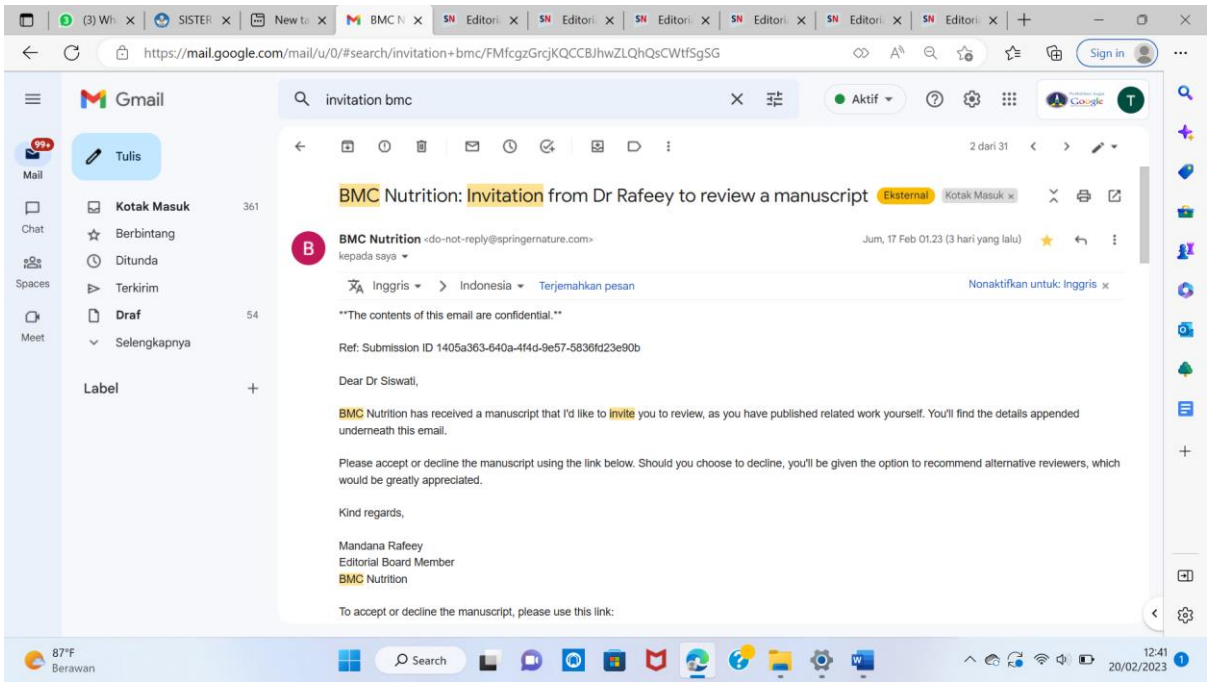
BMC_3_Prevalence of stunting and associated factors Zuria

A. Invitation



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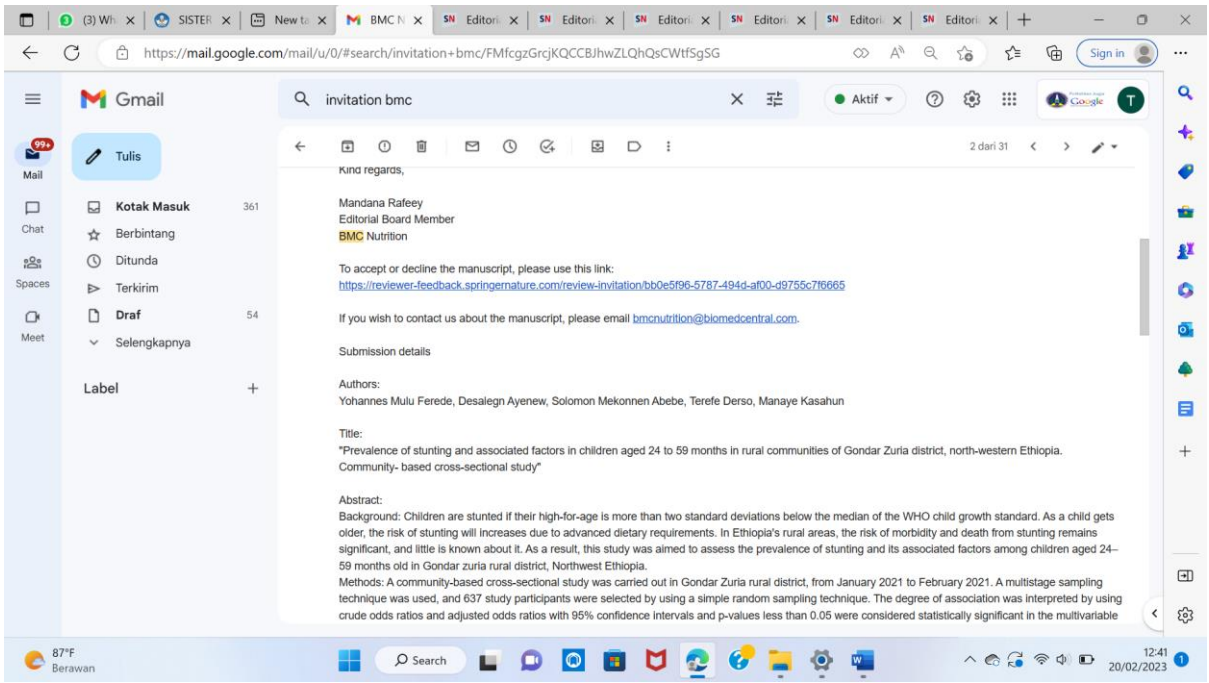

