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Research Article

Prevalence of Stunting and Associated Factors Among Under Five Years Children in Galkaio Town, Puntland, Somalia 2023: A cross-sectional study design

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Abstract

Background: Stunting is a frequent dietary issue that mostly affects less industrialized countries, such as Somalia. Even so, the Somali government has made some progress towards achieving the target for stunting, but still, 25.3% of children under five years old are stunted. If the annual decreasing proportion continues at this rate, Somalia will not be able to meet the established target set by the WHO in 2012, which was to reduce stunting by 40% by 2025. Therefore, this study aimed to assess the prevalence and associated factors of stunting among children aged 6-59 months in Galkaio Town, Puntland, Somalia, from 1-April 2023 to 1- May, 2023.

Methods and materials: A cross-sectional study with a community focus was carried out. among 362 children aged 6–59 months matched with mothers and caregivers. Districts served as first-stage units, villages served as second-stage units, and houses served as third-stage units in the multistage sampling technique. A structured questionnaire was used, and the mothers and caregivers were interviewed. Standardized anthropometric measurements were used to measure the child's height. Version 3.1 of Epi Data was used to enter the data, and SPSS version 20 was used for analysis. Using both bivariate and multivariate logistic regression models, the factors linked to stunting were determined. Statistical significance was set at $P < 0.05$.

Result: The overall prevalence of stunting among children between the ages of 6 and 59 months in this study was 37.3%, 95% CI (32.6–42.5). Polygamous marriage to father [AOR = 2.824; 95% CI: (1.60, 4.98)], educational status of mother [AOR = 2.502; 95% CI: (1.28, 4.90)], sex of child [AOR = 2.079; 95% CI: (1.27, 3.41)], time to initiation of breastfeeding [AOR = 3.212; 95% CI: (1.95, 5.29)], exclusive breastfeeding [AOR = 1.725; 95% CI: (1.01, 2.96)], minimum dietary diversity score [AOR = 2.579; 95% CI: (1.30, 5.28)], and postnatal care visits of mothers [AOR = 2.688; 95% CI: (1.60, 4.52)] were significantly associated with stunting.

Conclusion: The prevalence of stunting among children aged 6–59 months was higher than that among the national population. The polygamous marriage of the father, educational status of the mother, sex of the child, time for initiation of breastfeeding, exclusive breastfeeding, minimum dietary diversity score, and postnatal care visits of the mother were significantly associated with stunting.

Keywords: stunting, associated factors, under five children, Galkaio town, Puntland, Somalia.

INTRODUCTION

Malnutrition is one of the main factors that contribute to child morbidity and death rate in underdeveloped countries. Sub-Saharan Africa is at the top of the rankings because of its high malnutrition-related morbidity and mortality rates [1]. It impacts a country's potential for economic growth and remains a major issue for developing nations [2]. Stunting is a type of chronic malnutrition that severely damages children's minds and bodies by preventing them from reaching their potential for linear growth [3]. In addition, a stunted child has a low height for their age and is typically caused by a lack of nutrition, recurrent illnesses, and a lack of interaction with others. [4]. Additionally, it will have an irreversible impact on a child's development in the future, increasing population susceptibility and reducing its ability to handle situations in which it is under stress from consuming [5]. Children were considered extremely stunted if their measurements fell to -3 SD [6]. This shows that a community has chronic undernutrition and insufficient nutrients for a long period, starting with the womb [7].

Globally, stunting affected 22.0% of children less than five years of age in 2020, and Africa has one of the highest stunting and wasting prevalence's, only second to Asia [8].Stunting is one of the main public health concerns; a large percentage of children have moderate to severe forms of stunting, and this issue is more common in developing nations [9]. In Africa, 58.7 million children under five are stunted [5]. The studies conducted in Cameroon, Nigeria, and Malawi showed that; the prevalence of stunting was 16.4% [10] in Cameroon, 3.5%[11] in Nigeria, and 46.8 % [12] in Malawi. Other studies done in different parts of Tanzania shows that, the prevalence of stunting was 41% in Kilosa District [13], 33% in Dodoma region [14], and 54.3% in Gairo district [15]. In Ethiopia different studies was conducted on

different parts of the country. The prevalence of stunting was 38% in all parts of Ethiopia from EDHS of 2016[16], 52.5% in Butajira town [17], 39.5% in Dessie [18], 21.82% in Demba Gofa district [19], 27% in Jima Geneti District [20], 37.7% in Wonago, Southern Ethiopia [21], and 31.9% in Korahay zone, Somali region [22].

More than 30% of people in five African regions—including Eastern Africa—are stunted [23]. In the Eastern African region, including Somalia, the prevalence was 32.6%; it has slowly decreased since 2000, and the burden is greatest in places where hostility is still raging [8]. The pooled cross-sectional surveys conducted in 2007 and 2010 in Somalia showed that 31% of children under five had stunting [24], and classified as "high" according to World Health Organization (WHO) classifications [25].

Being severely stunted throughout childhood has negative effects on behavior as well as delayed mental and physical development. Children's social and academic performance might suffer from delayed cognitive and motor development, which can increase their long-term risk of illness, disability, and even death [26]. Chronic undernutrition has measurable negative health consequences that are both short- and long-term and is caused by a number of interrelated variables. The immediate effects of stunting include an increased risk of infectious diseases, inadequate cognitive development, and increased morbidity [27]. The lasting effects of stunting include reduced height and lean body mass in adulthood, decreased cognitive performance between 6 and 11 years of age, and less overall educational attainment [28].In 2017, Sub-Saharan Africa continued to be the region with the highest global rate of mortality for children under five with 76 deaths per 1,000 live births and 34% a prevalence of stunting [29].

