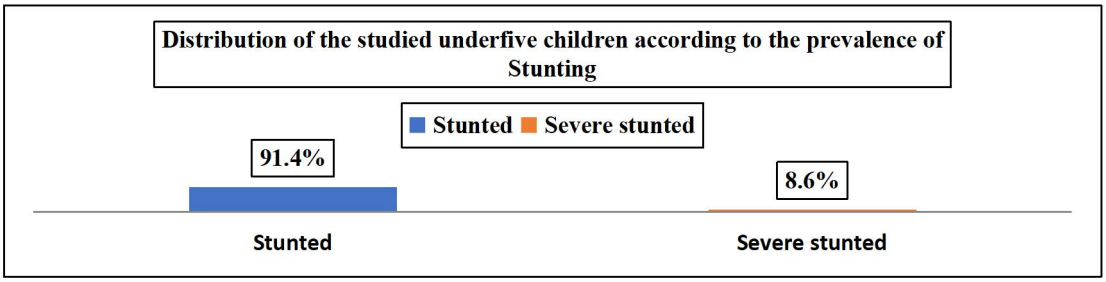

Figure (2): Distribution of the studied under five children according to the prevalence of underweight (Weight for age Z scores)

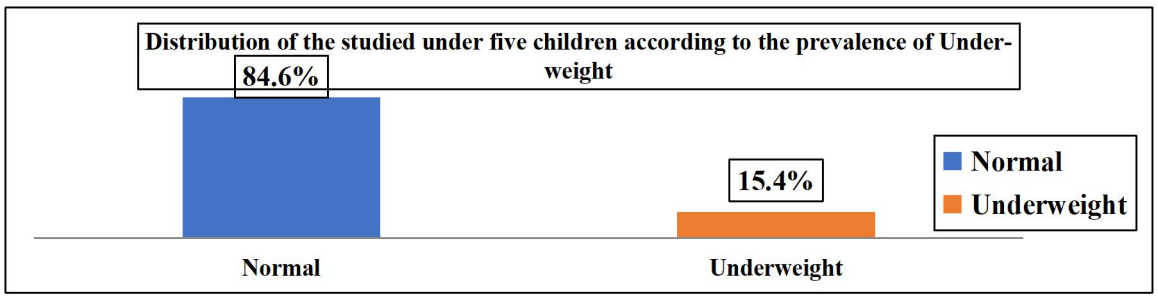

Figure (3): Distribution of the studied under five children according to the prevalence of wasting (Weight for height Z scores)

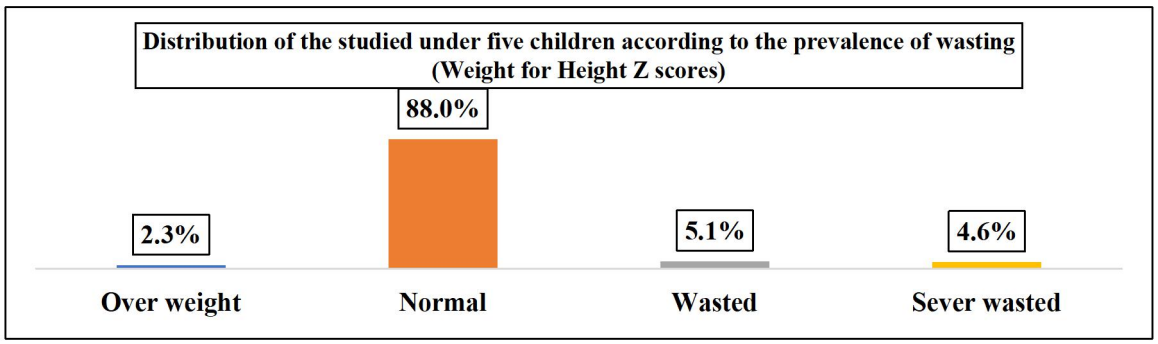

Figure (4): The distribution of the studied under five children according to consumption of the 7 food groups per day

