

# Prevalence of Stunting and Its Associated Factors Among Children Residing in Internally Displaced Persons (IDP) Camps in Hargeisa, Somaliland: A Community-Based Cross-Sectional Study

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**Background:** Stunting, a consequence of prolonged malnutrition, remains a critical global health issue affecting 165 million children under the age of five, with 10.6 million associated deaths. Its stunting prevalence is particularly pronounced in developing nations, notably Sub-Saharan Africa. Chronic protein-energy malnutrition, identified as a major cause of morbidity and mortality in displaced settings, underscores the urgency of understanding its impact in such contexts.

**Objective:** This study aimed to assess the prevalence and associated factors of stunting among children aged 12–59 months and residing in IDP camps in Hargeisa, Somaliland.

**Methods:** A community-based cross-sectional study was conducted in Hargeisa from May 5 to July 30, 2022, utilizing systematic random sampling, online mobile surveys, and caregiver interviews with anthropometric measurements. The SPSS version 25 was utilized in handled data entry, processing and analysis. Multivariable logistic regression, with  $p < 0.05$  significance, included variables from bivariate analysis ( $p < 0.2$ ). Stunting assessment utilized WHO AnthroPlus software, categorizing HAZ scores  $< -2.0$  SD.

**Results:** The prevalence of stunting among children living in IDP camps was found to be 21.1% [95% CI: 17.0–24.91%]. Vaccination status (adjusted odds ratio [aOR] = 0.19, 95% CI: 0.09–0.38), deworming practice (aOR = 6.5, 95% CI: 2.91–14.52), place of delivery (aOR = 0.14, 95% CI: 0.07–0.30), measles experience in the last year (aOR = 0.12, 95% CI: 0.04–0.34), ANC visits (aOR = 0.33, 95% CI: 0.14–0.81), and maternal insufficient extra food intake (aOR = 2.15, 95% CI: 1.11–4.15) were significantly associated with stunting.

**Conclusion:** The observed stunting prevalence in IDP camps (21.1%) was substantial, highlighting the need for targeted interventions. Future efforts should aim to reduce stunting from the current rate to an estimated 5–10%, emphasizing comprehensive measures such as deworming, maternal nutrition, postnatal care improvement, robust immunization, and promoting healthcare facility deliveries.

**Keywords:** stunting, IDP, Somaliland

## Introduction

Chronic malnutrition among children under the age of five remains a global problem. Approximately 165 million children younger than five years have a height-for-age Z score of  $-2$  or lower, indicating a 35% decline from the estimated 253 million in 2005, the prevalence of stunting has decreased from an estimated 40% in 1990.<sup>1</sup> Globally, around two billion people suffer from hidden hunger, and in 2020, an estimated 149 million children under the age of five were stunted, indicating a failure to reach their expected height for their age.<sup>2,3</sup>

Various factors have been identified as associated with malnutrition, including poor breastfeeding and child feeding practices.<sup>4</sup> Lack of access to nutritious food, low levels of parental education and income, inadequate healthcare services, and poor antenatal care are also recognized as key factors contributing to child malnutrition, diseases such as HIV infection can

compromise nutritional status.<sup>1,4,5</sup> Stunting is most prevalent in Sub-Saharan African countries, particularly in East and Central Africa, particularly, Burundi and Madagascar have the highest prevalence rates of stunting, at 54.6% and 48.4%, respectively. Eastern African countries, including Ethiopia, Kenya, and Uganda, also exhibit high prevalence rates of stunting, ranging from 29.0% to 47.7%.<sup>6,7</sup>

The predictors of childhood undernutrition are well-researched and could be classified as either proximate or distal, affecting the nutritional status of children at different levels. Proximate factors operate at the individual and child level, which includes age, sex, birth size, birth order, birth interval, and infections. Distal factors include a wider range of conceptual factors within the socio-cultural, economic, environmental, climatic and political context which influence food (in)security, sanitation, access to healthcare services, and education at the household and community levels. Studies have reported that these factors tend to vary spatially depending on geographic location and climatic conditions. Previous studies have reported a relationship between undernutrition and geographical region, clearly acknowledging that a child's geographic location is an important modifier of known determinants of undernutrition.<sup>8–10</sup> Undernutrition is common among underprivileged populations like women, children and adolescents, especially street dwellers. It is the single risk to global public health and by far the greatest contributing factor for child morbidity and mortality. It is a significant public health problem described as the silent murderer. This public health problem can affect any section of the population like children, adolescents, and pregnant women.<sup>11,12</sup>

