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ORIGINAL RESEARCH

Prevalence of Stunting and Its Associated Factors Among Children Aged 6–59 Months in Angolela Tera District, Northeast Ethiopia

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Background: Though stunting is a major public health problem worldwide. Developing countries are extremely affected regions. In Ethiopia, the child malnutrition rate is one of the most severe public health concerns and is responsible for the serious impact on the nation. Therefore, the aim of the current study was to assess the prevalence of stunting and its associated factors among children below years of age at the community level.

Methods: A community-based cross-sectional study was conducted by a simple random sampling technique with a sample size of 422 mothers with 6–59 months of age children. Interviewer administered semi-structured questionnaires were used to collect data. The data were entered using EpiData version 3.1 and analysis was done by SPSS version 24. WHO Anthro software was used for anthropometry calculation. Bivariate and multivariate logistic regression analyses were used. The variables that had significant associations were identified based on P-values ≤0.05 and 95% CIs.

Result: The findings of this study indicated that approximately 39.4% of the children were stunted. After full control of all variables, male sex (AOR=1.8; 95%CI: 1.23–2.82), child age from 12 to 23 months (AOR=2.1; 95%CI: 1.22–4.28), diarrhea morbidity within 2 weeks (AOR=1.8; 95%CI: 1.19–2.91), and attendance of antenatal care (AOR=0.3; 95% CI: 0.21–-0.45) were significantly associated with stunting.

Conclusion: The current study showed that a relatively high prevalence of stunting among children aged 6 to 59 months. The findings of the current study revealed that male sex, age, diarrheal morbidity, and lack of antenatal care follow-up were significant predictors of stunting.

Keywords: stunting, healthcare, diet, children, Ethiopia

Introduction

Stunting is defined as a height that is more than two standard deviations below the World Health Organization (WHO) child growth standard median.[1,2] It is a major public health problem in the nation when its magnitude in children is greater than 40%.[3] It is mainly the outcome of inadequate nutrition and frequent attacks of infection during the first 1000 days of the child's life.[1,4] It has a detrimental impact on individuals and societies, including reduced cognitive and physical growth, productive capacity, poor health, and increased risk of chronic non-communicable diseases such as diabetes.[4,5]

Worldwide, approximately 165 million children below 5 years of age are affected by undernutrition, of which 26% are stunted. This magnitude decreased

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by 35% from 253 million in 1990. The magnitude of stunting varied across different studies and has been reported to be approximately 36% in Africa and 27% in Asia. Besides, evidence showed that more than 90% of the stunted children in the world live in Africa and Asia.[3] A study performed in Vietnam showed that the prevalence of stunting was 44.3%, and 48% of under-five children in East Africa are stunted.[6,7]

Several studies showed that various factors are responsible for stunting such as low income, poor sanitation, inadequate food intake, inadequate breastfeeding, recurrent infections, and large family size was found to be a significant determinant of stunting.[8,9] Similarly, other studies supported that stunting may be caused by child age,[10] maternal age, child sex, and wealth index,[10] low family education, marital status of the mother, and the number of cattle in the family.[9,11,12] Furthermore, the accessibility and use of health-care services and the care provided to the child were found to be significant determinants of stunting.[13]

In Ethiopia, though the government designs different strategies to avert the magnitude and determinants of undernutrition particularly stunting, yet the levels of stunting were not reduced significantly. The 2016 EDHS report showed that 38% of the children were stunted.[13] The availability of an adequate level of evidence regarding the magnitude of stunting and determinant is an important prerequisite to developing appropriate strategies for nutritional intervention. However, there is no previous study about the prevalence and associated factors of stunting in the study area. Therefore, the current study aimed to estimate the prevalence of stunting and its associated factors among children aged 6–59 months in Angolela tera district, northeast Ethiopia.

Methods

Study Area and Design

This study was conducted in the Angolela tera district, northeast Ethiopia. The woreda is 112 km from Addis Ababa, the capital city of Ethiopia. The woreda has 21 kebeles, with a total area of 1508.19 km3 hectare, and the total population was 98,382, of these males comprising 50,458 and 47,924 females. Out of 15,175 under-five children, approximately 7401 were males and 7774 were female. The woreda has four health centers and 21 health posts. The main source of income in the community largely depends on farming and employment from the government and private sectors. This community-based cross-sectional study was conducted from December 30 to January 30, 2019.