Stunting is a major public health problem in nations with poor and moderate incomes because of its association with a higher chance of death during childhood, which leads to physical and functional deficits among survivors [30]. Numerous problems are associated with child undernutrition, such as political instability, slow economic growth, and a lack of education [31]. Underlying causes such as food insecurity, lack of care for mothers and children, and immediate causes such as infections and insufficient food consumption are the main factors affecting nutrition [32]. Stunting in early life can cause increased susceptibility to infectious diseases, attenuated cognitive ability, and increased behavioral problems during childhood [33]. Furthermore, After the age of two, young children that experience rapid weight gain are more likely to grow up to be overweight or obese. Such weight gain is also associated with a higher risk of coronary heart disease, stroke, hypertension, and type-2 diabetes [34].

The main causes of stunting include low maternal nutritional status and various related issues such as infection, food, micronutrient deficiencies, and the environment [35, 36]. Stunting is also significantly impacted by social, demographic, and environmental factors at the same time [37]. Furthermore, Food insecurity lowers dietary energy intake and jeopardizes the variety and quality of diets. A Lack of calories or other necessary nutrients can damage a person's physical and mental well-being, which lowers the population's potential for economic productivity. Stunting has become more common in Bangladeshi and Ethiopian homes because of extreme food poverty[38]

In Somalia, the past food insecurity crisis placed 800,000 children at risk of acute malnutrition. Acute malnutrition affects more than 34% of Somalian children who require medical attention. The pandemic of COVID-19 has caused a decline in food access and capacity to provide relief to those in danger, which will increase the rate of acute malnutrition. There are now improved levels of malnutrition owing to increasing efforts to provide humanitarian help and easier access to milk [39]. In addition, Somalia has made some progress towards achieving the target for stunning, but 25.3% of children under five years old are still affected, which is lower than the average for the African region (30.7%) [40]. To reduce the problems related to stunting, the Somalian government implemented the Somalian National Nutrition Strategy for the period 2020–2025. The strategy targets that by 2025, more than half of children under two years of age are expected to consume the minimum appropriate diet, and the percentage of stunted children and those under five years of age will drop by six percentage points [41]. Children less than five years old are particularly susceptible to malnutrition as a result of emergencies caused by natural disasters or wars, and it is challenging to measure dietary markers in such situations [42]. Chronic malnutrition rates and food insecurity have remained persistently high throughout Somalia (Puntland, south-central Somalia), varying according to zone and livelihood system. Malnutrition is confounded by regular conflicts, poor complementary feeding, displacement, a lack of infrastructure, and regular droughts [39]. In Somalia, the study focused on interventions that contribute to factors such as low-income women, polygamous marriages, large families, poor income, food poverty, preference for male-sex children, infectious diseases, diarrheal diseases, and other issues related to the environment [43].

For a child's growth, development, and health during infancy and the early years of life, adequate nutrition is crucial. A much more common nutritional issue that mostly affects developing nations like Somalia is stunting. Even though the Somalian administration has made significant progress towards achieving the target for stunting, [44]. If the percentage reduction every year continues at this rate, the nation is not on track to meet its established target. Therefore, it is essential to evaluate the prevalence and factors associated with linear development in a country experiencing complicated humanitarian crises, including flooding, drought, violence, and mass displacements. Therefore, this study aimed to assess the prevalence and associated factors of stunting among children aged 6–59 months in Galkaio Town, Puntland, Somalia, in 2023.

METHODS AND MATERIALS

Study area and Period

This study was carried out in the town of Galkaio, Puntland, Somalia. Galkaio Town is the capital of the north-central Mudug region of Somalia. Galkaio is located 575 kilometers from the capital city of Mogadishu. Geographically, Galkaio is divided into four main districts: Garsor, Horumar, Israc, and Wadajir. The study was conducted in two of the four districts (Garsoor and Israac districts). According to the estimation of the directorate of national statistics of Somalia, the total population of Galkaio town was 245, 000, of whom 159,918 and 58,212 were women and under-five children, respectively, in 2017 [45]. There were two general hospitals and five health centers in the town. This study was carried out in Galkaio Town from 1-April 2023, to 1-May, 2023.

Study design

A cross-sectional study with a community focus was carried out.

Source population

The source population consisted of all children aged 6-59 months with their Legally authorized representative in Galkaio Town.

Study population

The study population consisted of children aged 6-59 months with their Legally authorized representative residing in randomly selected villages in Galkaio town during the time of data collection.

Eligibility criteria

Inclusion criteria

Legally authorized representative of children aged 6-59 months who provided written informed consent were included in this study.

Exclusion criteria

All children whose Legally authorized representative had mental impairments were excluded from the study.

Sample size determination

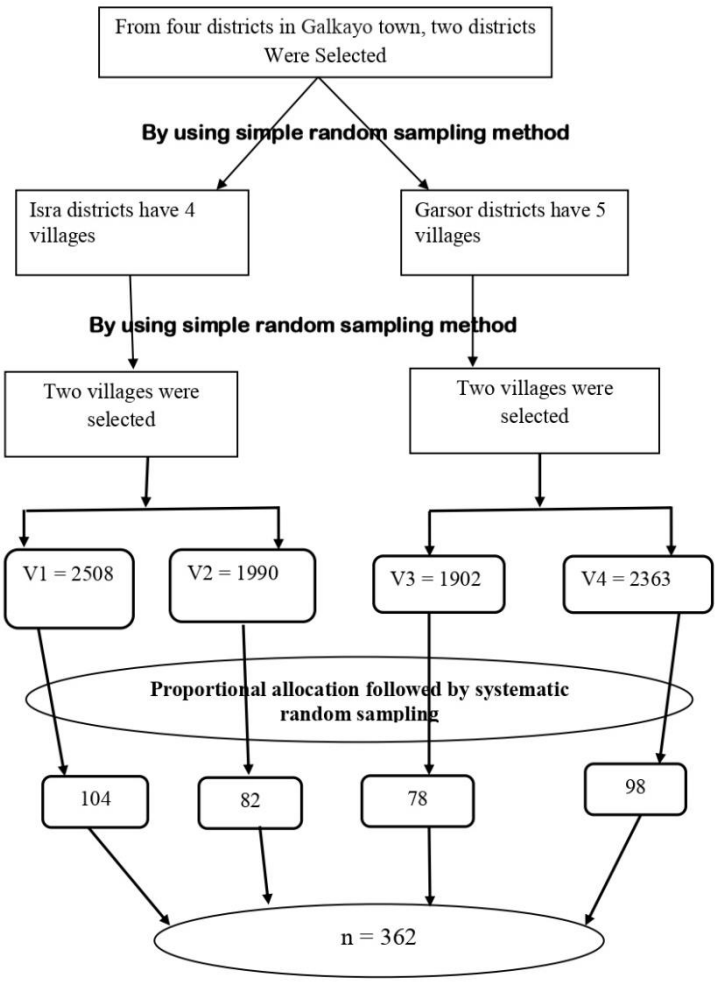
A single population proportion formula was used in this study. The sample size was determined by considering the following assumptions: prevalence (p) of stunting was 17.2% among under-five years of age, according to a previous study from Somalia [30], 95% confidence level, 5% margin of error.