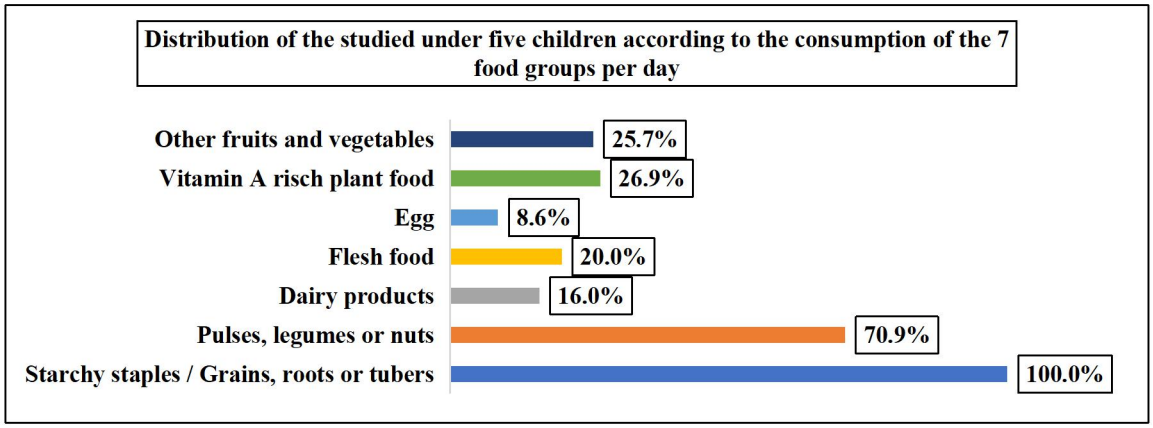

Figure (5): The distribution of the studied under five children according to number of food groups consumed per day

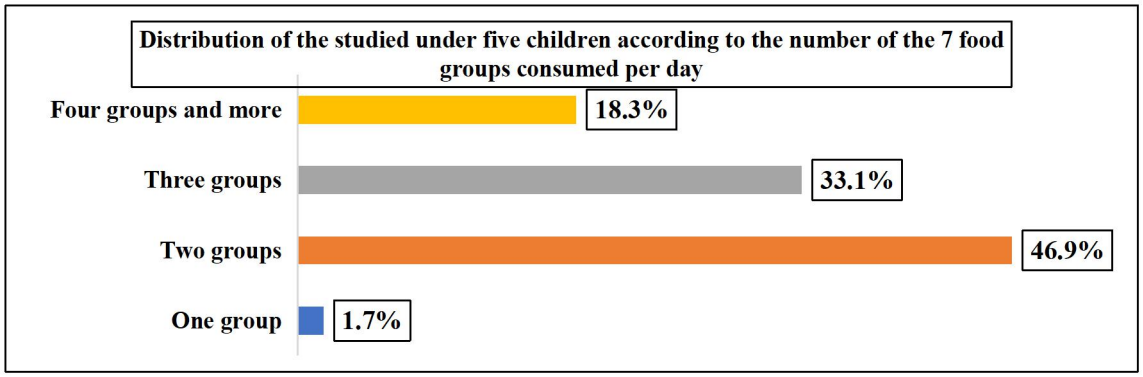

Figure (6): The distribution of the studied under five children according to level of dietary diversity

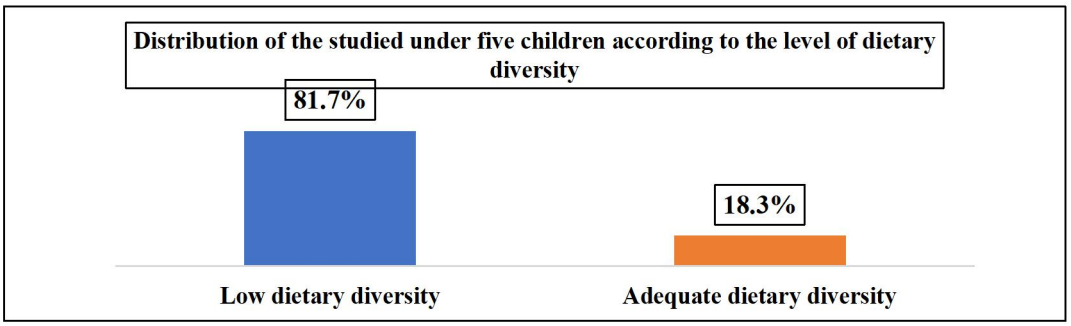

Table (5): The relationship between the levels of dietary diversity and the studied mothers/caregivers' related data

Items	Levels of Dietary Diversity				Total N=175		Test of Significance
	Low (N=143)		Adequate (N= 32)				
	No.	%	No.	%	No.	%	
Mother's age (years)							
<20	19	86.4	3	13.6	22	12.6	$X^2 = 4.183$
20 -	52	78.8	14	21.2	66	37.7	P=0.382
25 -	46	83.6	9	16.4	55	31.4	
30 -	15	93.8	1	6.2	16	9.1	
≥35	11	68.8	5	31.2	16	9.1	
Mother's level of education							
Read & write	2	100.0	0	0.0	2	1.2	$X^2 = 1.634$
Primary education	61	84.7	11	15.3	72	41.1	P=0.652
Secondary education	78	79.6	20	20.4	98	56.0	
University education	2	66.7	1	33.3	3	1.7	
Mother's Work							
Working	111	84.7	20	15.3	131	74.8	$X^2 = 5.495$
House wife	20	66.7	10	33.3	30	17.1	P=0.064
Student	12	85.7	2	14.3	14	8.0	
Father's age (years)							
<20	1	50.0	1	50.0	2	1.1	$X^2 = 2.413$
20 -	10	83.3	2	16.7	12	6.9	P=0.660
25 -	44	78.6	12	21.4	56	32.0	
30 -	15	78.9	4	21.1	19	10.9	
≥35	73	84.9	13	15.1	86	49.1	
Father's level of education							
Read and write	58	84.1	11	15.9	69	39.5	$X^2 = 1.834$
Primary education	63	82.9	13	17.1	76	43.4	P=0.608
Secondary education	20	74.1	7	25.9	27	15.4	
University education	2	66.7	1	33.3	3	1.7	
Father's work							
Working	10	90.9	1	9.1	164	93.7	$X^2 = 0.664$
Student	133	81.1	31	18.9	11	6.3	P=0.415
Residence							
Rural	123	86.0	20	14.0	143	81.7	$X^2 = 10.791$
Urban	16	66.7	8	33.3	24	13.7	P=0.005*
Semi-Urban	4	50.0	4	50.0	8	4.6	