Populations

The source populations were mothers with child pairs from 6 to 59 months of age who live in the Angolela tera district, northeast Ethiopia. The study populations were all randomly selected children 6–59 months of age who were living with their mothers in the sampled kebeles of Angolela tera district administration during the study period. Children who were seriously ill and had physical deformities of limbs and spines were excluded because of difficulty in height measurement.

Sample Size Determination and Sampling Techniques

The sample size was estimated using a single population proportion formula assuming that 51.1% was the prevalence of stunting under-five children,[14] a 5% margin of error with a 95% confidence level. After adding the non-response rate (10%), the final required sample size was 422 mother-child pairs. Out of 21 kebeles, six kebeles were selected by the lottery method. Households were allocated to selected kebeles by proportionate allocation. Study participants were selected by simple random sampling based on frames existing in health posts.

Data Collection Tools and Procedure

Data were collected by using a semi-structured questionnaire that was adapted from the United Nations Children's Fund and previous similar literature. Data collection tools were prepared in English and translated into Amharic language and then back to English to maintain consistency. Based on the study objective the questioners were designed to contain data related to socio-demographic, environmental, healthcare, and dietary factors among children aged 6–59 months. The data were collected by four diploma nurses and the supervision was undertaken by two BSc nurses. The data collectors and supervisors were selected based on experience with research, familiarity with the study area, local language, and interest in participating in the study. One day training was given to the data collector and supervisor by the principal investigator about the objectives of the study, data collection instruments, data collection procedures, physical measurement, and ethical considerations during data collection.

Anthropometric Data

Data were collected using the procedure designed by the WHO for anthropometric measurements. Before measuring anthropometric data for children, their age was determined first to ensure the eligibility criteria.

Age

To estimate the child's age, first data collectors were obtained from the mother interview and ensured by using a birth certificate or vaccination cards, and we used a "local-events" calendar.

Height/Length Measurement

The length of children aged up to 24 months was estimated without shoes, and the height was read to the nearest 0.1 cm by using a horizontal wooden length board with the infant in a recumbent position. But, the length of children aged above 24 months was measured using a vertical wooden height board by placing the child on the measuring board and the child standing upright in the middle of the board. The child's head, shoulders, buttocks, knees, and heels touch the board (19).

Data Quality Control, Data Processing, and Analysis

Pretesting was conducted on 5% of the sample size in the Basona Werana district before the actual data collection process. The pretest data were used only for the training of data collectors, to check the validity, and reliability of the tool. Besides, the data collectors were trained on accurate measuring of the child's height and age. To improve the quality of data, daily collected information was reviewed, and if errors were found returned to the data collectors for correction. The principal investigator was supervised and reviewed every questionnaire for completeness. Data were checked for completeness, coded, cleaned, entered into EpiData VS 3.1, and then exported to SPSS version 24 for further analysis. Descriptive statistics were used to describe the study participants about relevant variables. Variables found to have a p-value of <0.2 with the outcome variable at bivariable analysis were exported to multivariate analysis. Moreover, the variables that have a significant association were identified based on p-values< 0.05 and adjusted odds ratio (AOR), with 95% CI to measure the strength of the associations. Finally, the results of the study are presented in tables, figures, and text.

Result

Sociodemographic Characteristics of the Study Participants

In the current study, a total of 414 respondents participated in yielding a response rate of 98.1%. The mean age of the participants was 24.9 (±15.6 SD) months. Within this sample, 212 (51.2%) were males; approximately one-third of participants, 142 (34.3%) of the children were 12–23 months old. Most of the study participants were Orthodox Christians, 87.4%. Concerning birth order, first birth order children were account for about 114 (27.7%) of the participants. Most of the mothers were married (87.4%), housewives (87.7%), and nearly two-thirds (62.3%) were illiterate (Table 1).