In Somaliland, according to the Somaliland Demographic and Health Survey (SLDHS) conducted in 2020, the overall prevalence of stunting among children aged 6–59 months is 21.0%. However, there is limited research on this topic. This study aims to assess the prevalence of stunting among children aged 12–59 months in Somaliland, with a particular focus on families residing in internally displaced persons (IDP) camps within the country. The Somaliland government has developed a policy framework for IDPs, aiming to improve living conditions and provide durable solutions.<sup>13,14</sup>

Major risk factors contributing to stunting include poor maternal health, lack of access to antenatal care facilities, inadequate feeding and care practices, insufficient infrastructure, and healthcare facilities. Economic wealth and parental education also play vital roles in undernutrition, increasing the likelihood of stunting among primary school students.<sup>15,16</sup> Recognizing the broader socio-political context is also essential, as the prevalence of stunting reflects not just nutritional challenges but also the compounding impact of displacement-related factors, emphasizing the critical need for political stability, social support, and comprehensive policy interventions to improve the overall well-being of children in such settings.

Sub-Saharan Africa continues to face significant challenges related to malnutrition. In 2015, the region accounted for over 30% of global underweight children. Despite a global decline in childhood stunting, the African region witnessed an increase from 50.3 million to 58.8 million stunted children in 2018. Notably, Africa's prevalence of wasting among children under five, at 7.1%, is slightly lower than the global rate of 7.3%. However, the region experiences higher rates of stunting (22.7%) and wasting (9.4%) compared to the global averages. These findings underscore the complex and varied nature of malnutrition in SSA.<sup>17,18</sup>

Since 2015, the UNHCR (UN Refugee Agency) has estimated that there are 71,753 internally displaced persons (IDPs) in Hargeisa, Somaliland, due to a protracted 20-year civil war.<sup>19</sup> However, the nutritional status of children residing in IDP camps has not been adequately monitored. Therefore, this study aims to determine the level of stunting and its determinants among children aged 12–59 months in IDP camps in Hargeisa city.

## Materials and Methods

### Study Area and Period

The study was conducted in Hargeisa, the capital city of Somaliland, from May 05 to July 30th, 2022, Hargeisa. Somaliland is an unrecognized self-declared sovereign state that is not internationally recognized. It shares borders with Djibouti in the northwest, Ethiopia to the south and west, the Gulf of Aden to the north, and Somalia to the east. Hargeisa, with a population of 1.3 million individuals, has a significant proportion of internally displaced persons (IDPs) camps, accounting for 5.5% of the population. The study focused on eight main districts within Hargeisa, each with its own local administration. The study area is located at latitude 9° 33' 44.4" N and longitude 44° 10' 37.2" E, at an altitude

of 1334 meters (4377 feet) above sea level. The climate of the region is characterized as semi-arid. The IDP camps, which were included as sub-study areas, are situated in various locations within the city.<sup>20</sup>

## Study Design and Respondents

A community-based cross-sectional study design was employed to assess the nutritional status among children aged 12 to 59 months living in Internally Displaced Persons (IDP) camps in Hargeisa. Children aged 12 to 59 months were the source of the population, including all children within the specified age range residing in the IDP camps, and their parents or caretakers were the respondents. Mothers or caregivers who had hearing difficulties, children with physical deformities, and women or caregivers who had been living in the IDP camps for less than six months were excluded from the study.

