

Prevalence and factors associated with undernutrition among under-five children in Gairo district in Morogoro, Tanzania

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Abstract

Background: In Tanzania, under-nutrition is of most public concern as it affects human productivity in several areas like increasing economic costs to families and the country as a whole and impairing learning. Therefore this study aimed at assessing the prevalence and factors associated with undernutrition among under-five children in Gairo district, Morogoro. Findings from the study will help policymakers, and local and international organizations in designing appropriate nutrition policies and interventions to address undernutrition in rural areas.

Methods: A household-based cross-sectional study was employed involving 300 under-five children with their mothers/caretakers in three wards in Gairo district. A structured questionnaire was used and anthropometric measurements were performed using standard procedures. Odds ratio with a 95% confidence interval and p-value at ≤ 0.05 was used to identify factors associated with undernutrition.

Results: The study revealed that the prevalence of stunting was 54.3% (severe stunting 26.3% and moderate stunting 28%), underweight 23.3% (severe underweight 7% and moderate underweight 16.3%) and wasting 3.7% (severe wasting 1.3% and moderate wasting 2.4%).

Conclusion: The main factors that showed positive association were being a male, maternal occupation, child's age, maternal education, birth weight, and illness in the past one month, area of residence, maternal age, and time of introduction of solid foods and leaving a child when being outside. The prevalence of stunting and underweight in the study area was higher compared to the national and regional prevalence. Thus due attention is needed while much attention should be given to the factors that showed a positive association.

Keywords: Factors, undernutrition, under-five, Tanzania, Gairo

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Background

Malnutrition is a leading cause of morbidity and mortality in children under-five years of age. It contributes to between 3.5 and 5 million annual deaths among under-five children. According to World Health Organization (WHO), about 60% of deaths occurring among under-five children in developing countries are contributed by malnutrition (WHO, 2013). Undernutrition also results in several effects. Apart from its effect on physical growth, child undernutrition affects cognitive development and the Intelligence Quotient (IQ) of the child, resulting in delayed enrolment, higher absenteeism and poor performance in school. Evidence has shown that there is irreversible physical and cognitive damage due to undernutrition which is a major threat to human development (Martins *et al.*, 2011).

in the year 2016, it was estimated that globally, 22.9% of approximately 154.8 million children under the age of five years were stunted which decreased from 32.6% in 2005. Out of these, 7.7% were wasted and 20 million children were underweight (UNICEF/WHO/WB, 2017). In the year 2017, it was

estimated that around 150.8 million children were stunted and 50.5 million were wasted (Fanzo, *et al.*, 2018).

An approximated 35.6% of children under the age of five years in In East Africa were stunted and 6.5% were wasted (Onis & Branca, 2016; WHO, 2017). The Uganda Demographic and Health Survey of 2011 indicated four in ten Ugandan children under five years of age (33 %) were stunted (short for their age), six per cent were wasted (thin for their height), and fourteen per cent were underweight (low weight- for -age). (UDHS, 2011). In Kenya, according to Kenya Demographic and Health Survey 2014 reports, 26% of children under-five years were stunted, 4% were wasted and 11% were underweight (RK, 2014).

According to the Tanzania National Nutrition Survey (MoHCDGEC, 2018) about 31.8% of children under-five were stunted, 14.6% of children under-five were underweight and 4% were wasted. The prevalence of undernutrition in Morogoro region in 2018, 26.4% stunted, 12.1% underweight and 3.8% wasted (MoHCDGEC, 2018). With this prevalence in Tanzania, data on levels and patterns of undernutrition at district levels is limited. This study therefore aimed at assessing the prevalence and factors associated with undernutrition among under-five children in Gairo district in Morogoro. The study area was selected because there are limited studies that have investigated the prevalence and factors associated with undernutrition in the Gairo district.

Methodology

Study area

The study was conducted in three wards of Gairo district which were Gairo, Kibedya and Mandege. The study area was selected because there are no studies that have investigated the prevalence and factors associated with undernutrition in Gairo district. The district lies about 330 km west of Dar es Salaam, 132 kilometres east of Dodoma and 132 kilometres west of Morogoro Municipal. (URT, 2013). Agricultural production has been showing positive results by ensuring food security and surplus production with the major crops being maize, millet, beans, cassava, sweet potatoes and pigeon pea while the cash crops are sunflowers and ginger.