Table 1 Sociodemographic Characteristics of Children Aged 6 to 59 Months in Angolela Tera District, Northeast Ethiopia, 2019

Variables	Category	Frequency (N)	Percent (%)
Child age	6–11 month	91	22.0
	12–23 month	142	34.3
	24–35 month	64	15.5
	36–47month	52	12.6
	48–59 month	65	15.7
Sex of child	Male	212	51.2
	Female	202	48.8
Child birth order	First child	118	28.5
	From2–3child	137	33.1
	From4–5child	107	25.8
	Six and above	52	12.6
Mothers age at pregnancy	<20	29	7
	20–34	236	57
	>35	149	36
Residence	Rural	340	82.1
	Urban	74	17.9
Religion	Orthodox	362	87.4
	Protestant	39	9.4
	Muslim	13	3.1
Marital status	Married	362	87.4
	Divorced	30	7.2
	Widowed	6	1.4
	Unmarried	16	3.9
Family monthly income(ETB)	<1596	351	84.8
	≥1596	63	15.2

Note: NB, Income category (World Bank 2017 report = > 1.9 $/day or < 1.9 $/day, age category (WHO age classification)).

Health Care and Environmental Related Characteristics

In the present study, approximately 185 (44.7%) children had normal birth weights (2.5–4.0 kg) and 50 (12.1%) were <2.5 kg. Most of, 395 (95.4%) of the participants were immunized, and out of these 183 (46.3%) were fully vaccinated. Two hundred and eighty-eight participants had diarrhea during 2 weeks of the period before actual data collection. About 233 (56.3%) of the mothers had no antenatal care visits. One hundred and seventy-eight households used protected well as the main source of drinking water (Table 2).

Dietary Related Characteristics

Concerning breastfeeding practice, most (380, 91.8%) of children were breastfed in the first 6 months; nearly half (199, 46.1%) of children started breastfeeding within the first hour of birth. The majority of the study participants (314, 75.8%) received colostrum; 191 children breastfed for less than 12 months (46.1%), 167 children breastfed for 13–24 months (40.3%), and 56 children breastfed for more than 12 months (13.5%). Two hundred eighty-one children begin supplementary feeding at the age of 6 months. Concerning the method of feeding, 140 mothers (33.8%) used a cup to feed their children, and 138 (33.3%) used a hand to feed their children (Table 3).

Prevalence of Stunting

Based on the anthropometric indices, height-for-age, the findings of this study revealed that 163 (39.4%) of the participant children were stunted. In this study, the proportion of severe stunting among the children was 94 (22.7%) (Figure 1). Besides, the height for age z score distribution of children compared to the standard reference population from 6 to 59 months is illustrated in Figure 2.

Factors Associated with Stunting

The results of multivariable logistic regression analysis showed that male sex, age from 12 to 23 months, having diarrhea in the last 2 weeks, and lack of maternal ANC follow-up were significantly associated with stunting. Male sex was nearly 2 times (AOR= 1.85: 95% CI:

Table 2 Environmental and Health Care Characteristics of Children from 5 to 59 Months Age in Angolela Tera District, Northeast Ethiopia, 2019

Variables, N=414		Frequency (N)	Percent (%)
Antenatal care follow-up	Yes No	181 233	43.7 56.3
Place of delivery	Home Institution	163 251	39.4 60.6
Postnatal care follow-up	Yes No	78 336	18.8 81.2
Birth weight	Below 2.5 Between 2.5–4 Greater 4 Unknown	50 185 3 176	12.1 44.7 0.7 42.5
Immunization status	Yes No	395 19	95.4 4.6
Category of immunization	Fully immunized Currently on immunization Not fully immunized Unknown	183 46 166 19	46.3 11.6 42 4.6
Acute febrile illness in the past 2 weeks	Yes No	259 155	62.6 37.4
Had diarrhea in the past 2 weeks	Yes No	288 126	69.6 30.4
Respiratory infection in the past 2 weeks	Yes No	231 183	55.8 44.2

Table 3 Dietary Related Characteristics of Children from 6 to 59 Months of Age in Angolela Tera District, Northeast Ethiopia, 2019