## Sample Size Determination and Sampling Procedure

The sample size for this study was determined using the single population proportion formula based on the following assumptions: a prevalence (P) of 21.0% of children under the age of five being stunted (below  $-2$  standard deviations) from the 2020 Somaliland Demographic and Health Survey (SLDHS).<sup>13</sup> A 95% confidence interval (CI) represented by 1.96, and a margin of error of 5%. After adjusting for a 5% contingency and a design effect of 1.5, the final sample size was calculated to be 402 children aged 12 to 59 months residing in Hargeisa IDP camps.

To select the IDP settlements, a proportional listing approach was used. Three IDP settlements were randomly chosen using a simple random sampling method. Within each selected settlement, all households with children aged 12 to 59 months and residing for at least six months were considered as the study population. Systematic random sampling was employed to select households, with an interval (k) of 21. This means that the first household was selected through a lottery method, and subsequent households were chosen at every 21<sup>st</sup> interval. The three selected IDP settlements were Ayaha, Nasa-hablod, and Cakara.

## Data Collection Procedure and Tools

The study data was collected by trained data collectors, through mobile data collection which is Kobo collect. Three enumerators with bachelor's degrees who received a full day of data collection training. The study focused on two parameters: age and height. Age information was obtained from the caregivers/parents of the children. Anthropometric data, specifically height, was collected by the trained enumerators.

For children aged 12 to 59 months, height was measured without shoes (barefoot) using the UNICEF height board. A stand-height scale calibrated and checked for safety was used to take the measurements. Children aged 24 months and above had their height measured using a vertical height board. The child was positioned in the middle of the board, standing upright, with their head, shoulders, buttocks, knees, and heels touching the board. This protocol ensured accurate measurements were taken.

The collected data was entered into an Excel worksheet and later exported to the WHO AnthroPlus software. The software was used to generate Height-for-Age Z-scores and other anthropometric indicators used to evaluate stunting among the children in the study.

## Data Analysis and Quality Assurance

The data was entered and analyzed using the Statistical Package for the Social Sciences (SPSS) software, specifically IBM Version 25.0. Principle component analysis (PCA) was employed to generate wealth status of study participants. Twelve variables related to the ownership of selected household assets, the size and the quantity of durable equipment, materials used for housing construction, home ownership, improved water, and sanitation facilities were considered. Eventually, the generated principal component was divided into three equal quintiles (Poor, Middle, and Rich). To ensure data completeness, a cross-checking process was implemented. The study utilized a structured questionnaire that was adapted from various literature sources.<sup>21,22</sup> The questionnaire was initially prepared in English and then translated into the local language which is Somali.

To validate the questionnaire and ensure its effectiveness, a pretest was conducted with 5% of the study participants who shared similar characteristics with the IDP settlements. Descriptive statistics were used to calculate frequencies and

percentages for categorical data. Bivariate logistic regression analysis was performed to examine the association between the dependent and independent variables. Variables with a  $p$ -value of  $< 0.2$  in the bivariate analysis were considered as candidate variables for the subsequent multivariate logistic regression analysis, which aimed to control for confounding factors.

The multivariate logistic regression analysis was conducted to determine the relationship between the independent variables and the outcome variable. Furthermore, the Hosmer-Lemeshow goodness of fit was used to assess model suitability, with a cut-off point of a  $p$ -value  $< 0.05$  considered significantly associated with the outcome. Adjusted odds ratios (aOR) were calculated, along with a 95% confidence interval (CI), to measure the strength of the associations.

## Ethical Considerations

In conducting this study, ethical approval was secured from the Jimma University Institutional Review Board [IRB] of the College of Health Sciences under the reference number IHIRB/586/2022. Prior to data collection, the participants/caretakers were provided with information about the purpose of the study and their right to refuse participation or withdraw from the interview at any time. Verbal consent, duly accepted and approved by the ethics committee, was obtained from each participant before the interview, ensuring their willingness to participate. The participants assured that the information they provided would be treated confidentially throughout the study. To maintain confidentiality, no identification information, including the names of the participants, was recorded on the questionnaire. Respecting the principles of ethics, the study followed the principles outlined in the Declaration of Helsinki, underscoring our commitment to ethical practices in human research. In addressing the local context, permission was obtained from relevant Somaliland authorities to conduct this study. This underscores our commitment to respecting the autonomy and rights of individuals involved in the study while aligning with ethical committee-approved procedures.