$n = z^2pq/ d^2$ $n = \frac{(1.96)^2 * 0.172(1- 0.172)}{(0.05)^2} = 219$

Because it has two stages, we used two design effects, and the sample size was 219 × 1.5= 329. By Considering 10% non-response rate, the estimated number of non-responding participants was 329× 0.1=33. The minimum sample size for this study was 329+33= 362.

Sampling Technique and Sampling Procedure

A multi-stage sampling technique was used, including districts (subdivisions of the city) as first-stage units, villages as second-stage units, and households as third-stage units. First, out of the four districts in Galkaio Town, two districts (Isra and Garsor districts) were selected using a simple random sampling method. Two selected districts in Galkaio town had 13 out of 13 villages, and four villages were selected using simple random sampling. The villages were chosen from each of the two districts. After identifying the number of eligible children aged 6-59 months residing in the selected villages, a final sample size of 362 was allocated proportionally, followed by systematic random sampling. To determine the sampling interval (K), the total number of children aged 6-59 months residing in the selected villages, which is equal to 8763, was divided by the sample size (362) to obtain K= 24. Simple random sampling was used to select the first participants for this study. Then 24 children aged 6-59 months were selected to form the sample. A simple random sampling method was used for households with more than one child aged 6-59 months. A simple random sampling method was used to choose one. **(Fig 1)**



Keys:

V1: Village 3 V2: Village 5

V3: Village 9 V4: Village 10

Figure 1: Sampling procedure of the study on associated factors of Stunting among children aged between 6-59 months in Galkaio town, puntland, Somalia, 2023

Data collection tools

After reviewing the literature on similar studies, face-to-face interviews were conducted using structured questionnaires. Standardized anthropometric measurements were used to measure the child's height. The English version of the questionnaire was translated into the local language, Somali, and retranslated back into English by experts fluent in both languages to check for consistency with the reviewed literature. Data on Sociodemographic, maternal, and child health; environmental characteristics; household dietary diversity; and anthropometric measurements were collected via interviews [22].

Data collection procedures

For data collection, four anthropometric measurement recorders, four diploma nurses for data collection, and two BSc graduate supervisors were recruited and trained on how to complete a questionnaire, how to obtain consent, and how to orient the study participants. Anthropometric measurements, such as the height-for-age z-score, were collected from selected children using a height-measuring board to assess stunting. A horizontal wooden length board was used to measure the length of children aged 6–23 months. On the other hand, a wooden vertical height chart was used to measure the height of children aged 24–59 months [46]. The Child's age was ascertained by the mother and confirmed based on the birth certificate or vaccination card [46]. The mothers of the children were asked to list the food groups and drinks consumed by their children 24 hours prior to data collection. The mothers of the children were asked to count their children's meal frequency in the past 24 hours [47].

Dependent variable

Stunting status (Normal/Stunted)

Independent variables

Socio-demographic factors: Head of household, Age of the mother, maternal education, Occupation of mother, Occupation of father, Husband had polygamy, Family size, and number of under five children.

Child characteristics and carrying practice: Age of child, Sex, Birth interval, Birth order, Place of delivery, birth type of child, Time of initiation of breastfeeding, Exclusive breastfeeding, Time of started complementary food, Frequency of feeding, minimum dietary diversity score, Child vaccination status, and Morbidity.

Maternal characteristics: Number of ANC visit, PNC follow up, Preceding birth interval, and Family planning method.

Environmental health characteristics of households: Source of drinking water, Distance to obtain drinking water, Latrine utilization, and materials used for hand washing.

Operational definitions

Stunting: Height for age is a measure of linear growth retardation and cumulative growth deficits. Children whose height-for-age Z (HAZ) scores were below minus two standard deviations (-2 SD) on the WHO growth standard chart were considered stunted. Children below three standard deviations (-3 SD) were considered severely stunted [48].

Minimum Meal Frequency: Minimum meal frequency is defined as the proportion of children aged 6–59 months who receive solid, semi-solid, or soft foods at the minimum numbers of two and three times for children aged 6–8 months and 9–59 months, respectively [49].

Minimum Dietary Diversity Score: The proportion of infants and young children aged 6–59 months who received food and drinks from four or more food groups in the previous 24 hours. Consumption of any amount and quality of food from each food group was sufficient to "count" [49].

Data quality control

Data quality was ensured during the data collection, coding, entry, cleaning, and analysis. Two days of training that focused on the relevance of the study, the objective of the study, ethical issues, and informed consent prior to the interview and interviewing techniques were provided to data collectors and supervisors. The questionnaire was translated into the local language (Somali), pre-test was conducted on 5% of the participants two weeks before the actual data collection in one of the villages (village 2), which was not selected for the main study to modify if there was any ambiguity in the questionnaire. The Completeness of the data was checked by supervisors on each day of the activity, and the necessary feedback was offered to data collectors the next morning.