Variables, N=414	Category	Frequency	Percent (%)
Ever breastfed child	Yes No	380 34	91.8 8.2
Time for initiation of breast feed	Within 1 hour Within 24 hours > 24 hours	191 213 10	46.1 51.4 2.4
Child feed colostrum	Yes No	314 100	75.8 24.2
Prelacteal feeding	Yes No	134 280	32.4 67.6
Duration of breastfeeding	<12 month 12–24 month >24 month	191 167 56	46.1 40.3 13.5
Age complementary food	At 6 month No timely initiated	281 133	67.9 32.1
Method of child feeding	Spoon Cup Hand Bottle	117 140 138 19	28.3 33.8 33.3 4.6

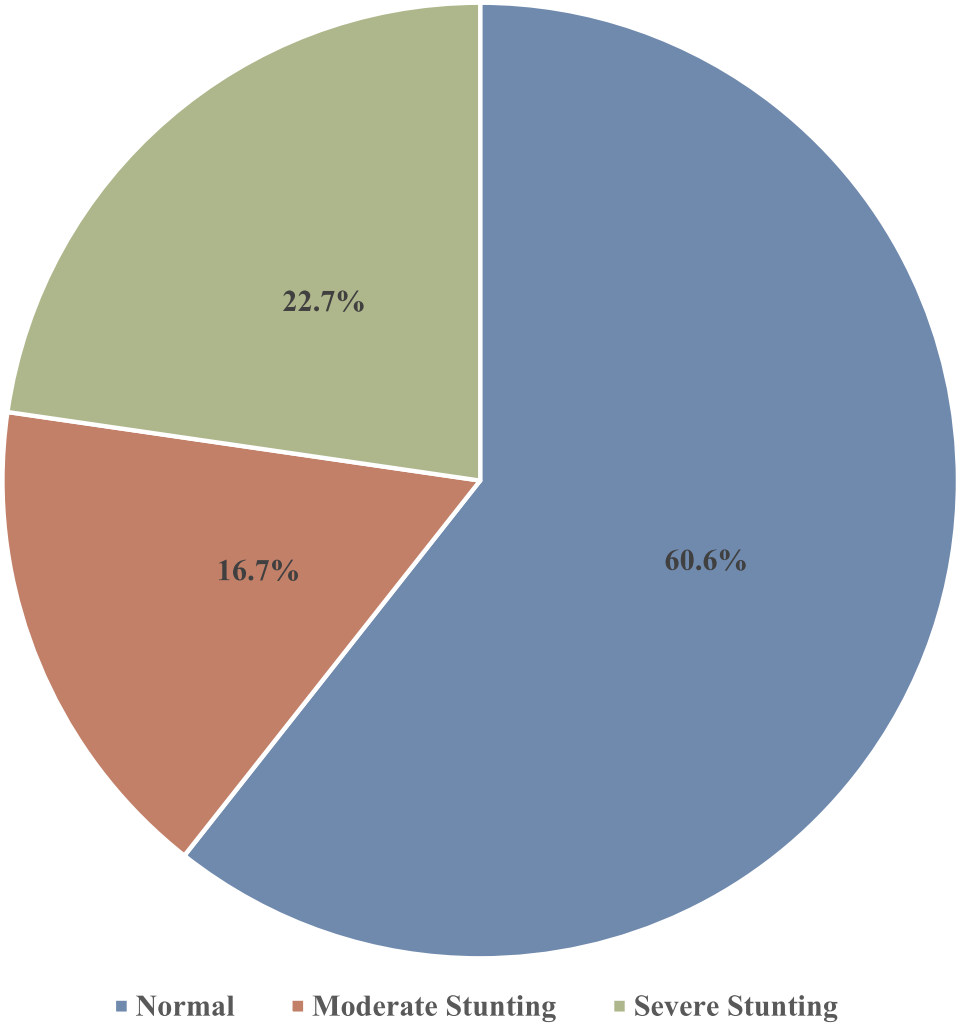

Figure 1 The prevalence and distribution of stunting among children 6–59 months of age in Angolela tera district, northeast Ethiopia, 2019.