B. Kinerja

Prevalence of stunting and associated factors in children aged 24 to 59 months in rural communities of Gondar Zuria district, north-western Ethiopia. Community-based cross-sectional study

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Abstract

Background: Children are stunted if their high-for-age is more than two standard deviations below the median of the WHO child growth standard. As a child gets older, the risk of stunting will increases due to advanced dietary requirements. In Ethiopia's rural areas, the risk of morbidity and death from stunting remains significant, and little is known about it. As a result, this study was aimed to assess the prevalence of stunting and its associated factors among children aged 24–59 months old in Gondar zuria rural district, Northwest Ethiopia.

Methods: A community-based cross-sectional study was carried out in Gondar Zuria rural district, from January 2021 to February 2021. A multistage sampling technique was used, and 637 study participants were selected by using a simple random sampling technique. The degree of association was interpreted by using crude odds ratios and adjusted odds ratios with 95% confidence intervals and p-values less than 0.05 were considered statistically significant in the multivariable logistic regression analysis.

Results: A total of 637 children participated in the study, with a response rate of (96.4%). Nearly two-thirds, or 60.4% [95% CI: 56.6 – 64.9%] of children were stunted. Participants who had no gardening practice [AOR = 1.37; 95% CI: 1.23 – 1.94], a mother's birth interval > 24 months [AOR = 2.41; 95% CI: 1.31–5.89] and home delivery [AOR = 1.55; CI: 1.14 – 2.21] were significantly associated with stunting.

Conclusions and recommendations: In the Gondar rural district, the prevalence of stunting was much higher than the planned World Health Organization (WHO) target. As a result, enhanced home gardening techniques and raising awareness about the benefits of institutional delivery practices and birth intervals of more than two years should have been encouraged.

Keywords: stunting; birth interval; under-five, Gondar, Ethiopia

Background

Children are stunted if their high-for-age is more than two standard deviations below the median of the WHO child growth standard [1, 2]. Globally, 149.2 million (22%) children under five were stunted ~~(too short for their age)~~ [3]. In developing countries, more than 30% of under-five children were stunted, and of the total deaths of under-five children, around 45% of the deaths were linked to undernutrition [3, 4]. These are more common in middle- and low-income countries, such as Ethiopia [5, 6]. According to Ethiopia's 2019 Mini Demographic and Health Survey (EMDHS), (37%) of children under the age of five were stunted ~~(below -2 SD).~~ In addition, children in rural areas were more likely to be stunted (41%) than in urban ones, (26%) [7]. Likewise, as a child gets older, the risk of stunting will increase due to advanced dietary requirements, in spite of the fact that the risk of stunting was seven times higher among those aged 24–59 months old than among those under the age of 24 months old [8, 9].

Poor nutrition, especially in the first 1000 days of a child's life, causes stunted growth [10, 11]. It is mainly correlated with poor development during childhood and is one of the harmful effects of poverty [2]. Furthermore, fetal growth restriction (FGR) and poor sanitation are the leading causes of stunting in developing countries [12].