Data processing and analysis

Following the completion of data collection activities, the data were entered using Epi Data version 3.2 and exported to SPSS version 26 for analysis. The data were cleaned using simple frequencies before analysis. Means with standard deviations for continuous variables and frequencies with percentages for categorical variables were used to describe the characteristics of the study participants. A binary logistic regression model was employed to show the relationship between stunting and associated factors. To control for potential confounders, independent variables (P-value < 0.25 in the bi-variable model) were considered candidates for multivariable logistic regression, and the multi collinearity of independent variables was checked using standard error[50]. Model fitness was assessed using the Hosmer–Lemershow test (P > 0.05)[51]. P-values <0.05 and adjusted odds ratios (AOR) with a 95% confidence interval (CI) were used to determine the strength of the association between the independent and the outcome variables.

RESULTS

Characteristics of study participants

Socio-demographic characteristics of respondents

362 parent-child pairs were included in the study, as shown in Table 1, obtaining a response rate of 97.8%. Fathers made up 332 (91.7%) of the household heads. The mothers of the participants had an average age of 29 years with a standard deviation of (±6.26) years at the end of the year, and 205 (56.6%) of them were between the ages of 25 and 34. The majority, 316 (87.3%), of the mothers were married, and 221 (61.0%) were housewives. In terms of the mothers' educational background, 198 (54.7%) had no formal education, while 89 (24.6%) had completed elementary school. 50.6%, or half of the 183 fathers, were pastoralists. The majority of families with children under five, or 206 families (56.9%), had more than five family members, and more than half of these homes, or 183 houses (50.6%), had two children under five. Additionally, 82 (22.7%) of them, or more than one-fourth, were from children whose dads were involved in several marriages.

Table 1: Socio-demographic characteristics of households of under-five years age children in Galkaio town, puntland, Somalia, 2023 (n=362).

variables	Category	Frequency	Percent (%)
Head of household	Father	332	91.7
	Mother	17	4.7
	Others	13	3.6
Age of mother (in years)	< 24 years	83	22.9
	25- 34years	205	56.6
	>= 35years	74	20.4
	Mean = 29.1 and SD = 6.26		
Husband had polygamy	Yes	82	22.7
	No	280	77.3
Marital status	Married	316	87.3
	Divorced	31	8.6
	Widowed	15	4.1
Educational status of mother	No formal education	198	54.7
	Primary (1–8)	89	24.6
	Secondary and above	75	20.7
Occupation status of mother	House wife	221	61.0
	Daily laborer	68	18.8
	Merchant	42	11.6
	Employed	31	8.6
Occupation status of father	Pastoralist	183	50.6
	Daily laborer	96	26.5
	Employed	39	10.8
	Merchant	44	12.2
Total number of under 5 children	1	148	40.9
	2	183	50.6
	3	31	8.6
Total family size	<=5	156	43.1
	>5	206	56.9

Child characteristics and carrying practice

Out of the under-five-year old children who participated, a round 117 (32.3%) were aged between 12 and 23 months, and 185 (51.1%) were male. Most of the children 128 (35.4%), were second by birth order, and 346(95.6%) and 193(53.3%) of the children were singletons and born at home, respectively. The majority, 213 (58.8%), were vaccinated, and two-thirds, 222 (61.3%) of them, had started breastfeeding with in the first hour. For at least six months, 267 (73.8%) of the children were exclusively breastfed, and more than half of them, 220 (60.8%), began receiving supplemental feedings at that point. Of the youngsters, 291 (80.4%) had a minimal dietary diversity score of fewer than four, and more than half, 217 (59.9%), consumed at least three meals a day. In terms of their morbidity status, 177 youngsters, or nearly half of them, had experienced at least one disease (Table 2).

Table 2: Under-five years age children characteristics and carrying practices in Galkaio town, Puntland, Somalia, 2023 (n=362).

Variables	Category	Frequency	Percent (%)
Sex of child	Male	185	51.1
	Female	177	48.9
Age of child in (months)	6-11 months	89	24.6
	12- 23 months	117	32.3
	24- 35 months	81	22.4
	36-59 months	75	20.7
Birth order of child	First	85	23.5
	Second	128	35.4
	Third	73	20.2
	Fourth and above	76	21.0
Birth type of child	Single	346	95.6
	Twin	16	4.4
Place of deliver of the child	Home	193	53.3
	Health institution	169	46.7
Initiation of breastfeeding	Within 1 hour	222	61.3
	After 1 hour	140	38.7
Exclusive Breastfeeding	<6 months	95	26.2
	>=6 months	267	73.8
Time of started complementary food	<6 months	62	17.1
	>6 months	80	22.1
	At 6 months	220	60.8
Frequency of feeding	<3 times	145	40.1
	>=3 times	217	59.9
Minimum dietary diversity score	<4	291	80.4
	>=4	71	19.6
Child vaccinated	Yes	213	58.8
	No	149	41.2
Morbidity	No disease	117	32.3
	One disease	177	48.9
	Two and more diseases	68	18.8

Health care and Environmental characteristics of respondents

Concerning the healthcare utilization-related factors, 141 (39.0%) of mothers had no antenatal care (ANC) follow-up, only 29 (8.0%) visited antenatal care >=4, and above half, 221 (58.3%) of mothers had not visited postnatal care (PNC). More than two-thirds, 231 (63.8%) of mothers had a preceding birth interval less than 24 months, and over half 192 (53.0%) of them did not know family planning methods. Regarding the environmental characteristics of respondents, out of 362 respondents, 218 (60.2%) used public taps as a source of drinking water, and above half, 211 (58.3%) had access to water for a round trip within less than 15 minutes. The majority of 230 (63.5%) had functional toilet facilities, and among these, 122 (33.7%) of them washed their hands with water only (Table 3).

Table 3: Health care and Environmental characteristics of respondents, of under-five years age children in Galkaio town, Puntland, Somalia, 2023 (n=362).