1.23–2.82) more likely to develop stunting than their counterpart. Those children aged between 12 and 23 months were 2 times more likely to developing stunting than children aged 48 months–59 months (AOR= 2.16, 95% CI=1.22–4.28). Children with diarrhea within 2 weeks before the data collection were nearly 2 times (AOR =1.86, 95% CI: 1.19–2.91) higher risk of developing stunting than children without the diarrheal disease. Children's mothers who had ANC follow-up had a 69% lower risk of stunting than those who had not ANC follow-up (AOR=0.31; 95% CI=0.21–0.45) (Table 4).

Discussion

The current study findings revealed that 39.4% of the children were stunted. The finding of our study, in line with EDHS 2016, which was 38% (18), Amhara region, 37.2%[15] and Hawassa, in which 39.3% of the children were stunted.[5] Besides, the findings are supported by the study conducted in the 2013 UNICEF report in which the prevalence was 40% and 39% in Sub-Saharan Africa and South Asia, respectively,[16] Botswana (38.7%).[17] However, our finding lower than in studies conducted in different parts of the country: Bulehora 47.6%, (35), and Labella 47.3%.[14] Besides, lower than studies reported in Khartoum, Sudan (51%),[18] India (49.36%),[19] and North Wollo, Ethiopia (44.5%).[20] The possible variation might be due to socioeconomic factors, sample size, study subjects, and periods compared with the present study. However, the prevalence of stunting in this study is higher than that reported in other studies in Nigeria,[21] which was 12.4%, South Africa,[22] which was 18%, and Nigeria,[23] which was 12.5%. Also higher than the study conducted in Mongolia, which was 15.6% (47), western Kenya, which was 30% (52), and Nepal 37%,[24] Vietnam (36.3%),[25] Somalia region, Ethiopia (34.4%).[26] This difference might be due to the difference in the study area,