Stunted children are at risk of developing a variety of health problems; yet, the serious consequences of stunting are often hidden and have no obvious signs, and the victims themselves are silent and not aware of the problem [1, 10, 13]. Diabetes, hypertension, heart disease, cognitive impairment, poor school attendance, reduced productivity, and increased morbidity and death are only a few of the negative health implications [1, 14-19]. Low education, being a farmer, big family size, low household income, poor hygiene practices, late start of supplemental feeding, and undiversified food are all connected to child stunting [5, 6, 10, 11, 20-23].

Stunting prevention should begin early in life, with intervention among those who are at risk. To prevent all forms of child malnutrition, adequate maternal nutrition before, during, and after pregnancy and lactation; optimal breastfeeding in the first two years of life; nutritious, diverse, and safe foods in early childhood; and a healthy environment, including access to basic health, water, hygiene, and sanitation services, as well as opportunities for safe physical activity, are all essential requirements. However, UNICEF, WHO, and the World Bank estimate that the majority of children are still malnourished, and the joint estimate data May 2018 implies that progress toward the World Health Assembly's 2025 targets (reducing the number of stunted children to 104 million) and the 2030 Sustainable Development Goals is insufficient [3, 24]. Designing and executing methods to address unresolved child malnutrition and achieve sustainable development goals should be a top priority. As a result, Ethiopia is one of the countries struggling to combat malnutrition by establishing nutrition programs and initiatives such as the Food and Nutrition Program (FNP) and Infant and Young Child Feeding, which are aimed at improving the health and nutrition of children [25, 26].

Thus, in Ethiopia's rural areas, the risk of morbidity and death from stunting remains significant, and little is known about it [7]. Hence, assessment of child malnutrition will help to determine whether the world is on track to achieve sustainable development goals, particularly target 2.2 to end all forms of malnutrition by 2030 [24]. Furthermore, this study will aid policymakers and researchers in understanding their progress in reducing stunting in the community, with a particular focus on children living in rural areas. Therefore, this study was aimed to assess the prevalence of stunting and its associated factors among children aged 24–59 months old in rural communities of Gondar zuria districts, Northwest Ethiopia.

Methods and Materials

Study design, period, and setting

A community-based cross-sectional study was conducted from January 2021 to February 2021 in Gondar zuria rural district. The district of Gondar Zuria is located in the North Gondar zone and is part of the Amhara region. The district is located 690 km away from the capital city of Addis Ababa, Ethiopia, and around 170 km from the Amhara regional state. Based on the 2007 Statistical Agency of Ethiopia (CSA), the total population of Gondar zuria district was 258,569 (129,110 were females and 129,459 were males), of which 236,996 of the population were living in rural areas and 21,573 of the population were living in urban areas. About 8,681 (4,876 females and 3,805 males) children between the ages of 24–59 months old live in the rural area. A total of 42,753 households were found in this rural district. The district has seven health centers and thirty-five health posts. Agriculture is the main source of income for most of the population.

Source population and study population

All children aged 24–59 months old who lived in the rural area of Gondar zuria district for at least 6 months were the source population, and all children aged 24–59 months old who lived in the selected kebeles were the study population.

Inclusion and exclusion criteria

All children aged 24–59 months old who lived in the rural area of Gondar zuria district for at least 6 months were included in the study, and children who had spinal curvature deformities (e.g., scoliosis and kyphosis) were excluded from the study.

Sampling size determination and sampling procedure

The sample size was estimated using a single population proportion formula, assuming that 52.5% was the prevalence of stunting in Butajira, Ethiopia [27], with a 5% margin of error and

a 95% confidence level. A multi-stage sampling technique was used with a design effect of 1.5 and a 15% non-response rate added to give a final sample size of (n = 661). Of the total 38 rural kebeles, eight (20% of 38) kebeles were randomly selected by using the lottery method. The required sample size was selected by using a simple random sampling technique (an under-five registration book was used as a sampling frame, which was taken from the health post center). Likewise, when two or more children were found in a single household, in this case, participants were selected by using the lottery method.