Variables	Category	Frequency	Percent (%)
Number of ANC visits	None	141	39.0
	1-3 visits	192	53.0
	>=4 visits	29	8.0
PNC visits of Mother	Yes	151	41.7
	No	221	58.3
Preceding birth interval	Less than 24 months	231	63.8
	More than 24 months	131	36.2
Mother knows family planning method	No	192	53.0
	Yes	170	47.0
Sources of drinking water	Private tap	101	27.9
	Public tap	218	60.2
	Spring	43	11.9
Time to obtain drinking water	<15 minutes	211	58.3
	15-30 minutes	100	27.6
	>30 minutes	51	14.1
Latrine facility availability	Yes	230	63.5
	No	132	36.5
Materials used for hand washing	Water only	122	33.7
	Using soap sometimes	164	45.3
	Using soap always	76	21.0

Prevalence of stunting

In children under five, the prevalence of stunting was 135 (37.3%) with a 95% CI (32.6–42.5). Of them, 102 (28.2%) were moderately stunted, and 33 (9.1%) were severely stunted (Figure 2). The percentage of children that were stunted varied according to their sex: 76 (41.1%) of male children and 59 (33.3%) of female children (Figure 3). the prevalence of stunting varied according to age, with children at 6–11 months, 12-23 months, 24-35 months, and 36–59 months having the highest frequency (38 (43.2%), 49 (41.9%), 39 (48.1%), and 9 (11.8%), respectively (Figure 4).

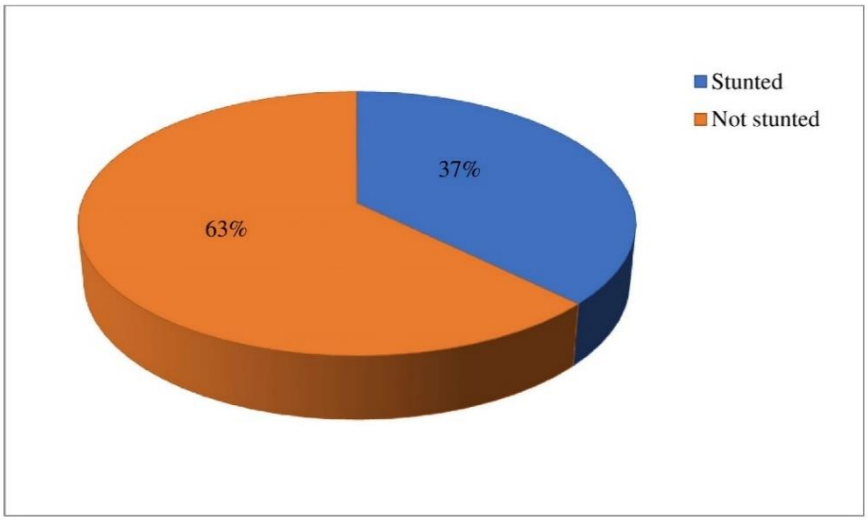


Figure 2: A Pie chart showing prevalence of stunting among under-five children 6-59 months in Galkayo town, Mudug region, Somalia, 2023.

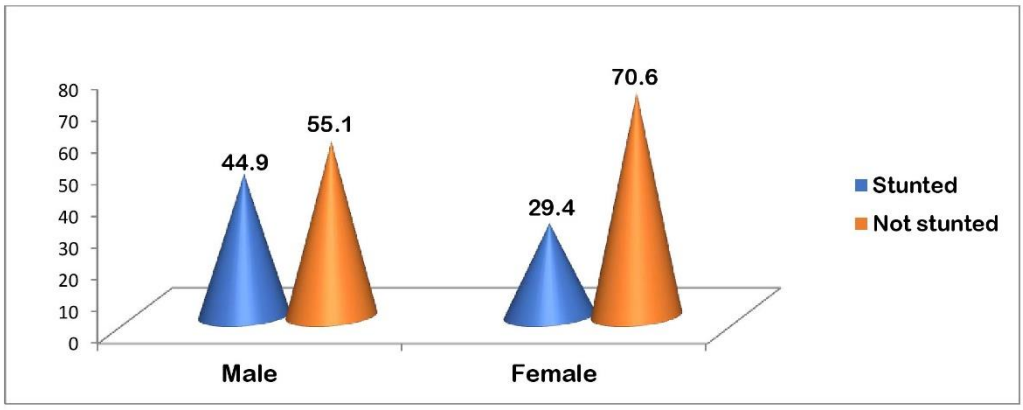


Figure 3: Prevalence of stunting with sex among children 6-59 months in Galkaio town, Mudug region, Somalia, 2023.

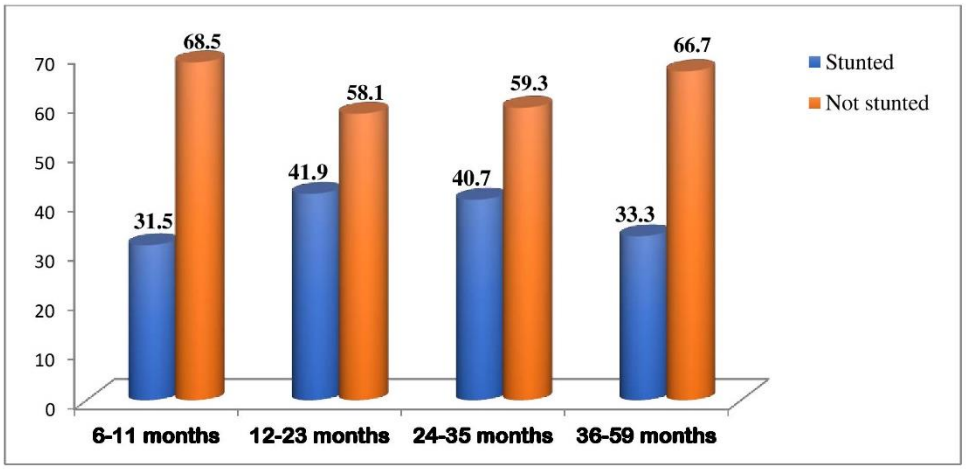


Figure 4: Prevalence of stunting with age groups among children 6-59 months in Galkaio town, Mudug region, Somalia, 2023.