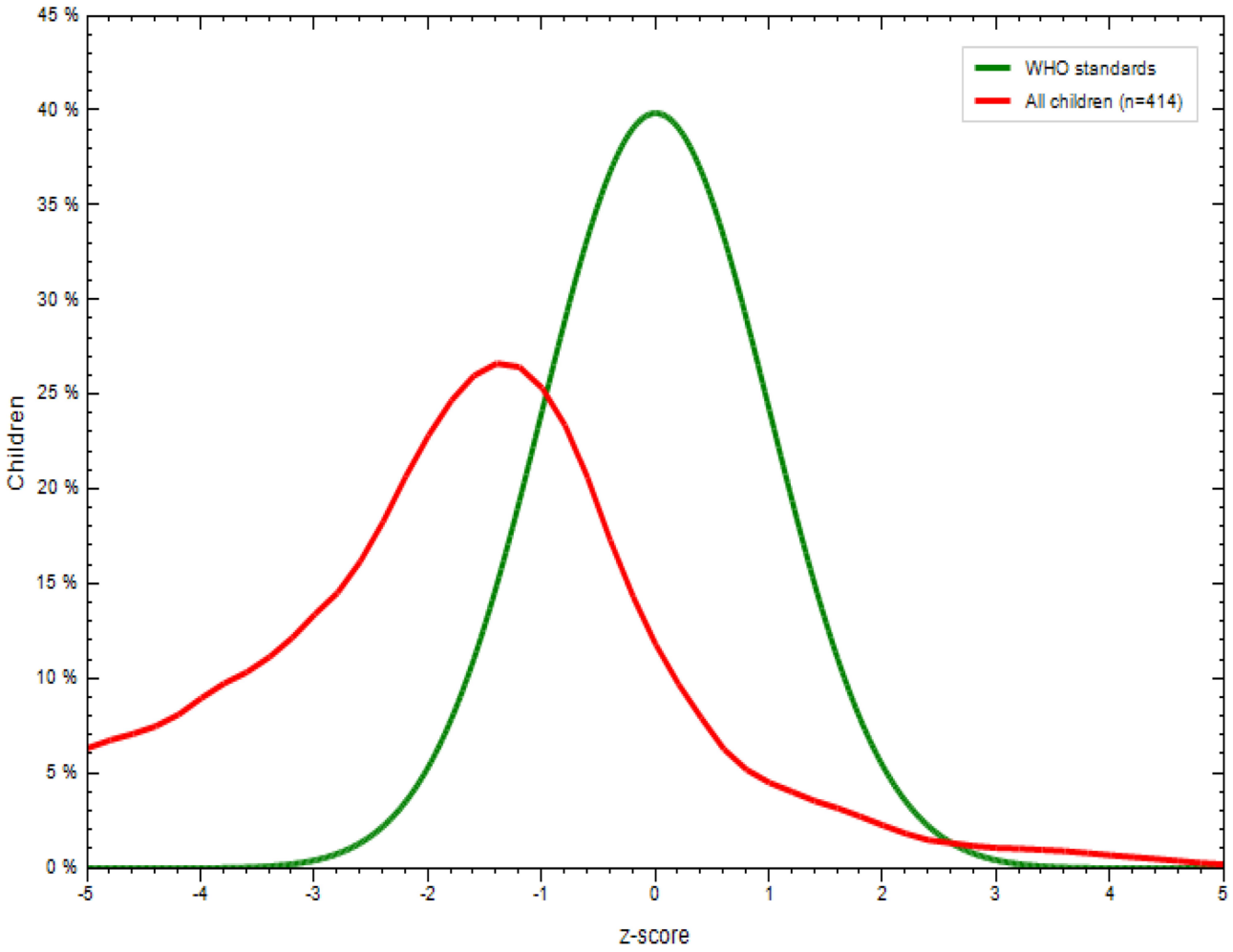

Figure 2 Height for age Z score distribution of children as compared to the standard reference population from 6–59 months of age in Angolela tera district, northeast Ethiopia, 2019.

sample size, period, health service delivery, and socioeconomic difference of each study area.

In the current study, male sex was found to be significantly associated with stunting. The present study supported by different studies in Ethiopia and elsewhere has reported that under-five male children are more likely to become stunted than their female counterparts.[26–29] Evidence supported that boys are more influenced by environmental stress than girls. Besides, epidemiological evidence showed that boys to be biologically more vulnerable to morbidity.[30] The prevalence of stunting in the younger age group was higher compared with older children peaking at the age groups of 12–23 months. The finding is consistent with a study conducted in the northern part of Ethiopia in which stunting was found to be peak (66.7%) at the age of 12–23 months.[15] This might be due to the rates of exclusive breastfeeding during the first 6 months are high in the study area is low, the gradual decreasing of stunting among children under-5 years might be due to the appropriate food supplementation during the weaning period when infants should undergo a transition from exclusive breastfeeding to including complementary foods in their diet.[31]

According to the present study maternal antenatal care follow-up is reduced the occurrence of stunting. Children whose mothers had no antenatal follow-up were more likely to be stunted than children whose mothers had four and above ANC visits. This finding was supported by different studies conducted in developing and developed countries.[32–35] Established antenatal care (ANC) programs, which typically identify high-risk mothers, and include nutritional and educational interventions such as information and advice on food hygiene, diet, and lifestyle advice, are designed to deal with factors that are most

Table 4 Bivariate and Multivariable Logistic Regression Analysis Factors Responsible for Stunting in Angolela Tera District, Northeast Ethiopia, 2019

Variables	Stunted	Non-Stunted	COR(95%CI)	AOR(95%CI)
Sex				
Male	99(60.7%)	113(45%)	1.88(1.12–2.47)	1.85(1.23–2.82)*
Female	64(39.3%)	138(55%)	1	1
Child age				
6–11 month	35(21.5%)	56(22.3%)	1.52(0.76–2.99)	1.64(0.82–3.29)
12–23 month	69(42.3%)	73(29.1%)	2.29(1.22–4.28)	2.16(1.22–4.28)*
24–35 month	28(17.2%)	36(14.3%)	1.88(0.91–3.89)	1.99(0.951–4.16)
36–47 month	12(7.4%)	40(15.9%)	0.726(0.31–1.67)	0.727(0.31–1.70)
48–59 month	19(11.7%)	46(18.3%)	1	1
Diarrhea within the last two week				
Yes	117(71.8%)	128(51%)	2.44(1.61–3.72)	1.86(1.19–2.91)*
No	46(28.2%)	123(49%)	1	1
ANC				
Yes	46(28.2%)	135(53.8%)	0.33(0.22–0.51)	0.31(0.21–0.45)*
No	117(71.8%)	116(46.2%)	1	1
Birth order				
First child	39(23.9%)	79(31.5%)	0.57(0.29–1.12)	0.59(0.29–1.19)
2–3 child	58(35.6%)	79(31.5%)	0.85(0.45–1.63)	0.87(0.44–1.70)
4–5 child	42(25.8%)	65(25.9%)	0.75(0.38–1.47)	0.73(0.36–1.47)
>6 and above	24(14.7%)	28(11.2%)	1	1
Birth interval				
First child	38(23.3%)	80(32.0%)	0.78(0.47–1.29)	0.786(0.469–1.319)
<24 month	65(39.9%)	72(28.7%)	1.49(0.93–2.36)	0.990(0.61–1.607)
≤24 month	60(36.8%)	99(39.6%)	1	1