Initially, there was no district hospital but currently, there is a district hospital and health centres and dispensaries in Chakwale, Nongwe, Ibuti and Songambe. The increase in health facilities has resulted in a remarkable increase in the population in need of health services and an improvement in the standard of living. Thus diseases like malaria and infant mortality have been reduced from 13,545 patients to 5,065 patients and from 31 to 8 per 1,000 respectively from 2015 to 2017.

Study design

A cross-sectional study design was used to conduct this study. A simple random technique was used to select three wards from two divisions of Gairo district. A sample was estimated by using Cochran's formula as adopted by Bartlett *et al.* (2001). Based on the prevalence rate of stunting in Morogoro region of 26.4% (MOHCDGEC, 2018), the standard normal distribution of 95% and absolute error of 5% were used to obtain the sample size of 300 mothers/ caregivers and their children aged 6-59 months.

Data collection and instruments

The study used a semi-structured questionnaire on socio-demographic characteristics, child and maternal factors and anthropometric measurements using standard procedures. A Seca™ electronic weighing scale was used to measure weight. The device was held on a flat floor and standardized to zero at the start of each day. For children who were unable to stand alone, the mother or caregiver was asked to step on the scale, without the child and the scale was set to zero then the mother with a child's weight was measured. The scale read to the nearest 0.1 kg with light clothing and no shoes. Recumbent length was measured for children under the age of 2 years who refused to stand alone.

For children above 24 months were measured at standing height using a wooden measuring board to the nearest 0.1 cm.

Ethical consideration

The study was granted by the National Institute for Medical Research, (*NIMR/HQ/R.8a/Vol. IX/3926*). Informed consent was obtained from each mother/caretaker. All information was kept confidential.

Data analysis

Anthropometric data were entered and processed using WHO Anthro Software version 3.2.2. The obtained results with the data from the questionnaire were coded, entered and analysed using Statistical Package for the Social Sciences (SPSS) software version 20, whereby frequencies and percentages were generated to categorize socio-demographic characteristics, child factors and maternal factors for children under five years of age. The indices for nutrition status such as stunting (height for age), underweight (weight for age) and wasting (weight for height) were converted from weight and height measurements, in terms of standard deviation (SDs) being below or above standard measures (WHO,2006). Chi-squared tests and odds ratios were used to compare group differences for categorical variables. Independent variables were significant if (p-value equal to or less than 0.05).

Results

Socio-demographic characteristics.

Three hundred (300) respondents were interviewed, 100 from each ward (Gairo, Kibedya and Mandege). Nearly half of mothers/caregivers aged 25-34 years were from Mandege ward. The majority of respondents were married, had primary education and were farmers. (Table 1).

Table 1: Socio-demographic characteristics of respondents from Gairo district (N=300)

			Wards		
			Gairo (N=100)	Kibedya(N=100)	Mandege (N=100)
Socio-demographic characteristics			n (%)	n (%)	n (%)
Maternal/caregiver age	15-24 years		33 (33.3)	37 (37.0)	39 (39.0)
	25-34 years		46 (46.0)	45 (45.0)	42 (42.0)
	Above 35 years		21 (21.0)	18 (18.0)	19 (19.0)
Maternal marital status categories	Married		62(62.0)	64 (64.0)	79 (79.0)
	Single		38 (38.0)	36 (36.0)	21 (21.0)
Maternal occupational status	Farmer/pastoralist		56 (56.0)	95 (95.0)	95 (95.0)
	Government employed		1 (1.0)	2 (2.0)	1 (1.0)
	Casual labor		25 (25.0)	2 (2.0)	3 (3.0)
	Housewife		18 (18.0)	1 (1.0)	1 (1.0)
Maternal education status	Primary school		57 (57.0)	61 (61.0)	65 (65.0)
	Secondary school		25 (25.0)	15 (15.0)	2 (2.0)
	Tertiary		1 (1.0)	0 (0.0)	2 (2.0)
	Illiterate		17 (17.0)	24 (24.0)	31 (31.0)
Father occupational status	Farmer/pastoralist		58 (58.0)	86 (86.0)	94 (94.0)
	Government employed		7 (7.0)	1 (1.0)	4 (4.0)