X^2 Chi Square Test * Statistically Significant at $p \leq 0.05$

Table (5): Cont.

Items	Levels of Dietary Diversity				Total N=175		Test of Significance
	Low (N=143)		Adequate (N= 32)				
	No.	%	No.	%	No.	%	
Family Income							
Enough	28	73.7	10	26.3	38	21.7	$X^2 = 2.110$
Not enough	109	83.8	21	16.2	130	74.3	P=0.348
Don't know	6	85.7	1	14.3	7	4.0	
Type of family							
Nuclear family	50	73.5	18	26.5	68	38.9	$X^2 = 5.622$
Extended family	41	83.7	8	16.3	49	28.0	P=0.060
Single parent family	52	89.7	6	10.3	58	33.1	
Mothers' age at marriage (years)							
<15	1	50.0	1	50.0	2	1.1	$X^2 = 5.671$ P=0.225
15 -	97	85.1	17	14.9	114	65.1	
20 -	37	77.1	11	22.9	48	27.4	
25 -30	2	50.0	2	50.0	4	2.3	
Not married	6	85.7	1	14.3	7	4.0	
Mother's age at the last pregnancy (years)							
<15	2	100.0	0	0.0	2	1.1	$X^2 = 3.211$ P=0.668
15 -	37	86.0	6	14.0	43	24.6	
20 -	58	80.6	14	19.4	72	41.1	
25 -	27	84.4	5	15.6	32	18.3	
30 -	16	76.2	5	23.8	21	12.0	
≥ 35	3	60.0	2	40.0	5	2.9	
Mothers' experience of health problems							
Yes	52	94.5	3	5.5	55	31.4	$X^2 = 8.838$
No	91	75.8	29	24.2	120	68.6	P=0.003*

X^2 Chi Square Test * Statistically Significant at $p \leq 0.05$

Table (6): The Relationship between levels of dietary diversity and the under five children' basic characteristics

Items	Levels of Dietary Diversity				Total N=175		Test of Significance
	Low (N=143)		Adequate (N= 32)				
	No.	%	No.	%	No.	%	
Age (years)							
2 –	57	85.1	10	14.9	67	38.3	$X^2 = 1.493$
3 –	51	82.3	11	17.7	62	35.4	P= 0.474
4 – <5	35	76.1	11	23.9	46	26.3	
Sex							
Male	74	78.7	20	21.3	94	53.7	$X^2 = 1.216$
Female	69	85.2	12	14.8	81	46.3	P=0.270
Birth order in the family							
First	27	75.0	9	25.0	36	20.6	$X^2 = 2.327$
Second	44	80.0	11	20.0	55	31.4	P=0.676
Third	38	86.4	6	13.6	44	25.1	
Fourth	19	82.6	4	17.4	23	13.1	
Fifth and more	15	88.2	2	11.8	17	9.7	
Presence of chronic diseases							
Yes	20	83.3	4	16.7	24	13.7	$X^2 = 0.049$
No	123	81.5	28	18.5	151	86.3	P=0.825

X^2 Chi Square Test * Statistically Significant at $p \leq 0.05$

Table (7): The relationship between levels of dietary diversity and the under five children' anthropometric measurement

Items	Levels of Dietary Diversity				Total N=175		Test of Significance
	Low (N=143)		Adequate (N= 32)				
	No.	%	No.	%	No.	%	
Levels of stunting according to Height for age Z scores							
Severe stunted	14	93.3	1	6.7	15	8.6	$X^2 = 1.482$
Stunted	129	80.6	31	19.4	160	91.4	P=0.223
Level of malnutrition according to Weight for age Z scores							
Under weight	24	88.9	3	11.1	27	15.4	$X^2 = 1.099$
Normal	119	80.4	29	19.6	148	84.6	P=0.294
Level of malnutrition according to Weight for height Z scores							
Over weight	3	75.0	1	25.0	4	2.3	$X^2 = 0.641$
Normal	125	81.2	29	18.8	154	88.0	P=0.887
Wasted	8	88.9	1	33.3	9	5.1	
Sever wasted	7	87.5	1	12.5	8	4.6	