Factors associated with stunting

In the crude analysis, polygamous marriage of the father, educational status of the mother, total family size, sex of the child, age of the child, time for initiation of breastfeeding, exclusive breastfeeding, minimum dietary diversity score, morbidity, mother's postnatal care visits, sources of drinking water, and materials used for hand washing were candidate variables for multivariate logistic regression analysis at P<0.25. However, maternal age, mother's occupation status, father's occupation status, place of delivery of the child, time of starting complementary food, frequency of feeding, number of antenatal care visits, and latrine facility availability were not included in the multivariable logistic regression analysis because the P-values were greater than 0.25. (Table 4).

In a multivariable logistic regression model, polygamous marriage of the father, educational status of the mother, sex of the child, time for initiation of breastfeeding, exclusive breastfeeding, minimum dietary diversity score, and postnatal care visits of the mother were significantly associated with stunting ($p < 0.05$). The under-five children whose fathers had a polygamous marriage were 2.8 times [AOR = 2.824; 95% CI: (1.60, 4.98)] more likely to be stunted than those children whose fathers had a monogamous marriage. Regarding the educational level of mothers, the odds of being stunted were 2.5 times [AOR = 2.502; 95% CI: (1.28, 4.90)] higher among children born to parents without any formal education as compared to children born to parents with secondary and higher education. Regarding the sex of child, being male increased the odds of being short for their age two times [AOR = 2.079; 95% CI: (1.27, 3.41)] compared to their female counterparts. Children who started breastfeeding after 1 hour had 3 times higher odds of being stunted [AOR = 3.212; 95% CI: (1.95, 5.29)] compared to children who started breastfeeding within one hour. Moreover, a child who was exclusively breastfed for less than six months' had 72% higher odds of stunting [AOR = 1.725; 95% CI: (1.01, 2.96)] when compared to children who exclusively breastfed for six months or more. Children whose minimum dietary diversity score of her mother's was less 4 four were 2.5 times [AOR = 2.579; 95% CI: (1.30, 5.28)] more likely to be stunted than those children whose minimum dietary diversity score of her mother's was greater than or equal to 4. Besides, children whose mothers did not attend postnatal care services increased the risk of stunting 2.6 times [AOR = 2.688; 95% CI: (1.60, 4.52)] compared to those children whose mothers attended postnatal care services. (Table 5).

Table 4: Bivariable logistic regression of factors associated with prevalence of stunting among children 6-59 months in Galkayo town, puntland, Somalia, 2023.

Variable	Categories	Prevalence of stunting		COR (95% CI)	P-Value
		Stunted N(%)	Normal N(%)		
Age of mother (in years)	< 24 years	33(39.8)	50(60.2)	1.46(0.76, 2.83)	0.258
	25- 34years	79(38.5)	126(61.5)	1.39(0.79, 2.45)	0.255
	>= 35years	23(31.1)	51(68.9)	1	
Husband had polygamy	Yes	47(57.3)	35(42.7)	2.93(1.77, 4.86)	0.000
	No	88(31.4)	192(68.6)	1	
Educational status of mother	No formal education	88(44.4)	110(55.6)	2.53(1.39, 4.61)	0.002
	Primary (1–8)	29(32.6)	60(67.4)	1.53(0.77, 3.05)	0.227
	Secondary and above	18(24.0)	57(76.0)	1	
Occupation status of mother	House wife	81(36.7)	140(63.3)	1.05(0.48, 2.31)	0.899
	Daily laborer	28(41.2)	40(58.8)	1.27(0.53, 3.07)	0.591
	Merchant	15(35.7)	27(64.3)	1.01(0.38, 2.66)	0.984
	Government/self-employee	11(35.5)	20(64.5)	1	
Occupation status of father	Pastoralist	70(38.3)	113(61.7)	0.99(0.49, 2.02)	0.980
	Daily laborer	32(33.3)	64(66.7)	0.80(0.37, 1.73)	0.571
	Merchant	18(40.9)	26(59.1)	1.11(0.46, 2.68)	0.820
	Government/self-employee	15(38.5)	24(61.5)	1	
Total family size	<=5 children	46(29.5)	110(70.5)	1	
	>5 children	89(43.2)	117(56.8)	1.82(1.17, 2.83)	0.008
Sex of child	Male	83(44.9)	102(55.1)	1.96(1.27, 3.02)	0.002
	Female	52(29.4)	125(70.6)	1	
Age of child in (months)	6-11 months	28(31.5)	61(68.5)	1	
	12- 23 months	49(41.9)	68(58.1)	1.57(0.88, 2.80)	0.127
	24- 35 months	33(40.7)	48(59.3)	1.49(0.79, 2.81)	0.209
	36-59 months	25(33.3)	50(66.7)	1.09(0.57, 2.10)	0.798
Place of deliver of the child	Home	67(34.7)	126(65.3)	0.79(0.52, 1.21)	0.279
	Health institution	68(40.2)	101(59.8)	1	
Time for initiation of breastfeeding	Within 1 hour	62(27.9)	160(72.1)	1	
	After 1 hour	73(52.1)	67(47.9)	2.81(1.81, 4.38)	0.000
Exclusive Breastfeeding	<6 months	48(50.5)	47(49.5)	2.113(1.31, 3.40)	0.002
	>=6 months	87(32.6)	180(67.4)	1	
Time of started complementary food	<6 months	26(41.9)	36(58.1)	1.34(0.75, 2.39)	0.317
	>6 months	32(40.0)	48(60.0)	1.24(0.73, 2.09)	0.426
	At 6 months	77(35.0)	143(65.0)	1	
Frequency of feeding	<3 times	54(37.2)	91(62.8)	0.99(0.65, 1.54)	0.987
	>=3 times	81(37.3)	136(62.7)	1	
Minimum dietary diversity score	<4	120(41.2)	171(58.8)	2.62(1.42, 4.85)	0.002
	>=4	15(21.1)	56(78.9)	1	
Morbidity	No disease	37(31.6)	80(68.4)	1	
	One disease	71(40.1)	106(59.9)	1.45(0.89, 2.37)	0.140
	Two and more diseases	27(39.7)	41(60.3)	1.42(0.76, 2.65)	0.266
Number of ANC visits	None	59(41.8)	82(58.2)	1.59(0.68, 3.76)	0.282
	1-3 visits	67(34.9)	125(65.1)	1.19(0.51, 2.76)	0.684
	>=4 visits	9(31.0)	20(69.0)	1	
PNC visits of Mother	Yes	38(25.2)	113(74.8)	1	
	No	97(46.0)	114(54.0)	2.53(1.60, 3.99)	0.000
Sources of drinking water	Unprotected	50(51.0)	48(49.0)	2.19(1.37, 3.52)	0.001
	Protected	85(32.2)	179(67.8)	1	
Latrine facility availability	Yes	83(36.1)	147(63.9)	1	
	No	52(39.4)	80(60.6)	1.15(0.74, 1.79)	0.531
Materials used for hand washing	Water only	60(49.2)	62(50.8)	1.76(0.98, 3.16)	0.061
	Using soap sometimes	48(29.3)	116(70.7)	0.75(0.42, 1.34)	0.331
	Using soap always	27(35.5)	49(64.5)	1	