Casual labor	35 (35.0)	12 (12.0)	2 (2.0)
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N=Total number of respondents, n= Total number of respondents in each category and %= percentage
Nutritional Status of Children

The overall prevalence of stunting in the Gairo district was 163(54.3%), the prevalence of underweight was 70 (23.3%) and the prevalence of wasting was 11 (3.7%) (Fig. 1 and 2). The nutritional status of children in Gairo district by wards is presented in Table 2. There was a significant difference in stunting and underweight among wards ($p=0.000$ and 0.008 respectively).

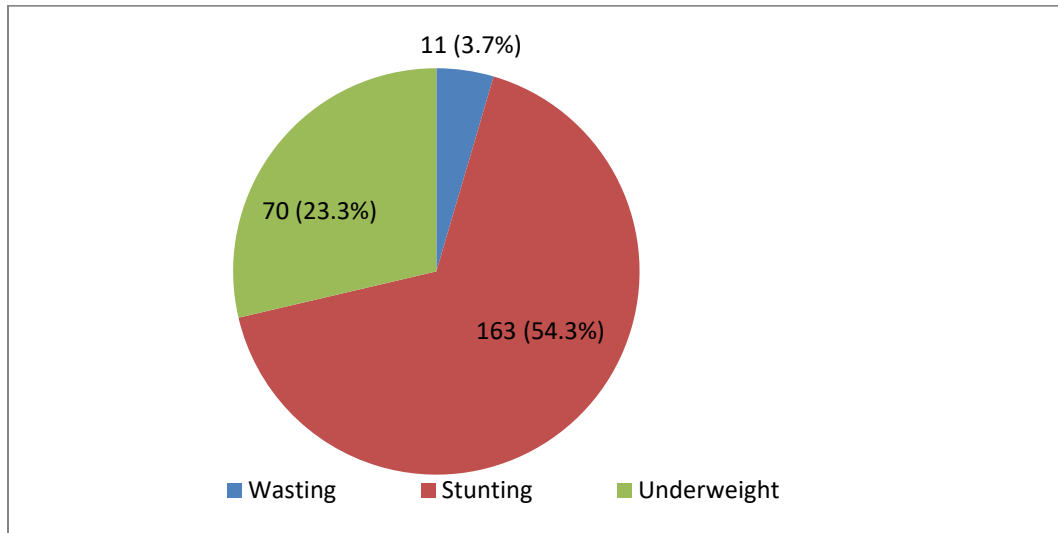


Figure 1: Overall prevalence of undernutrition in Gairo district

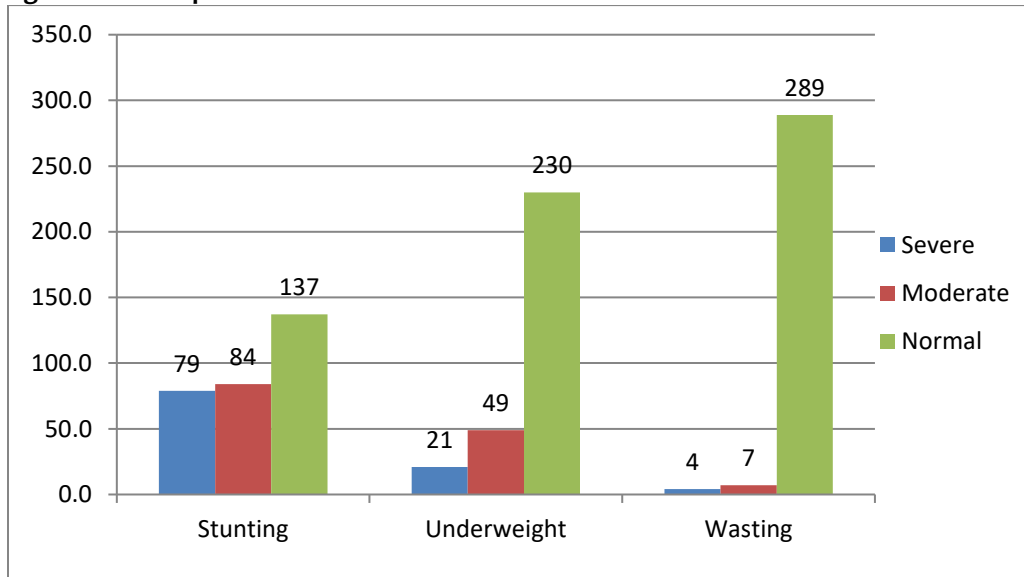


Figure 2: Nutritional status of children by SAM and MAM

Table 2: Nutritional status of children by wards

	Gairo	Kibedya	Mandegye	Total	P-value
Variables	n (%)	n (%)	n (%)	n(%)	P <or = 0.05
Wasting	3 (27.3)	4 (36.4)	4 (36.4)	11 (3.7)	0.910
Underweight	13 (18.6)	26 (37.1)	31 (44.3)	70 (23.3)	0.008

Stunting	39 (23.9)	54 (33.2)	70 (42.9)	163(54.3)	0.000
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Child Factors Associated with Undernutrition

Majority of male children were stunted and underweight while female children were wasted. Children aged 24- 36 months and those who started solid foods at 3-4 months were undernourished. And children with a birth weight greater or equal to 2.5kg majority were wasted, underweight and stunted. (Table 3).

Table 3: Child factors associated with undernutrition

Child factors		Wasting		Underweight		Stunting	
		n (%)	P-value	n (%)	P-value	n (%)	p-value
Child's sex	Male	4 (36.4)	0.758	36 (51.4)	0.160	88 (54.0)	0.079
	Female	7 (63.6)		34 (48.6)		75 (46.0)	
Child's age	6-11 months	2 (18.2)	0.550	3 (4.3)	0.122	9 (5.5)	0.030
	12-23 months	3 (27.3)		14 (20.0)		40 (24.5)	