Data collection tool and procedures

A face-to-face interview administered questionnaire was used to collect data from mothers/caregivers during a house-to-house visit. An Amharic version of the questionnaire and anthropometric measurement tools were used. The questioners had four parts, which were classified into socio-demographic characteristics, home garden practice and consumption of food, maternal and child health hygiene-related characteristics, and environmental and hygiene-related characteristics. Child height was measured using the Seca vertical height scale (German, Serial No.0123), standing upright in the middle of the board, and the child's head, shoulders, buttocks, knees, and heels touched the vertical board and read to the nearest 0.1 cm; similarly, the Seca beam balance was used to determine the child's weight to the nearest 0.1 kg (No. 5755086138219) [28, 29]. During weight measurement, clients were instructed to remove heavy clothing and shoes. Instrument calibration was done before weighting each child. Furthermore, the weighting scale was checked daily against the standard weight for accuracy. The child's dietary diversity score was calculated using 24-hour recall methods. As a result, mothers were asked to make a list of all the foods consumed by their children in the 24-hour period prior to the survey. The food products were divided into seven categories: starch staples (grains, roots, and tubers); legumes, nuts, and seeds; dairy products (milk, yogurt, and cheese); flesh foods (poultry, fish, meat and, organ meat); eggs;

vitamin-A-rich fruits and vegetables; other fruits and vegetables. DDs of less than four were categorized as "low dietary diversity" when four categories were considered the minimum acceptable dietary diversity of children's diets[30].

Data processing and analysis

The collected data was checked for completeness and consistency before being entered into EPI-info version 7, and it was exported into SPSS version 20 for analysis. Height, weight, and age were transferred to the WHO Anthro-Plus software version 1.0.4 using Stat/Transfer version 9 and the Z-scores of the indices, Height-for-Age Z-scores (HAZ), were calculated using the WHO Multicenter Growth Reference Standard. If the child's Z-score was < -2 Standard Deviation (SD), he or she was considered stunted; otherwise, if the Z-score was ≥ -2 SD, he or she was considered well-nourished. A child with a weight-for-height Z-score(WHZ) less than -2 SD from the reference population was classified as wasted [28].

The household wealth index was calculated using a composite indicator that took into account properties (household assets) and agricultural land size. The factor score was summed and ranked into poorest, poor, medium, rich, and richest using principal component analysis (PCA). Descriptive statistics were used to describe variables by using tables and graphs. Both bivariable and multivariable logistic regression model were used to see the association between the dependent and the independent variables. Variables with a p-value of < 0.2 in the bivariable logistic regression model were entered into the multivariable logistic regression model. In the multivariable logistic regression model, variables with a p-value of < 0.05 were considered as factors statistically associated with the outcome variable. Both the Crude Odds Ratio (COR) and the Adjusted Odds Ratio (AOR) with a corresponding 95% Confidence Interval (CI) were computed to show the strength of the association.

Data quality management

A pretest was conducted on 5% of the total sample size in the Western Dembia rural district before the actual data was collected. Eight data collectors (BSC nurses) and four field supervisors (MSC in public health) participated in the data collection process. One and a half-day of training was given for data collectors and supervisors by the principal investigator about the objective of the study, data collection instruments, data collection procedures, physical measurements, and ethical issues. The collected data were checked for completeness and errors were corrected by the principal investigator daily.

Results

Socio-demographic characteristics of participants in Gondar zuria rural district

A total of 637 child-mothers or caregivers were included in the study, with a response rate of (96.4%). A majority (88.5%) of mothers were married, and (83.5%) of them were unable to read and write. Based on the wealthy index, about (19.8%) of the participants were the poorest family members. (**Table 1**).

Table 1: Socio-demographic and economic characteristics of participants in Gondor zuria rural district, Northwest Ethiopia, 2021 (n=637).

Variables	Frequency (no.)	%
Sex of households head		
Male	520	81.6
Female	117	18.4
Family size		
<5	277	43.5
>=5	360	56.5
Age of mother at first birth		
<18years	192	30.1
18-30years	425	66.7
>40years	20	3.2
Religion		
Orthodox	620	97.3
Muslim	17	2.7

Educational status of mothers		
Unable to read and write	532	83.5
Able to read and write	37	5.8
Elementary	57	8.9
Secondary and above	11	1.8
Occupation of the caretaker/wife		
Governmental employee	183	28.7
Private employee	24	3.8
Farmer	201	31.6
Merchant	66	10.4
Housewife	88	13.8
Daily laborer	75	11.8
Marital status of mothers		
Married	564	88.5
Unmarried	73	11.5
Occupation of the father		
Governmental employee	93	14.6
Private employee	87	13.7
Farmer	306	48.0
Merchant	53	8.3
Daily laborer	98	15.4
Wealth index		
Poorest	126	19.8
Poor	129	20.3
Moderate	126	19.8
Rich	129	20.3
Richest	127	19.9
Birth interval in month		
<24	63	9.9
≥24	502	78.8
The first birth of a child	72	11.3

Food consumption and home garden practice of participants in Gondar zuria rural district

Half (51.3%) of the households practiced home gardening and consumed food from these agricultural products. The majority (80.7%) of study participants had grown maize crops in their home gardens. However, less than one-third of study participants had grown tomatoes (26%) and onions (28.1%) (**Fig 1**).