X^2 Chi Square Test * Statistically Significant at $p \leq 0.05$

Table (8): The Relationship between levels of dietary diversity and the under five children' feeding patterns

Items	Levels of Dietary Diversity				Total N=175		Test of Significance
	Low (N=143)		Adequate (N= 32)				
	No.	%	No.	%	No.	%	
Exclusive breast feeding							
Yes	81	78.6	22	21.4	103	58.9	$X^2 = 1.764$
No	62	86.1	10	13.9	72	41.1	P=0.184
Formula feeding							
Yes	41	77.4	12	22.6	53	30.3	$X^2 = 0.965$
No	102	83.6	20	16.4	122	69.8	P=0.326
Time to introduce complementary food							
< 6 months	82	83.7	16	16.3	98	56.0	$X^2 = 0.572$
≥ 6 months	61	79.2	16	20.8	77	44.0	P=0.449
Number of complementary meals per day							
One meal	1	100.0	0	0.0	1	0.6	$X^2 = 9.149$
Two meals	11	61.1	7	38.9	18	10.3	P=0.027*
Three meals	114	86.4	18	13.6	132	75.4	
Four meals and more	17	70.8	7	29.2	24	13.7	
Number of main meals per day							
Two meals	1	100.0	0	0.0	1	0.6	$X^2 = 1.578$
Three meals	141	82.0	31	18.0	172	98.3	P=0.454
Four meal and more	1	50.0	1	50.0	2	1.1	

X^2 Chi Square Test * Statistically Significant at $p \leq 0.05$

Discussion

Malnutrition including stunting has become one of the most serious global public health challenges of the 21st century in both developed and developing countries especially among under five children (UNICEF, 2018).Stunting is associated with many adverse physical and psychological effects that may appear in childhood and track into the adult years **(Torlesse, Cronin, Sebayang, & Nandy, 2016).**

The under-five period is a crucial time to study the determinants and risk factors of childhood stunting. It is appropriate time to begin intervention for stunting prevention as this period in particular is a pivotal time during which long term dietary habits are established, with potential lifelong effects on health **(de Onis & Branca, 2016).**

In Tanzania, a high prevalence of chronic and acute undernutrition still persists. It was estimated that about 450,000 children in Tanzania are acutely undernourished or wasted, with over 100,000 suffering from the most severe form of acute malnutrition, making it a country with one of the highest undernutrition burdens in Eastern and Southern Africa. The recently released national survey of 2018 reported that 31.8% of children were stunted, 3.6% were wasted and 14% were underweight **(IRS, 2017; Ministry of Health, Community Development, Gender et al., 2019).** The same picture was portrayed in the current study findings where the vast majority of the studied under five children were stunted, while, less than one fifth of them were severely stunted. Similar findings were reported in the Tanzania national nutritional survey in the year 2019, where the prevalence of stunting was 31.8% of which one tenth were severe stunted **(Ministry of Health, Community Development, Gender et al., 2019).**

Furthermore, the current study found that less than one fifth of the studied under five children were underweight, and around one tenth of them were either wasted or severely wasted. In the same line, the results of Fikry 2019, who found that more than one tenth of the children were wasted **(Fikry, Mohamed, & Mohamed, 2019).**

However, the prevalence of under-weight were slightly higher in a study done by Shaban , Fahmy & Hassan in the year 2017, where, less than one fifth of the children had moderate underweight, and less than one tenth of them had severe underweight (Shaban, Fahmy, & Hassan, 2017). Moreover, according to Tanzania national nutritional survey in the year 2019, the prevalence of underweight were 14.6%, 3.5% were wasted while 0.4% were severely wasted and 2.8% were over-weight **(Ministry of Health, Community Development, Gender et al., 2019).**

Poor infant and young child feeding practices are the main causes of undernutrition in Tanzania and other developing countries. Therefore, the consumption of adequate, diversified food is necessary (Abeshu et al., 2016). Globally, however, only less than one-fourth of infants aged 6–23 months meet the recommended criteria for dietary diversity, and only a few of them are receiving a nutritionally adequate diet. The World Health Organization has recommended that an infant should receive the minimum dietary diversity (MDD) of at least four food groups out of seven in order to maintain proper growth and development during this critical period, but many children cannot meet these criteria **(WHO 2018).**

In Tanzania, according to the national nutritional survey in the year 2019, only 35.1% of children aged 6 to 23 months had received the minimum dietary diversity **(Ministry of Health, Community Development, Gender et al., 2019).** The current study reveals that the majority of the children had low level of dietary diversity (less than 4 food groups), while less than one fifth of them had a high level of dietary diversity (4 food groups and more). The possible reasons for low dietary diversity practices in the study could be low affordability of foods that is not available at home and those foods that are coasty are sold from the house instead of feeding their child. In addition, due to low feeding practices, where animal source foods are commonly used during holidays and ceremony other than usual **(Gewa & Leslie, 2013).** Likewise, similar result was reported by