COR=Crude odds Ratio and CI= 95% Confidence interval

Table 5: Multivariable logistic regression of factors associated with prevalence of stunting among children 6-59 months in Galkaio town, Puntland, Somalia, 2023.

Variable	Categories	Prevalence of stunting		COR (95% CI)	AOR (95% CI)	P-Value
		Stunted N(%)	Normal N (%)			
Husband had polygamy	Yes	47(57.3)	35(42.7)	2.93(1.77, 4.86)	2.824(1.603, 4.978)	0.000***
	No	88(31.4)	192(68.6)	1	1	
Educational status of mother	No formal education	88(44.4)	110(55.6)	2.53(1.39, 4.61)	2.50(1.28, 4.89)	0.007**
	Primary (1–8)	29(32.6)	60(67.4)	1.53(0.77, 3.05)	1.35(0.62, 2.93)	0.452
	Secondary and above	18(24.0)	57(76.0)	1	1	
Total family size	<=5 children	46(29.5)	110(70.5)	1		
	>5 children	89(43.2)	117(56.8)	1.82(1.17, 2.83)	1.46(0.89, 2.40)	0.138
Sex of child	Male	83(44.9)	102(55.1)	1.96(1.27, 3.02)	2.08(1.27, 3.41)	0.004**
	Female	52(29.4)	125(70.6)	1	1	
Time for initiation of breastfeeding	Within 1 hour	62(27.9)	160(72.1)	1	1	
	After 1 hour	73(52.1)	67(47.9)	2.81(1.80, 4.38)	3.21(1.95, 5.29)	0.000***
Exclusive Breastfeeding	<6 months	48(50.5)	47(49.5)	2.11(1.31, 3.40)	1.73(1.01, 2.96)	0.048*
	>=6 months	87(32.6)	180(67.4)	1	1	
Minimum dietary diversity score	<4	120(41.2)	171(58.8)	2.62(1.42, 4.85)	2.58(1.30, 5.13)	0.007**
	>=4	15(21.1)	56(78.9)	1	1	
PNC visits of Mother	Yes	38(25.2)	113(74.8)	1	1	
	No	97(46.0)	114(54.0)	2.53(1.60, 3.99)	2.69(1.60, 4.52)	0.000***
Sources of drinking water	Unprotected	50(51.0)	48(49.0)	2.19(1.37, 3.52)	1.42(0.82, 2.47)	0.211
	Protected	85(32.2)	179(67.8)	1	1	

Significant at P<0.05=*, at P<0.01=**, at P<0.001=***; COR=Crude odds Ratio, AOR =Adjusted odds Ratio and CI = 95% Confidence interval N = Number

DISCUSSION

For a child's growth, development, and health during infancy and early childhood, adequate nutrition is essential. A far more prevalent nutritional issue that mostly affects developing nations like Somalia is stunting. Even though the government of Somalia has made some progress towards achieving the target for stunting, 25.3% of children under five years of age are still affected[44]. If the reduction percentage every year continues at this rate, the nation is not on the track to meet its established target. Thus, assessing the prevalence and predictors of linear growth in a country suffering from complex humanitarian crisis such as large-scale displacements, flooding, threats, and drought is important.

In Galkaio Town, Puntland, Somalia, in 2023, this study assessed the prevalence of stunting and evaluated the risk factors for stunting in children aged 6–59 months. In this study, 37.3% of children between the ages of 6 and 59 months had stunting overall. The polygamous marriage of the father, educational status of the mother, sex of the child, time for initiation of breastfeeding, exclusive breastfeeding, minimum dietary diversity score, and postnatal care visits of the mother were predictors of stunting.

In this study, Stunting affected 37.3% of children between the ages of 6 and 59 months overall. This finding is in line with the studies conducted in five South Asian countries: 35%[52], Indonesia 36.7% [53], and Ethiopia, such as Ethiopia from the EDHS of 2016, 38% [16], Wonago 37.7 % [21], Hossana 35.4% [54], and Dessie 39.5% [18]. These findings are lower than those reported in Pakistan 44.4% [27], Malawi 46.8% [12], Tanzania 54.3% [15], and Ethiopia, such as Butajira town 52.5% [17], Dabat 64.5% [55], Lasta 49.7% [56], and Libo-Kemekem district 49.4% [57]. This discrepancy could be the result of limited awareness, sociodemographic variables, seasonal variations, and cultural variations in the study population's customary food preparation practices.

This finding is higher than the studies conducted in Pakistan 31.7% [58], Cameroon 16.4% [10], Nigeria 3.5% [11], Tanzania 33% [14], and Ethiopia such as Demba Gofa district 21.8% [19], Jimma Geneti District 27% [20], Sodo Zuria District 24.9% [59], West Guji Zone 31.8% [47], Somali region 31.9% [22], and Somalia such as surveys from 2007 31%, national Somalia Micronutrient Survey (SMS) of 2019 17.8% [30], and national reports 25.3% [44] . The discrepancy could be attributed to many forms of assistance, primarily from non-governmental organizations, as well as agricultural techniques, child feeding customs, and variations in socioeconomic endeavors. The difference could

also result from a lack of media access and local marketplaces, which would make it difficult to get varied recommendations on dietary variety.