	24-59 months	6 (54.5)		53 (75.7)		114 (70.0)	
Birth weight	Not reported	2 (18.2)	0.486	8 (11.4)	0.512	21 (12.9)	0.816
	>=2.5kg	9 (81.8)		53 (75.7)		126(77.3)	
	<2.5kg	0 (0.0)		9 (12.9)		16 (9.8)	
Illness in the past month	Yes	6 (54.5)	0.625	35 (50.0)	0.610	78 (47.9)	0.844
	No	5 (45.5)		35 (50.5)		85 (52.1)	
Age started solid foods	3-4 months	5 (45.5)	0.517	35 (50.0)	0.337	88 (54.0)	0.701
	5-6 months	6 (54.5)		35 (50.0)		75 (46.0)	

Maternal Factors Associated with Undernutrition

Maternal factors associated with undernutrition are shown in Table 4. Majority of stunted, underweight and wasted children were from farmers/pastoralist mothers, married mothers/caregivers, mothers who had primary education and mothers aged 25- 34 years.

Table 4: Maternal factors associated with undernutrition

Maternal Factors		Wasting		Underweight		Stunting	
		n (%)	p-value	n(%)	p-value	n (%)	p-value
Maternal/caregiver age	15-24 years	3(27.3)	0.399	26 (37.1)	0.610	63 (38.7)	0.656
	25-34 years	7(63.6)		28 (40.0)		70 (42.9)	
	Above 35 years	1 (9.1)		16 (22.9)		30 (18.4)	
Maternal marital status	Married	7(63.6)	0.733	53 (75.7)	0.129	117(71.8)	0.162
	Single	4 (36.4)		17 (24.3)		46 (28.2)	
Maternal occupational	Farmer/pastoralist	11 (100)	0.286	65 (92.9)	0.026	145(89.0)	

	Employed	0 (0.0)		3 (4.3)		13 (8.0)	0.002
	Housewife	0 (0.0)		2 (2.9)		5 (3.0)	
Maternal education	Primary level	8 (72.7)	0.710	42 (60.0)	0.452	101(62.0)	0.517
	Secondary/tertiary	1 (9.1)		8 (11.4)		21 (12.9)	
	Illiterate	2 (18.2)		20 (28.6)		41 (25.2)	
Age at pregnancy	Less than 18yrs	2(18.2)	0.575	4 (5.7)	0.046	22 (13.5)	0.637
	18yrs or greater	9(81.8)		66 (94.3)		141(86.5)	
When an outside child is with	Older siblings	6(54.5)	0.397	19 (27.1)	0.007	51 (31.3)	0.004
	Neighbors	0 (0.0)		4 (5.7)		5 (3.0)	
	Others(specify)	3 (27.3)		18 (25.7)		50 (30.7)	
	Go with my baby	2 (18.2)		29 (41.4)		57 (35.0)	