## Results

### Socio-Demographic Characteristics of Study Respondents

The study included a total of 402 children under the age of five. However, 3.2% of children with a HAZ index that was flagged and were excluded from the study, leaving 389 children for the final analysis. The mean age of the children was 24.6 months with a standard deviation of 11.37. In terms of gender distribution, slightly over half (58.4%) of the respondents were female. All respondents identified themselves as followers of the Muslim religion. Most of the participants (86.1%) were married, and a significant proportion (86.4%) had no formal education. Additionally, the majority (95.9%) of the respondents were Somali regarding their ethnicities (see [Table 1](#)).

**Table 1** Socio Demographic Characteristics of the Respondents in an IDP Settings, Hargeisa, Somaliland, 2022 (n=389)

Variables (n=389)	Categories	Frequency	%
Age categories	12–23	208	53.5
	24–35	105	27.0
	36–47	46	11.8
	48–59	30	7.7
Sex of child	Male	162	41.6
	Female	227	58.4
Educational status of mothers	No Formal education	336	86.4
	Primary education	53	13.6

(Continued)

**Table 1** (Continued).

Variables (n=389)	Categories	Frequency	%
Current Marital status	Unmarried	54	13.9
	Married	335	86.1
Number of under five in household	1–2 children	317	81.5
	3 and above	72	18.5
Ethnicity	Somali	327	95.9
	Ethiopia	14	3.6
	Arab	2	0.5
Wealth index	Poor	158	40.6
	Middle	81	20.8
	Rich	150	38.6

## Prevalence of Stunting

The overall prevalence of stunting among children under five in the IDP setting was 21.1% [95% CI: 17.0–24.9%]. The highest proportion of stunting (57.3%) was observed among females.

## Childcaring and Child Characteristics

Out of the study respondents, approximately 170 (43.7%) reported feeding their children three times a day. Regarding vaccination status, 190 (48.8%) of the children were fully vaccinated, while 199 (51.2%) were either partially vaccinated or not vaccinated at all. In terms of delivery method, nearly two-thirds (63.8%) of the study subjects had home deliveries. Additionally, the majority (73.5%) of the children under study were primarily cared for by their mothers. Bottle feeding was reported by almost half (47.6%) of the subjects. Moreover, more than half (57.8%) of the caregivers used deworming tablets for their children. Approximately two-thirds (66.3%) of the mothers in the study sought healthcare for their children when they fell ill. Lastly, one-third of the children experienced measles in the past year (see [Table 2](#)).

**Table 2** Child Caring and Child Characteristics Among IDP Settings, Hargeisa, Somaliland, 2022 (n=389)

Variables (n=389)	Categories	Frequency	%
Number of children feeding per a day	Twice a day	44	11.3
	Three times a day	170	43.7
	Four times a day	88	22.6
	Five time and above a day	87	22.4
Vaccination status on children	Not Fully Vaccinated	199	51.2
	Fully Vaccinated	190	48.8
Place of delivery	Health Institution	141	36.2
	Home Delivery	248	63.8

(Continued)

**Table 2** (Continued).

Variables (n=389)	Categories	Frequency	%
Deworming practices	Yes	225	57.8
	No	164	42.2
Childcaring after mother	Mother	286	73.5
	Sister	13	3.3
	Grand mother	90	23.1
Child experienced measles for the last year	Yes	134	34.4
	No	255	65.6
During lactation did consume extra food	Yes	250	64.3
	No	139	35.7
Method of child feeding	Bottle	185	47.6
	Cup	179	46.0
	Spoon	25	6.4
Place of child treat after got ill	Home treatment	103	26.5
	Taking traditional healers	28	7.2
	Taking Health Institution	258	66.3

## Maternal Related Characteristics

Among the caregivers under study, nearly two-thirds (65.0%) visited antenatal follow-up during pregnancy fewer than four times. Moreover, more than two-thirds (82.1%) of the mothers had given birth to fewer than six children in their lifetime. The majority of caregivers (76.9%) demonstrated knowledge of family planning, with a significant proportion (67.4%) utilizing natural family planning methods. In terms of hand hygiene practices, out of the study respondents, only 36 (9%) reported using water alone, while more than two-thirds (70.1%) reported using soap occasionally to clean their hands before feeding their children (see [Table 3](#)).