Notes: N. B; 1=reference group. *Significant at p-value<0.05.

likely contribute to improving child nutrition status. Such programs are advocated as a way of alleviating the incidence of low birth weight, and evidence on the role they play in reducing the incidence of adverse pregnancy outcomes in developing counties is evolving.[36,37]

In the present study, those who had diarrheal morbidity in the last 2 weeks before the actual data collection period was significantly associated with stunting. Besides, diarrheal morbidity within 2 weeks was significantly associated with stunting. The findings of this study are consistent with the results of studies conducted in different developing countries.[28,38] In fact, evidence showed that the bidirectional relationship between diarrhea and malnutrition has been one of the most extensively investigated topics in medical research.[39] This might be due to diarrhea disease which is responsible for decreasing appetite, poor digestion, and malabsorption.[40] Also, recent evidence revealed that use the longitudinal history of diarrhea to model growth effects has reported that diarrhea may result in both transient growth deficits and in delayed and cumulative effects resulting in permanent growth deficits later in life.[41]

Conclusion

The current study revealed that the overall prevalence of stunting was relatively high among children aged 6 to 59 months. Child age from 12 to 23 months, male sex, diarrheal morbidity, and lack of ANC follow-up were significantly associated with stunting. Therefore, implementing context-based interventions and strategies by emphasizing on supporting housewives, treating diarrheal disease, and encouraging ANC follow-up, education on child feeding and nutrition should be strengthened.

Limitation of the Study

The present study had some limitations. First, participants might not tell us real information about their

socioeconomic status because of social desirability bias. Second, the cross-sectional nature of the data; therefore, causal conclusions were not possible. Third, there may be recall bias due to some research variables were assessed by asking the participant experience.

Abbreviations

ANC, Antenatal Care; AOR, Adjusted Odds Ratio; BF, Breast-Feeding; CI, Confidence Interval; COR, Crude odds ratio; EBF, Exclusive Breast Feeding; EDHS, Ethiopian Demographic and Health Survey; ENA, Emergency Nutritional Assessment; HAZ, Height for Age Z-Score; HEW, Health Extension Worker; IRB, Institutional Review Board; PNC, Postnatal Care; SD, Standard Deviation; SPSS, Statically Package for Social Science; UNICEF, United Nations Children's Fund; WHO, World Health Organization.

Data Sharing Statement

The data used to support the findings of this study are included in the article.

Ethical Approval and Consent to Participate

Ethical clearance was obtained from the ethical review committee of Health Science Debre Berhan University with institutional research ethics review committee number of (IRB protocol: DBU/CHS/MN/SG12/2019). Permission was obtained from Angolela tera district Health office administrators. All participants were informed about the purpose of the study before consenting to participate. Verbal consent was obtained from each participant before data collection. Verbal informed consent was approved by the Ethical Review Committee of the Health Science Debre Berhan University. A participant name was not included in the data collection format, and the data were not disclosed to any person other than principal investigators. This study was conducted in accordance with the Declaration of Helsinki.

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Author Contributions

LAM contributed to generating topics, writing proposals, data collection, analyses, development of the manuscript, processed publication YW, WSS, and YAA contributed to reviewing the proposal, assisted in data collection and analyses, and critically reviewed the manuscript. All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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