The odds ratio of undernutrition in maternal and child factors

The factors that were significantly associated with wasting, underweight and stunting are shown in Table 5.

Table 5: Odds ratio of undernutrition on maternal and child factors

Variable	Odds ratios		
	Wasting	Underweight	Stunting
Ward	0.570	2.700	3.294
Maternal age	0.974	1.188	1.180
Age at pregnancy	1.032	0.272	1.076
Child's sex	0.506	1.025	1.543
Child's age	1.537	0.620	0.650
Illness within one month	1.274	0.978	0.720
Age started solid food	0.757	0.721	0.787
Marital status	0.801	1.302	1.226
Maternal occupation	3.719	1.746	1.653
Maternal education	1.069	0.850	1.012
Child's birth weight	1.991	0.769	0.838

Discussion

The study aimed at assessing the prevalence and factors associated with undernutrition in Gairo district. Undernutrition was significantly associated with the sex of the child, age of the child, time of introducing complementary food, areas of residence, maternal occupation, working outside the home, age at pregnancy, marital status and child's birth weight.

Prevalence of stunting was found to be above the WHO acceptable level (30%), the national and regional prevalence (MoHCDGEC, 2018). Out of that per cent, there were severely and moderately stunted children with the highest prevalence of stunting in Mandege ward. These results corroborate with those reported by Mrema *et al.* (2021) in which highland areas had the highest prevalence of stunting among under-five children. The reason for this higher prevalence of stunting especially in Mandege could either be because it is a high land area thus, being disadvantaged from all kinds of basic services like access to improved water sources, access to health services, good infrastructures and sanitation services that can trigger various infections thus poor nutritional status (Black *et al.*, 2011).

In the binary logistic regression model, the child's sex was significantly associated with stunting since the majority of male children were stunted compared to their female counterparts. These findings were consistent with the findings in previous studies (Bork & Dialo, 2017; Thurstans *et al.*, 2020) in which male children were stunted compared to their female counterparts. This may be

explained by the following reasons; favouritism towards daughters occurs as a result of lowered socioeconomic status, male children are known to be more hungry than female children which leads to early weaning for male children and lastly, female children spend much time at home than male and having more access to the kitchen. This makes female children more nutritionally advantaged than their male counterparts (Wamani *et al.*, 2007).

This study revealed that children aged 24-59 months had a significantly high risk of being stunted compared to children aged 6-23 years. Similarly to the findings reported in previous studies (Nyaruhucha *et al.*, 2006; Chirande *et al.*, 2015) that older children had a higher prevalence rate of stunting than young children. This may be due to inadequate quality or quantity of food given to children during the weaning period. It is well known that malnutrition and the weaning period coexist since children grow well in the first months of their lives before shifting to solid foods (Nyaruhucha *et al.*, 2006). In this study, the most weaning food was maize porridge and the most illness were diarrhoea and intestinal worms which were likely the cause of the increased rate of stunting at that age.

It is known that birth weight is usually linked with undernutrition, as children with low birth weights were more likely to be undernourished than normal birth weight children. This study showed a majority of children with normal birth weight were stunted compared to children with low birth weight. Consistency with the findings from Mtoi in Pangani reported that low birth weight babies were well nourished compared to normal birth weight babies (Mtoi & Nyaruhucha, 2019). This can be explained as due recall bias since a large proportion of mothers lost their children's clinic cards thus birth weight could be wrongly reported.

This study found that children who started solid foods at 3-4 months were stunted compared to children who started at 5-6 months. Similarly to the study conducted in Kwale, Kenya (Adeladza, 2009). The binary logistic regression revealed that maternal/caretaker age, age during pregnancy and marital status were associated with stunting. Similar statistics emerged from several studies as maternal age, the age of the mother during pregnancy and marital status were the predictors of stunting (Gebre *et al.*, 2019; Kassie & Workie, 2020; Menalu *et al.*, 2021).