In addition to determining the prevalence of stunting among children aged–6-59 months, this study identified several predictors of stunting. The results showed that children under the age of five whose fathers were in a polygamous marriage had a greater risk of stunting than those whose fathers were in a monogamous marriage. This finding is consistent with those of Kenya [59] and Ethiopia [47]. This could occur as a result of the prevalence of polygamous marriage in the research region, which can induce stunted growth and malnourishment in children under five. The majority of women in the study area were financially dependent on their husbands and, absent their husbands' support, were unable to cover the costs of healthy diet, eating at least once a day.

Concerning the educational level of mothers, the odds of being stunted were higher among children born to mothers who had no formal education than among children born to mothers with secondary and higher education. This finding is consistent with those of Tanzania [14] and Ethiopia [16, 31, 56]. This might be because mothers who had no formal education were less aware of their children's nutritional consequences than educated mothers were. Uneducated mothers may be less likely to introduce new feeding practices that help improve the nutritional status of their children. Moreover, educated mothers have better health-seeking behaviors for childhood illnesses than uneducated mothers, which can help prevent stunting [60].

Regarding the sex of the child, being male increased the likelihood of being short for their age by two times compared to their female counterparts. This finding is in agreement with those of studies conducted in Cameroon [10], Tanzania [15], Mozambique[9], and Ethiopia, such as in the Sodo Zuria District[61] and West Guji zone [47]. This difference may be due to cultural issues, gender preferences, or discrimination during feeding. Additionally, this difference may be due to the differing socioeconomic and cultural acceptance of gender within the community. The Somali community does not adhere to traditional gender norms and values all children equally, regardless of gender. Concerning the time for initiation of breastfeeding, children who started breastfeeding after 1 hour had 3 times higher odds of being stunted compared to children who started breastfeeding within 1 hour. This finding is in agreement with the studies conducted in Indonesia [62] and Ethiopia [18]. This may be because early breastfeeding leads to increased secretion and production of breast milk, which nourishes the babies. Colostrum provides infants with natural immunity, thereby reducing hypoglycemia and hypothermia, which in turn protects their well-being [63]. Moreover, a child who was exclusively breastfed for less than 6 months' had 72% higher odds of stunting when compared to children who exclusively breastfeed for six months or more. This finding is consistent with those of Tanzania [64], Bangladesh [65], and Ethiopia [18]. A likely explanation is that inappropriate timing for the provision of complementary food affects children's nutritional status when their digestive and immune systems are immature. Exclusive breastfeeding is essential to prevent infections that could hamper infant development, particularly in regions with poor hygiene. Hence, mothers should be advised to take advantage of breastfeeding, and an enabling environment that encourages optimal breastfeeding should be created.

The other significant factor for stunting was the dietary diversity score. Children whose minimum dietary diversity score of their mother was less than 4 were more likely to be stunted than those whose minimum dietary diversity score of their mother was greater than or equal to 4. This finding is consistent with those from Tanzania [66] and Ethiopia, such as the West Gojjam Zones [67] and Dessie [18]. This may be because malnutrition can be reduced by using a greater variety of complementary foods. Households should be trained and encouraged to provide appropriate and varied foods that meet the energy and nutritional needs of infants.

Postnatal visits to the mothers were significantly associated with stunting. Children whose mothers did not attend postnatal care services had an increased risk of stunting when compared with those whose mothers attended postnatal care services. This finding is consistent with findings from Ethiopia (the somali region) [2222]. However, a study conducted in north-eastern Ethiopia revealed that postnatal visits were not significantly associated with growth retardation.

This variation might be due to the differences in the population regarding the acceptability of the health services provided in the area. This discrepancy could be due to different populations acceptance of the healthcare services provided in the region.

Limitation of the study

There may be a possibility of recall bias regarding infant feeding practices. Aside from that, because the study is cross-sectional, demonstrating a direct cause-and-effect relationship between risk factors and outcome may not be sufficient.

CONCLUSION

In this study, the prevalence of stunting among children aged 6-59 months was higher than that among the national population. Polygamous marriage of the father, educational status of the mother, sex of the child, time for initiation of breastfeeding, exclusive breastfeeding, minimum dietary diversity score, and postnatal care visits of the mother were significantly associated with stunting. This study provides valuable insights that can inform efforts to address undernutrition and promote the healthy growth and development of young children in the region.

Based on the findings of this study, the following recommendations were made:

For the community:

Should have to avoid child sex preference between male and female during feeding and caring

For Galkaio town health office:

Need to plan nutritional interventions to effectively address nutritional conditions with the participation of stakeholders and the community at large.

In addition to this health official, cooperation between several sectors is required to enhance the enforcement of the legislation regarding polygamy.

For the health extension workers:

Need to provide nutrition education for the community about maternal and child nutrition to accelerate the prevention of stunting by focusing on the most critical periods of child development.

There is a need to be actively involved and provide training to mothers with practical demonstrations of how to prepare and provide optimal foods for infants and young children.

Declarations

Ethical considerations

Ethical approval for this study was obtained from Jigjiga University Institution of Research and Ethics Review Board (JJURERB0123/2018). The official permission letters written by the College of health science were submitted to the Galkaio

Town Administration. Written Informed consent was obtained from Legally authorized representative of each study participant. To ensure confidentiality, no identifying information about the study participants was indicated in the questionnaires, and they were informed that the collected data were used only for research purposes.

Author contributions

MA, and FS, involved in the formation of the research idea (MA, FS, AM, and MA), participated in the data extraction, analysis, interpretation, and manuscript write-up. All authors read and approved the final manuscript.

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Conflict of interest

The authors sustain no conflict of interest.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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