Figure 1: Food consumption and home garden practice of participants in Gondar zuria rural district, Northwest Ethiopia 2020

Maternal and child health hygiene-related characteristics of participants in Gondar zuria rural district

Around half of the children (53.1%) began supplemental feeding at the age of six months. Four meals per day were consumed by (47.1%) of the total participants. Almost (87.3%) of the mothers had antenatal care follow-up, and around half (58.1%) of the mothers gave birth at home. Within one hour, almost (69.7%) of children started breast feeding. (**Table 2**).

Table 2: Maternal and child health-related characteristics of participants in Gondar zuria rural district, Northwest Ethiopia 2021(n=637).

Variables	Frequency (no.)	%
Sex of child		
Female	353	55.4
Male	284	44.6
Age of children in months		
24-35	225	35.3
36-47	251	39.4
48-59	161	25.3
Duration of breastfeeding		
<24	32	5

≥24	605	95
Initiation of breast milk after birth		
Within one hour	444	69.7
After one hour	193	30.3
Pre-lacteal-feeding		
Yes	23	3.6
No	614	96.4
Meal frequency of children per day		
3 times	61	9.6
4 times	300	47.1
>4 times	276	43.3
Antenatal care(ANC)		
Yes	556	87.3
No	81	12.7
Complimentary food initiation		
Early	9	1.4
Timely(at 6 months)	338	53.1
Lately	290	45.5
Equipment used to feed children		
Hand	234	36.7
Cup and spoon	376	59.1
Bottle	27	4.2
Types of additional food /complementary feeding/		
Cow milk	159	25
Food prepared for adults (e.g injera)	162	25.4
Oatmeal/soup/	316	49.6
Dietary diversity score		
<4 food groups	352	55.3
≥4 food groups	285	44.7
Number of antenatal visits		
< four	259	40.7
≥ Four	297	46.6
Place of birth		
Institutional delivery	267	41.9
Home	370	58.1
Fully vaccinated children		
Yes	632	99.2
No	5	0.8
Child vaccination card		
Yes	351	55.1
No	286	44.9
Vitamin A supplementation of child		
Yes	314	49.3
No	323	50.7
Infection of Measles 3 weeks before the survey		
Yes	19	3.0
No	618	97.0
Fever in the last 2 weeks of child		
Yes	93	14.6

No	544	85.4
Coughing in the last 2 weeks		
Yes	93	14.6
No	544	85.4
Dewormed in the last six months		
Yes	259	40.7
No	378	59.3
Diarrhea in the last 2 weeks		
Yes	71	11
No	566	89

Environmental and hygiene-related characteristics of participants in Gondar zuria rural district

The majority (78.2%) of study participants were drinking protected water, and (85.9%) of the participants treated their water before using it. Half (48.4%) of the households lacked toilet facilities **(Table 3).**

Table 3: Environmental and hygiene-related characteristics of study participants in Gondar zuria rural district, North West Ethiopia, 2021 (n=637).

Variables	**Frequency**	**%**
Source of water for drinking only		
Protected[#]	498	78.2
Unprotected[##]	139	21.8
Use of water treatment		
Yes	547	85.9
No	90	14.1
Hand wash after toilet with soap		
No	388	60.9
Yes	249	39.1
Hand wash before child feed		
Yes	481	75.5
No	156	24.5
Latrine available		
Yes	329	51.6
No	308	48.4
Disposal of child feces		
Latrine	219	34.4
Open defecation	418	65.6
Water used per day in a liter		
>25	55	8.6

≤25	582	91.4
Method of water storage		
Clay pot	18	2.8
Plastic pot	619	97.2

Notes: superscripts [#] Pipe, protected well and protected spring water, [##]Unprotected well, spring and surface water

Prevalence of stunting among children aged 24-59 months old in Gondar zuria rural district

The prevalence of stunting among children aged 24–59 months was 60.4% [95% CI: 56.6–64.9%]. The prevalence of wasting was found to be 5.3% [95% CI: 3.6–7.1%].