There was a significant difference between maternal/caregiver occupation, leaving a child to another person when working outside the home and stunting. Contrary to a previous study conducted in Ethiopia in which undernutrition was highly reported in children who were left by their mothers without adequate care (Mutisya, 2019).

Also, this study revealed that children from farmers/pastoralists were more stunted than children from other occupations. This could be because almost all of the participants in the study area were farmers therefore, rely solely on produce from their farms to meet household food needs leading to a monotonous diet household (Mutisya, 2019). They also need to sell the crops they had harvested from their farms with the money raised spent on non-food items. Therefore, it has contributed to the poor nutritional status of children of farming mothers.

The prevalence of underweight was above the national and regional prevalence which are 14.6% and 12.1% respectively (MoHCDGEC, 2018). Underweight was significantly associated with the area of residence with the highest prevalence of underweight being in Mandege ward. These results are similar to the findings reported by Mrema in Kilosa (Mrema *et al.*, 2021).

There was a significant relationship between underweight and maternal occupation. Consistency with the study conducted in Ethiopia in which women who had insufficient time to care for their children, their children had a high risk of being undernourished compared to women who had time to care for their children (Mutisya, 2019). The explanation for this, Majority of study participants were farmers who spent much of their time on their farms while carrying/ leaving their children with nothing to eat until they came back, therefore, leaving the child starving for many hours could lead to undernutrition.

This study showed that maternal age during pregnancy is a significant factor for underweight in which the highest percentage of underweight children been in mothers who were above 18 years compared to mothers who were below 18 years. Similar to findings conducted in Maharashtra, India in which mothers aged 20 years and above their children were likely to be underweight compared to mothers below 20 years of age (Murarka *et al.*, 2020).

The findings showed that mothers/caregivers being with their children when working outside the home, their children had higher values of underweight compared to children left at home with their siblings or relatives. This was because mothers/caregivers were busy farming, they don't even give their children something to eat before they left home otherwise their children need to wait until the time of lunch, and after that they wait until it is dinner time.

Also, food insecurity could be the reason for this higher prevalence since they depend on their production which is not as much as enough for ensuring the stability of food in the household therefore, a household was able to have only one meal per day regardless of having children in the household. Similar to the findings conducted in Kiteto in which underweight was prevalent in children from busy mothers (Maleya, 2015).

Prevalence of wasting was shown to be below the national and regional averages (4% and 3.8% respectively) (MoHCDGEC, 2018). The prevalence of wasting is highly pronounced in Kibedya and Mandege.

Maternal education, child's birth weight, child's age, illness in the past month and the introduction of solid food was shown to be significantly associated with wasting. In line with the findings conducted in Bangladesh that older children were likely to be wasted compared to younger children (Alom *et al.*, 2012). Also, the study conducted in South Ethiopia revealed that children who started complementary food before the age of six months were likely to be wasted compared to children who started complementary foods after six months (Asfaw *et al.*, 2015).

Also, children from educated mothers had low chances of being wasted as education makes mothers informed about nutritional benefits of food and aware with child growth (Galgamuwa *et al.*, 2017). The study revealed that children with normal birth weight and above were likely to be wasted different from the study done by Arthur, that low birth weight babies were wasted more than normal birth weight babies (Arthur, 2019).

Limitation of the study

The causal effect might not be strong as the study employed was a cross-sectional study design. Also recall bias might occur when reporting the birth weight of children, the time a child was introduced to solid foods as well as the history of illness within one month.

Conclusion and recommendation

In conclusion, this study reveals that undernutrition especially stunting and underweight were most prevalent in the study area than wasting. The factors associated with undernutrition were being male, maternal occupation, child's age, maternal education, birth weight, illness in the past one month, area of residence, maternal age and time of introduction of solid foods and leaving a child when working outside the home. The findings of this study suggest that policies and programs aiming at reducing undernutrition levels should pay attention to synergistic interventions that involve both sectors. Also, researchers should consider other factors associated with undernutrition that was not included in this study.

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