Rakotomanana et al where less than one quarter of the enrolled children had a minimum dietary diversity **(Rakotomanana, Gates, Hildebrand, & Stoecker, 2017).** Another study done by **Temesgen 2018,** found that young children in Ethiopia had low dietary diversity mean scores **(Temesgen, Negesse, Woyraw, & Mekonnen, 2018).**

Dietary diversity, as a marker of micronutrient adequacy, may increase nutrient density of the child's foods, which promote optimal child growth and development. Receiving an inadequately diversified diet may lead to undernutrition, and predispose children to opportunistic infections and severe illnesses **(Darapheak, Takano, Kizuki, Nakamura, & Seino, 2013).** This link was reflected in the current study findings, where, low dietary diversity was more encountered among those under five children with severe stunting, underweight, wasted, and those with moderate or severe malnutrition. These results are consistent with findings reported from other studies conducted in developing countries **(Ahmad, Khalique, Khalil, Urfi, & Maroof, 2018; Khamis, Mwanri, Ntwenya, & Kreppel, 2019; Temesgen et al., 2018).**The current study suggests that undernutrition can be reduced by improving the dietary diversity of the under five children. This is supported by the fact that dietary diversity is a good predictor of dietary quality and micronutrient density in children **(Temesgen et al., 2018).** Therefore, generally, this makes dietary diversity one of the important factors that policy makers should adopt to improve the nutritional status of children.

Concerning the relationship between the children's basic characteristics and dietary diversity, the current study found that low dietary diversity was higher among the children aged from 2 to less than 3 years old. Possible interpretation of this finding is that the meal requirement of younger children is minimal which adversely affects dietary diversity due to low meal frequency. Besides, children in this age category are victimized by the faulty complementary feeding practices **(Shumey, Demissie, & Berhane, 2013).** As a result, the low meal frequency may affect the probability of getting diversified diet. Furthermore, older children usually request their family to provide them foods whenever they feel hungry and could show their food preference which might increase the chance of meeting diversified foods. In the same line, results of **Custodio E 2019 and Seboka BT 2021** who found that older children had more adequate dietary intake as compared to younger children **(Custodio et al., 2019; Seboka et al., 2021)**. Moreover, Frempong & Annim, 2017 in their study observed that food diversity increased with child's age **(Frempong & Annim, 2017).**

Sex-based influences on eating behavior have been thought to be minimal. However, there are both biological (e.g., sexual dimorphic patterns of in utero neural development and genetics) and psychosocial (e.g., parental feeding practices and societal body ideals) factors that may affect the way children eat prior to **puberty (Weber, Leonard, & Zemel, 2012).** Moreover, the literature has consistently shown sex differences in children's food acceptance and preference patterns, particularly for foods that impact weight status and overall dietary quality (i.e., fruits, vegetables, proteins, etc.) **(Keller et al., 2019).** Concerning the child's sex, the current study found that low dietary diversity was more encountered among female children. This finding may be attributed to the cultural variations in eating that may be associated with macro-environmental variables such as country of residence. Similar finding was reported by **Blissett, J., 2013** who found a significant association between the children's sex and the parents' feeding practices, where male children had a greater number of foods than female children **(Blissett & Bennett, 2013).**

Moreover, in Tanzania, particularly Dodoma city societal norms that are linked to certain cultural beliefs which restrict a certain food to a certain gender especially female and norms that prioritize male during meal time are believe to affect the food intakes which in turn affect dietary diversity **(Bonatti, Borba, Schlindwein, Rybak, & Sieber, 2019).**

Looking at the effect of birth order on the dietary diversity, the present study illustrated that low dietary diversity was lesser among first born

child in comparison to the last child. This finding could be attributed to the culture prevailed in the community which pampered the first-born child than the later born child, that reflected in their child's feeding practices and styles. So, the mothers or caregivers may care more about the child's diet, that may result in more varieties in the first-born child's diet. The result of the current study come in line with the results of **Demilew Y 2017 and Temesgen H 2018** who showed that children of the first rank were less likely to have low dietary diversity with significant association between the child's birth order and dietary diversity **(Demilew, Tafere, & Abitew, 2017; Temesgen et al., 2018).** Furthermore, **Howell E 2018** also found an association between birth order and stunting and the feeding pattern of the children **(Howell, Holla, & Waidmann, 2016).** Moreover, the finding of the current study regarding birth order were inconsistent with **Gebremedhin et al., 2017** who found no association between child's birth order and dietary diversity **(Gebremedhin et al., 2017).**