**Table 3** Maternal Related Characteristics Among IDP Settings, Hargeisa, Somaliland, 2022 (n=389)

Variables (n=389)	Categories	Frequency	%
Number of under five in the household	1–2	274	70.4
	≥3	115	29.6
Frequency visiting ANC during the pregnancy	0–3 times	253	65.0
	≥4 times	136	35.0
Knowledge about family planning	Yes	298	76.6
	No	91	23.4

(Continued)

**Table 3** (Continued).

Variables (n=389)	Categories	Frequency	%
Method of FP have you ever used	Pills	4	1.0
	Implant	70	18.0
	IUDs	17	4.4
	Natural	261	67.1
	No method	37	9.5
Hand washing methods	Only water	35	9.0
	Soap sometimes	272	69.9
	Always soap	47	12.1
	Use ash	35	9.0

### Factors Associated Stunting Among Children in IDP Settings, Hargeisa, Somaliland, 2022 (n=389)

The bivariate and multivariable logistic regression analyses revealed significant associations between various factors and the stunting status of under-five children in an IDP setting (see Table 4). The vaccination status, deworming practice, place of child delivery, child's experience of measles, and maternal consumption of extra food during lactation were found to be significantly associated with stunting. Children who were fully vaccinated had a significantly lower likelihood of stunting compared to those who were not fully vaccinated (aOR= 0.19, 95% CI: 0.09–0.34,  $p<0.001$ ), with an 81% reduction in the odds of stunting. Caregivers who did not practice deworming for their children were found to be 6 times more likely to have stunted children compared to their counterparts (aOR= 6.5, 95% CI: 2.9–14.5,  $p<0.001$ ). Children born in health facilities had a significantly lower likelihood of stunting, with an 86% reduction in odds compared to those born outside health facilities (aOR= 0.14, 95% CI: 0.07–0.3,  $p<0.001$ ). Similarly, children who did not experience measles in the last year were 88% less likely to be stunted compared to those who did experience measles (aOR= 0.12, 95% CI: 0.04–0.3,  $p<0.001$ ). Mothers who visited antenatal care services showed a preventive effect towards stunting, with a 67% reduction in odds compared to mothers who did not visit

**Table 4** Factors Associated with Stunting Among Under Five Children in IDP Settings, Hargeisa, Somaliland, 2022 (n=389)

Characteristics	Stunting		COR (95%CI)	aOR (95%CI)	P-value (<0.05)
	Yes (%)	No (%)			
Vaccination status					
Fully vaccinates	47 (57.3)	143 (46.6)	0.18 (0.1–0.3)	0.19 (0.09–0.38)	0.000
Not Fully vaccinated	35 (42.7)	164 (53.4)			
Deworming practices					
Yes	69 (84.1)	156 (50.8)			
No	13 (15.9)	151 (49.2)	5.3 (2.7–9.7)	6.5 (2.91–14.52)	0.000
Place of delivery					
Home delivery	26 (31.7)	222 (72.3)			
Health institute delivery	56 (68.3)	85 (27.7)	0.17 (0.1–0.3)	0.14 (0.07–0.30)	0.000

(Continued)