Factors associated with stunting among children aged 24-59 months old in Gondar zuria rural district

Bivariable and multivariable logistic regression analyses were used to check the association between stunting and its independent variables. The result of multivariable logistic regression analysis revealed that home garden practice, birth interval, and place of delivery were significantly associated with stunting. The odds of stunting were 1.37 times higher among participants who had no home gardening practice than among participants who had home gardening practice [AOR = 1.37; 95% CI: 1.23 – 1.94]. Mothers with a birth interval of fewer than 24 months were 2.41 times more likely to increase the risk of stunting than mothers with their first birth [AOR = 2.41; 95% CI: 1.31 – 5.89], and the odds of stunting were 1.55 times higher among home delivery mothers than institutional delivery mothers [AOR=1.55; CI: 1.14 – 2.21] (**Table 4**).

Table 4: Factors associated with stunting among children aged 24-59 old in Gondar zuria rural district, Northwest Ethiopia, 2021 (n=637).

Variable	Stunting		COR[95% CI]	AOR [95% CI]
	Yes	No		
The practice of home gardening				
Yes	185	142	1	1

No	200	110	1.39(1.50,1.92)	1.37(1.23,1.94)*
Sex of child				
Female	206	147	0.82(0.59,1.13)	0.75(0.53,1.06)
Male	179	105	1	1
Latrine available				
No	187	121	1.02(0.74,1.41)	1.34(0.95,1.92)
Yes	198	131	1	1
Birth interval in months				
≥24	286	216	0.79(0.48,1.32)	0.83(0.49,1.43)
<24	54	9	3.6(1.54,8.44)	2.41(1.31, 5.89) *
First child	45	27	1	1
Hand wash after toilet with soap				
Yes	136	113	1	1
No	249	139	1.49(0.94,2.06)	1.68(0.89,2.38)
Place of child delivery				
Home	239	131	1.51(1.09,2.09)	1.55(1.14, 2.21)*
Institutional	146	121	1	1

Notes: superscript* indicates p-value < 0.05

Abbreviation: AOR: adjusted odds ratio, COR: crud odds ratio.

Discussion

The overall prevalence of stunting among children aged 24–59 months old was 60.4 % [95% CI: 56.6–64.9%]. This finding was consistent with the study done in the Dabat district, Northwest Ethiopia (64.5%)[20]. Furthermore, the finding was higher than the study done in Sierra Leone (31.6%) [31]. The possible rationale is that in Ethiopia, poor child feeding practices and access to health care are still major issues in rural regions, resulting in children's linear development being stunted [32].

In this study, the odds of stunting were 1.37 times higher among participants who had no home gardening practice than among their counterparts. This is supported by the study done in Mumbai, India [33]. This might be due to the production of targeted nutrition-rich crops, homestead gardens, and diversification of agricultural production systems towards fruits and vegetables, as well as aquaculture, which can potentially improve nutrient intake and nutritious outcomes. Gardening also provides a variety of fresh foods, which improves the

quality and amount of nutrients available to the family, reducing children's nutritional insufficiency [34].

Likewise, mothers who had a birth interval of fewer than 24 months were 2.41 times more likely to increase the risk of stunting than mothers who had their first birth. These findings were supported by a study done in India [35]. This might be because short birth intervals cause issues with sharing among living siblings since mothers are unable to provide better care for their children while also compromising the duration of breastfeeding for the index kid. This may raise the risk of stunting [36].

Accordingly, children born at home were 1.55 times more likely to be stunted as compared with children born at health facilities. This is supported by the previous study done in Ethiopia; around three-fourths (73%) of mothers gave birth at home [19]. This could be because dietary advice/guidance is frequently offered quickly after delivery in a health institution, allowing mothers to better care for their children and prevent malnutrition and other health problems [37].

Conclusions and recommendations

In the Gondar-Zuria rural district, the prevalence of stunting was much higher than the planned WHO target. As a result, enhanced home gardening techniques and raising awareness about the benefits of institutional delivery practices and birth intervals of more than two years should have been encouraged.

Limitations of the study

This study attempted to address the issue of stunting, which is a major public health concern. However, the cross-sectional nature of this study did not show the causal relationship between the response and explanatory variables.

Lists of abbreviations

AOR: Adjusted Odds Ratio; ANC: Antenatal Care; COR: Crude Odds Ratio; CI: Confidence Interval; PNC: Postnatal Care; SPSS: Statistical Package for Social Science; WHO: World Health Organization.