The children's birth weight is another determinate factor for dietary diversity. The result of the current study showed that dietary diversity was more prevalent among those children with history of low birth weight. Possible explanation of this finding is the mothers/ caregiver poor feeding practices regarding those low-birth-weight children, where they are considered high risk children, so the mothers may fail to meet all nutritional requirements of those growing children, and therefore, the consumption of inadequate, low diversified food especially in the presence of other poverty, poor education, and adverse environmental factors. This result is in parallel with **Temesgen H 2018 and Ahmed I 2018** who found that the child's low birth weight was significantly associated with higher level of dietary diversity **(Ahmad et al., 2018; Temesgen et al., 2018).**

Presence of chronic diseases among children may affect nutrition and growth by means of multiple mechanisms. Direct effects of the condition that may cause undernutrition include increased resting energy expenditure, excess losses through malabsorption, difficulty ingesting food, and decreased appetite. Indirect effects of chronic diseases may be mediated by learnt or adaptive behaviors, secondary anorexia, inappropriate diets, or conditions that aggravate existing social nutritional risks to the child **(Westwood, 2015).** This could explain the result of the current study, where, low dietary diversity was more encountered among children with chronic diseases. This result is in consistent with **Tegegne, M 2017** who concluded that child's illness were statistically associated with dietary diversity practice **(Tegegne, Sileshi, Benti, Teshome, & Woldie, 2017).** While, **Yesufa N 2021** found that children's poor appetite may affect and reduce the frequency of feeding which ultimately decreases the chance of getting more diversified food **(Yesuf, Mekonnen, & Takele, 2021).**

Concerning the relationship between the parents' basic characteristics and the children's dietary diversity, the current study found that there are several factors affecting the children' dietary diversity such as age, level of education, work status, and monthly income.

Parents' age is an important determinant in the children nutritional status. The current study found that low dietary diversity was more encountered among those children with young mothers (less than 20 years) and those with older fathers (more than 35 years old). Possible explanation is that younger mothers may have less experience in child's care and in turn this may affect their feeding practices offering those children less food groups varieties to eat. On the other hand, according to the social perspective, fathers are seen as bread winners. So, they are so busy in their work, giving them less time to be engaged in children rearing and feeding practices. Similar findings were reported by **Disha A 2015 and Gebremichael B 2017** who found statistically significant associations between parents' age and the child feeding practices **(Disha, Tharaney, Abebe, Alayon, & Winnard, 2015; Gebremichael, Egata, & Assefa, 2017).** Furthermore, **Alamu, Gondwe, Eyinla, & Maziya-Dixon, 2019** found that mother's age influenced the diet diversity of food consumed by the households **(Alamu, Gondwe, Eyinla, & Maziya-Dixon, 2019).**

Parent's education, undoubtedly, is one of the most important factors that determine the nutritional status of the children. The current study findings reveal that low dietary diversity was more prevalent among those children whose fathers and mothers were highly educated. These findings could be attributed to that education of parents has several positive effects on the quality of care rendered to children. Those educated parents may understand the sequelae of inappropriate feeding practice thereby introduce a right quantity and quality of foods would be higher. In addition, the probability of reading and understanding of information regarding young child feeding practices appeared in magazines, news, and other sources might be higher among this group. The results of the current study were reported by **Abuya B 2012, Woldegebriel A 2020** and **Kassa T 2016** who found that parents' education at college and over might be a protective factor for children undernutrition and concluded that as the education level of the parents increases, there is access to more information on educational messages and different mass media like radio, television, and newspaper; as a result, their children are more likely to fulfill the minimum dietary diversity requirement **(Abuya, Ciera, & Kimani-Murage, 2012; Kassa, Meshesha, Haji, & Ebrahim, 2016; Woldegebriel et al., 2020).**

Moreover, another study done by **Dafursa & Gebremedhin, 2019** found that literate mothers' children had increased dietary diversity score and concluded that mother who had no education had limited knowledge which related to better child feeding and caring, low income and low living conditions. Educated women use health care facilities, interact more effectively with health professionals, comply with treatment recommendations, and keep their environment clean. Moreover, education of mothers improves child health by altering intra-household allocation of resources in a manner that favors children. Educated mothers are more likely to follow child feeding recommendations, which ultimately improves dietary diversity and meal frequency and nutritional status **(Dafursa & Gebremedhin, 2019).**