**Table 4** (Continued).

Characteristics	Stunting		COR (95%CI)	aOR (95%CI)	P-value (<0.05)
	Yes (%)	No (%)			
Measles ill for the last year					
Yes	5(6.1)	129 (42.1)	I	I	I
No	77 (93.9)	178 (57.9)	0.09 (0.04–0.2)	0.12 (0.04–0.34)	0.000
ANC visit during pregnancy					
Yes	58 (70.7)	235 (76.5)	1.4 (0.8–2.3)	0.33 (0.14–0.81)	0.015
No	24 (29.3)	72 (23.5)	I	I	I
Does you take sick child for health institute after they sick					
Yes	63 (76.8)	264 (86.0)	I	I	I
No	19 (23.2)	43 (14.0)	1.9 (1.0–3.4)	2.26 (0.86–5.97)	0.10
Does mother consume extra food during lactation					
Yes	46 (56.1)	204 (66.4)	I	I	I
No	36 (43.9)	103 (33.6)	0.65 (0.4–1.1)	2.15 (1.11–4.15)	0.02
Does mother perform exclusive breastfeeding					
Yes	28 (34.1)	82 (26.7)	I	I	I
No	56 (65.9)	225 (73.3)	1.4 (0.8–2.4)	0.73 (0.31–1.75)	0.48

**Note:** I stands for reference category.

ANC services (aOR= 0.33, 95% CI: 0.14–0.81, p=0.015). Mothers or caregivers who did not consume extra food during lactation were found to have a 2-fold increased likelihood of having stunted children compared to those who consumed extra food during lactation (aOR= 2.15, 95% CI: 1.11–4.15, p=0.02).

## Discussion

The aim of this study was to determine the prevalence of stunting and its associated factors among under-five children living in IDPs in Hargeisa, Somaliland. The study was specifically conducted in three IDP camps, revealing a stunting prevalence of 21.1% [95% CI: 19.7–28.1%]. This figure indicates a slightly higher prevalence compared to the Somaliland Health and Demographic Survey, which reported a prevalence of 20.0%.<sup>13</sup> Other studies conducted in Sub-Saharan Africa and Northwest regions have shown varying prevalence's of stunting among under-five children. For instance, the prevalence in the Somali regional state of Ethiopia was 33.4%, while in IDP settings in Uganda, it was 52.4%.<sup>23,24</sup> Similarly, studies in Pakistan and India reported prevalence rates of 48.2% and 33.8%, respectively.<sup>25,26,27</sup> Studies conducted in IDP camps in Myanmar for assessing stunting revealed a prevalence of 59.4%, while in IDP camps in Somalia for measuring the prevalence of stunting was 66.0%.<sup>28,29</sup> and the prevalence of stunting among IDP children in Uganda was found to be 52.4%.<sup>24,30</sup> The differences in these prevalence rates could be attributed to variations in the study populations. This study assessed children at different stages of under-five age, whereas other studies focused on specific age groups or targeted under-five children in different contexts. Additionally, socioeconomic and cultural differences in dietary habits and care practices among children may also contribute to the variation.

Our findings indicate that mothers who did not consume surplus food during lactation, caregivers whose children were partially or not vaccinated, mothers who delivered outside of health facilities, and children under five who had experienced measles were more likely to have shorter stature. These factors emerged as major determinants of stunting among under-five children in this study. Despite showing no association between family income/wealth status and the child's stunting, low family income may have an indirect association with the nutritional status of children by influencing



the low quality and less diversity of a child's diet and the low ability to access food.<sup>29,31,32</sup> Our study also illustrated that the majority of mothers were illiterate and has no formal education (86.4%), which is consistent with previous studies.<sup>29,33</sup> This may be because a mother's ability of childcare and education level is associated with undernutrition. A mother's education and approach to information can be essential determining factors in a child's growth development.<sup>34,35</sup> Education might improve mother's self-rule, thereby increasing her ability to make decisions about her own health.

Studies conducted in various contexts have yielded diverse findings regarding the determinants of stunting among under-five children in IDP camps. Common factors associated with undernutrition and stunting in this demographic include delayed introduction of complementary foods, lack of caregiver knowledge, and food insecurity. For instance, a study in Uganda identified risks such as male children being prone to stunting (aOR = 1.57, 95% CI: 1.15–2.13, *p*-value=0.004), children aged 3–24 months being at risk of acute malnutrition (aOR = 2.78, 95% CI: 1.26–6.15, *p*-value=0.012), and de-worming offering protective effects (aOR 0.44, 95% CI: 0.22–0.88, *p*-value=0.018).<sup>24</sup> In northern Ethiopia, being female and the absence of washing facilities and latrines were associated with stunting among under-five children.<sup>26</sup> Similarly, in southern Ethiopia, factors such as polygamous marriages of fathers, female sex, fewer meal frequencies, lack of vaccination, poor household wealth status, and severe household food insecurity were significantly associated with stunting among under-five children.<sup>28</sup>