Declarations

Ethics approval and consent to participate

All methods were carried out in accordance with relevant guidelines and regulations. Ethical clearance was obtained from the Institutional Review Board (IRB) of the University of Gondar, College of Medicine and Health Science, Institute of Public Health. A supportive letter was obtained from the leader of the Gondar Zuria rural district. The study did not involve any invasive procedures. As a result, the study posed a low, or no more than a minor, risk to the participants. Each study participant was informed about the purpose, methods, and expected benefit of the study. They were also informed about their full right to not participate in or withdraw from the study at any time. The confidentiality of their information was maintained by using a code (ID number) rather than personal identification. Written informed consent was obtained from each study participant. In addition, written informed consent was obtained from parents/guardians for inclusion of minors participants in the study.

Consent for publication

Not applicable

Availability of data and materials

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

Competing interest

Authors declare that they have no conflict of interest

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No fund available

Authors' Contributions

DA; wrote the proposal, participated in data collection, analyzed the data, and drafted the manuscript. SMA, TD, MK, and YMF; participated in data collection, validating the data, conceptualization, methodology, and data analysis. All authors have approved the final draft of the manuscript for submission.

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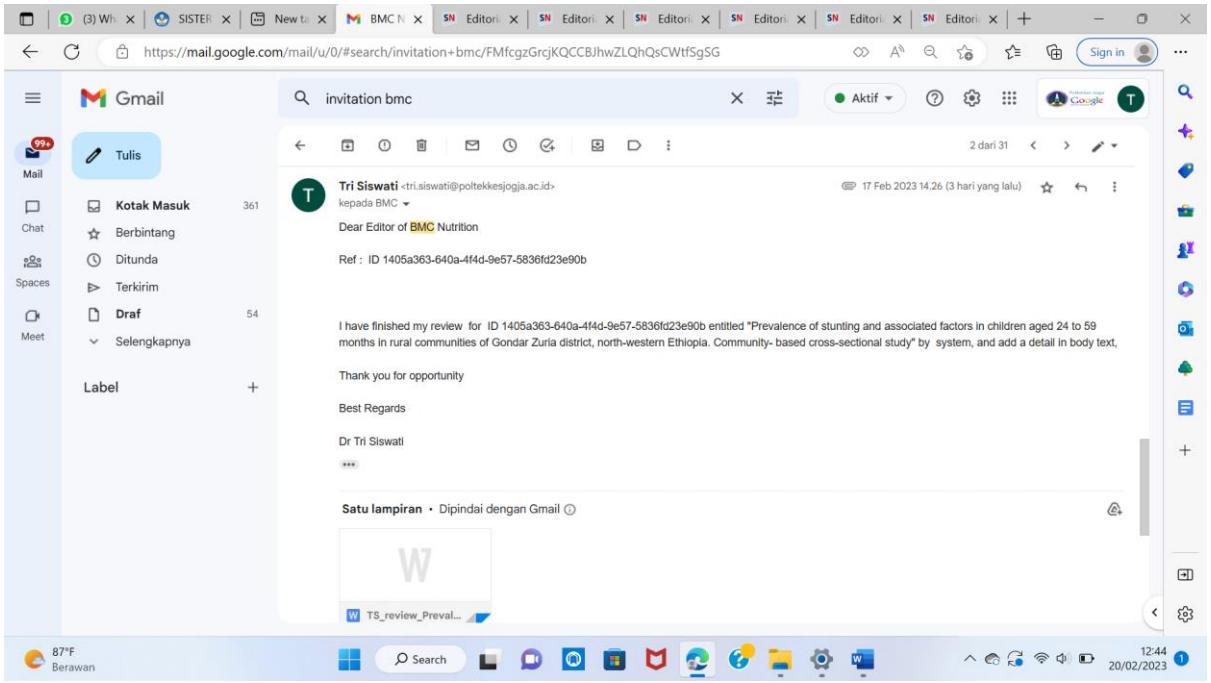
C. Laporan hasil review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Dear Editor of BMC Nutrition
Ref : ID 1405a363-640a-4f4d-9e57-5836fd23e90b
I have finished my review for ID 1405a363-640a-4f4d-9e57-5836fd23e90b entitled "Prevalence of stunting and associated factors in children aged 24 to 59 months in rural communities of Gondar Zuria district, north-western Ethiopia. Community- based cross-sectional study" by system, and add a detail in body text,
Thank you for opportunity
Best Regards
Dr Tri Siswati
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