Parents' employment is another factor affecting the nutritional status of the children. The results of the current study reveal that low dietary diversity was more encountered among the children with non-working fathers, and working mothers. An explanation of these findings is that housewife mothers may spare and spend much time with their children thereby the contact will be increased and the child might have high probability of getting variety of food items along with frequency of feeding. Moreover, working mothers' bustle did not guarantee the formation of poor nutritional status in children. They may have limited time to provide food for children, and may alternate it by providing instant food, and just ignored healthy food choices. On the other hand, in case of non-working fathers, the family income will be affected, which in turn affect the nutritional choice and varieties offered to the whole family including the children. The findings of the current study were in congruent with those of **Woldegebrie A 2020, Demilew Y 2017** who found that parents' occupation significantly impact the young children dietary intake **(Demilew et al., 2017; Woldegebriel et al., 2020).** On the other hand, different results regarding mother's work had been observed by **Khan et al 2017 and Sebayang et al 2020,** where women's labor were positively associated with higher dietary diversity score **(Khan et al., 2017; Sebayang et al., 2020).**

The association between the socioeconomic status and the nutritional status was investigated in the current study, which found that low dietary diversity was more prevalent among children from families who reported income insufficiency. This finding could be explained as children from wealthier households had a more diverse diet because they may have high access to diverse diets than children from poorer households. Similar finding was reported by **Seboka et al 2021** who concluded that socioeconomic status is a proxy for wealth because it reflects increased access to foods purchased outside the household (**Seboka et al., 2021**). Furthermore, **Woldegebrie et al 2020** found that socioeconomic status of the family is a significant determinant of the minimum dietary diversity of children in their study and indicated that family income has a direct association with household food security, since food consumption

is believed to be heavily influenced by income of the household **(Woldegebriel et al., 2020).**

With respect to the place of residence, it is apparent from the current study that low dietary diversity was more present among children from rural areas. This might be due to differences in socioeconomic status, feeding habits, lifestyles, and demography between rural and urban areas. Moreover, mothers or caregivers from urban areas may have easy access to information, market, and health services about dietary diversity and child feeding practices. In the same line, the results of **Seboka et al 2021** and **Khamis A 2019** who found that children from urban areas had higher dietary diversity mean scores with significant association between place of residence and dietary diversity **(Khamis et al., 2019; Seboka et al., 2021).** In contrast, Mukherjee et al 2018 found that their study participants from rural area had significantly higher odds of adequate dietary diversity compared to urban area **(Mukherjee, Paul, Saha, Som, & Ghose, 2018).**

Family type and size has been proven to be related closely to health aspects of the family; the larger the family size, the more health problems among family members including young children **(Karmee, Satapathy, & Tripathy, 2017).** The current study found that low dietary diversity was more encountered among children from extended families in comparison to nuclear families. A possible explanation is that the bigger the family is, the more members must fulfill their nutrition, the less ability to fulfill their needs for diverse food. Similar result was reported by **Khamis A 2019** who found that the number of children in the household is significantly associated with minimum dietary diversity and concluded that families with many numbers of children are less likely to purchase diversified food groups and unable to fulfill their children's dietary requirement **(Khamis et al., 2019).**

In Tanzania, most of the household are characterized by extended family with many number of children (total fertility rate is currently 5.2 children per household) as well as short birth spacing (currently the median child spacing is 33 months) which make poor food distribution especially for the vulnerable group like children under-five **(TDHS, 2016b).**

Another interesting finding in the current study is that low dietary diversity was more encountered among children from single parents' families. This finding could be attributed to several factors including child rearing practices, parenting style, socioeconomic status which all in turn affect the child's nutritional status. In the same line, the results of **Mitchodigni I et al 2017** and Gebremedhin, S et al 2017 who found that children from female headed families had lower dietary diversity scores in comparison to those from ordinary families with significant association between parents' marital status and dietary diversity of the children **(Gebremedhin et al., 2017; Mitchodigni et al., 2017).**

Chronic physical illnesses are complex, lengthy, and difficult to treat. People dealing with this type of illness often experience impaired physical and social functioning, as well as reduced well-being. Because of these issues, the impact of a physical illness often reaches beyond an individual to his or her immediate family **(Guo et al., 2018).** The current study found that low dietary diversity was more prevalent among children whose mothers had health problems. This could be explained as mothers are the main providers of primary care to their children. So, the mothers' ill health status may have a problem in providing optimal care to their children which consequently affect the diet quality. The same findings were reported by **Dessie, Z.B et al 2019,** who found an association between the maternal health status and the nutritional status of children **(Dessie, Fentie, Abebe, Ayele, & Muchie, 2019).** Furthermore, a study done by **Frempong & Annim, 2017 and Sebayang et al., 2020** found that children born to parents with chronic health problems had a more diversified diet **(Frempong & Annim, 2017; Sebayang et al., 2020).**

The current study noticed that low dietary diversity was more encountered among under five children of those mothers who had pregnancy at age less than 15 years old. A possible explanation of this finding is that those younger mothers may lack experience in child's care and feeding practice.