This study, unique in its focus on IDP children below five years of age, differs from research in other African regions. It identifies factors associated with stunting among IDP children, including vaccination status ((aOR = 0.19, 95% CI: 0.09–0.38), measles experience in the last year (aOR = 0.12, 95% CI: 0.04–0.34) deworming practice (aOR = 6.5, 95% CI: 2.91–14.52), place of delivery (aOR = 0.14, 95% CI: 0.07–0.30), ANC visits (aOR = 0.33, 95% CI: 0.14–0.81), and caregivers/mothers' consumption of extra foods during lactation (aOR = 2.15, 95% CI: 1.11–4.15). These factors present unique challenges in the IDP context and emphasize the need for tailored interventions to address the specific determinants of stunting in this population.

## Limitations of the Study

The limitations of this study encompass several aspects. Firstly, the cross-sectional nature of the study design impedes the ability to establish a temporal relationship between cause and outcome. As a result, causal inferences and the direction of causality cannot be definitively determined.

Furthermore, the study is susceptible to potential recall bias among participants, particularly when answering questions related to events such as fever and diarrhea in the child's past history. The accuracy of reported information may be influenced by memory limitations or variations in individual recall.

Additionally, the overrepresentation of female children is an outcome of systematic random sampling, wherein caregivers are selected rather than directly controlling the sex of the child. The determination of the child's sex relies on information provided by caregivers during interviews, and unfortunately, it cannot be controlled due to inherent uncertainty in our study design. This may introduce a gender-related bias that should be considered when interpreting the study findings.

## Conclusion

This study underscores a notable prevalence of stunting among under-five children in IDP camps, surpassing the standard range of 10–15%. A significant proportion of the study participants lacked full vaccination, emphasizing the imperative for enhanced adherence to vaccination practices in IDP settings to reduce the risk of stunting. Notably, children born at health facilities exhibited a preventive effect against stunting, suggesting that mothers receiving post-natal sessions, immunization, and health education can potentially mitigate the impact of home delivery. Conversely, the research identified an elevated risk of stunting among children in IDP settlements who did not receive deworming treatment, indicating a high susceptibility to future stunting. Advocating for caregivers to prioritize deworming for children with a history of worm infestations is crucial. Additionally, mothers or caregivers utilizing extra food demonstrated a lower risk of their children experiencing hunger, as revealed in this study.

To translate these findings into actionable measures, it is imperative to promote comprehensive vaccination coverage for children under five in IDP settings. Efforts should focus on sensitizing caregivers about the significance of health facility deliveries to reduce the likelihood of childhood stunting. Encouraging mothers to consume extra food during

pregnancy is paramount, given its preventive effect on the risk of stunting. Implementing these recommendations is vital for reducing stunting prevalence and enhancing the overall health of children in IDP camps. Targeted interventions addressing vaccination coverage, deworming practices, delivery location, and maternal nutrition should be prioritized. Ongoing research and collaborative efforts are essential to formulate effective strategies and policies addressing stunting in IDP settings comprehensively.

## Abbreviations

ANC, Ante-Natal care; BMI, Body mass index; EPI, Extended Program for Immunization; HAZ= Height for Age Z score; HH, Household; IDP, Internally Displaced Persons; MoH, Ministry of Health; NRR, Non-Response Rate; PNC, post-Natal care; SLDHS, Somaliland Demographic and Health survey; SLSH, Somaliland Shillings (Somaliland Currency); SDG, Sustainable Development Goals; UNICEF, United Nation Child's Fund; WHO, World Health Organization.

## Data Sharing Statement

The datasets used during the current study are available from the corresponding author on reasonable request.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no potential competing interests.

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