Similar results were reported by **Rakotomanana et al 2017** who found that mother's age during the occurrence of pregnancy was significantly and positively associated with dietary diversity score as children born to mothers who had first given birth at an age younger were more likely not to have the recommended dietary diversity **(Rakotomanana et al., 2017).**

Furthermore, the current study found that low dietary diversity was more prevalent among under five children of those mothers who had health problems after delivery as well as those with health problems either acute or chronic diseases. This finding could be attributed to the ill mothers' deficient care given to their children because of illness, which could be reflected in poor dietary practices and low dietary diversity. In the same line, the results of **Correia LL et al 2014** who found that presence of mother's diseases was significantly associated with low dietary diversity score **(Correia et al., 2014).**

Breast-feeding is critical to the development and survival of young children and to the well-being of mothers **(Victora et al., 2016).** According to the WHO recommendations, infants should be exclusively breastfed for the first 6 months, and breast feeding should be supplemented with additional foods for the first 2 years and beyond **(UNICEF et al., 2020).** Breast feeding promotes healthier feeding pattern because it allows infants to control intake utile satiety is reached. Another mechanism is that it decreases appetite as it contains leptin which is a hormone that regulates appetite and it is contains all nutrient needed for this age **(Victoria et al., 2016).** This could explain the findings of the current study where low dietary diversity was more observed among children who were not exclusive breast feeding, and among those children with less frequently breast feed (less than five times a day). In congruent, the results of **Sebayang et al 2020** who reported that children who were age-inappropriately breastfed had lower dietary diversity **(Sebayang et al., 2020).**

Moreover, the findings of the current study revealed that low dietary diversity was more present among children who had shorter duration of breast feeding, which could be attributed to that shorter duration of breast feeding is probably associated with early introduction of commentary foods which may be low diverse. In the same line, **Dede et al 2020,** concluded that longer breast-feeding duration was a protective factor against malnutrition, where prevalence of malnutrition was lesser among those who had exclusive breast feeding **(Dede & Bras, 2020).**

From the age of 6 months, breastfeeding is no longer able to meet all nutritional requirements of a growing child, and therefore, the consumption of adequate, diversified food is necessary **(Abeshu et al., 2016).** The current study observed that low dietary diversity was less encountered among those under five children who had; both breast and formula feeding in comparison to those children with breast feeding only, and those children with more frequent formula feed, and those who had more amount of formula milk. Unlike the results from the current study, studies conducted by **(Bortolini et al 2019; Byrne, et al, 2018)** who revealed that uses of formula feeding were negatively affect the dietary diversity of the children **(Bortolini et al., 2019; Byrne et al., 2018).** Difference in the current study results and other studies could be explained by the differences in types of formula, as the majority of children in current study utilized homemade formula especially boiled cow milk not readymade industrial formula as reported in these studies **(Byrne et al., 2018).**

Complementary feeding is a strong determinant of food diversity **(Mitchodigni et al., 2017).** Consumption of less varied diet has been linked to lack of food access, low food utilization, and large seasonal fluctuations in food security, in addition to poor child rearing practices **(FAO, 2018).** Dodoma is a semi-arid region characterized by a long duration of a dry season. Dodoma also like the other part of the world is facing climate change, moreover, food cultivation and processing is not well established in **Dodoma** city and largely depend in seasonal rainfall (irrigation system is not well established) **(Mwantu, Agbo, & Ngwama, 2015).** Consequently, all of the factors highlighted affect availability, accessibility, and affordability of the

food which in turn affect both nutritional status and dietary diversity of the children. This could explain the result of the current study which found that low dietary diversity was more common in children who had complementary feed at age of less than 6 months, and those who consumed a smaller number of meals per day. **Likewise, Mitchodigni et al., 2017** found a significant association between complementary feeding practices and dietary diversity **(Mitchodigni et al., 2017). Moreover, Belew et al 2017,** found that the meal frequency was positively associated with dietary diversity among infant and young children (**Belew et al., 2017)**.

Conclusion

Based on the current study findings, it can be concluded that the vast majority of the studied under five children were stunted, while, less than one tenth was severely stunted. Less than one fifth of them were under-weight and a minority of them were wasted and severely wasted.

Additionally, the majority of the studied under five children had low dietary diversity and less than one fifth of them had adequate dietary diversity. Moreover, there were several risk factors for the occurrence of low dietary diversity whether related to the basic characteristics of the children and their families.

Recommendations

In the light of the findings of the present study, the following recommendations are proposed:

- Increase the scope of community-based programs for provision of professional services on appropriate and recommended feeding practices for infant and young children.

- Discouraging the use of breast milk substitute like home-made and commercial formula as well as the use of fast food and soft drinks.

- Further researches on the correlates of malnutrition among the under five children is recommended.

Further studies:

- Study on exploration of the knowledge on the nutritional stunting among mothers or care givers in Dodoma city.

- Interventional studies on behavioral changes on the feeding styles among infants and young children in Dodoma city.

- Studies on each component of breast feeding, formula feeding and complementary feeding practices.

- Studies on cognitive, social and economic effects of stunting among stunted children early in childhood and later during adulthood.

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