Stunting and associated factors among under-five children in Wukro town, Tigray region, Ethiopia: a cross sectional study

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Abstract
Objective: The objective of the study was to assess the prevalence of stunting and associated factors among under-five children of Wukro town, Tigray, Ethiopia, 2017–2018.
Result: Totally 394 under-five children were participated in this study with a response rate of 98.5%. A total of 222 (56.3%) of respondents were females and 106 (26.95%) were in the age group of 12–23 month. One hundred ninety-eight (50.3%) of the participants were between 2 and 3 in birth order and 194 (49.2%) had 4 to 5 house hold size. The overall prevalence of stunting was 194 (49.2%). Being female and presence of washing facilities nearby latrine were significantly associated with stunting. Under-five female children were 35.4% lower odds of stunting compared to male children (p = .041, OR = .644, and 95% CI (.422, .983)).
Keywords: Stunting, Factors, Wukro, Tigray region, Ethiopia

Introduction
Under-nutrition causes 175 deaths per 1000 children in low-income compared to high-income countries. Malnutrition affects all individuals, but young children are the most vulnerable because of their high nutritional requirements for growth and development [1, 2]. Globally in 2011, 165 million children were stunted and these burdens were not distributed evenly worldwide [3]. Children who suffered from chronic malnutrition were more likely to achieve lower educational levels than healthy children [4]. Numbers of children stunted were declined from 255 million in 1999 to 159 million in 2014 [5].

Stunting and other forms of under nutrition are clearly a major contributing factor to child mortality, disease, and disability. A severely stunted child faces four times higher risk of dying, poor school achievement and poor school performance [3]. In Ethiopia, 40% and 19% of under-five children were moderately and severely stunted respectively [6]. Similarly 16% of repetitions in school were because of chronic malnutrition and Ethiopia costs 55.5 billion-ETB for under nutrition prevention and management which accounts for 16.5% of the country’s GDP. The country had an estimated 378,591 child mortality related with under nutrition, from 2004 to 2009 [4]. Therefore the aim of this study was to assess the prevalence of stunting and associated factors among under-five children of Wukro town, Tigray region, Ethiopia.

Main text
Methods

Study design, period and participants
A community-based cross-sectional study design was conducted among under-five children from December 2017 to January 2018.

Sample size and sampling procedure
A single population proportion formula was employed to estimate the sample size with a consideration of
p = 45.7% stunting (Ethiopian EDHS 2014)
Z = standard normal distribution curve value for the
95% confidence interval (1.96)
d = the margin of error or accepted error = 5% (.05)

5% non-response and the final sample size for this
study were 400 participants.

Wukro town has three kebeles, out of this kebele 01 and
03 were included in the study randomly through the lot-
tery method. Proportional allocation of subjects to each
kebele was employed based on the number of under-five
children and finally the study participants were selected
through a systematic method based on the arrangement
of houses. For households with more than one child, one
child was selected randomly.

**Data collection instruments and procedure**

A structured questionnaire was developed by the prin-
cipal investigator after reviewing different related lit-
eratures with required modification based on outcome
variables and their predictors. The questionnaire was
prepared first in English then translated to the local language
(Tigrigna). To check the consistency of the translation;
retranslation to English was done by another translator.
The questionnaire includes socio-demographic charac-
teristics of care giver/family and child, child health con-
dition, maternal health care, environmental health and
anthropometric measurements.
The questionnaire was pre-tested on 5% of the same
source population other than sampled population. Based
on the pre-test, questions were revised, and edited.
Finally, Tigrigna version questionnaire was used for data
collection.

**Variables**

Dependent variable: under-five stunting.
Independent variable: socio-demographic variables,
child caring practices, maternal characteristics and envi-
ronmental Health condition.

**Definition of terms**

Stunting: Height-for-age below −2 SD of median of the
standard curve and severe stunting below −3 SD [7].

Height/length measurement: Body length of children
up to 23 months age was measured without shoes and the
heights were read to the nearest 0.1 cm by using a hori-
zontal wooden length board with movable headpiece and
the infant in a recumbent position. However, the height
of children 24 months and above was measured using a
vertical wooden height board by placing the child on
the measuring board, and child standing upright in the
middle of board. The child's head, shoulders, buttocks,
knees and heels touching the board.

**Data processing and analysis**

Anthropometric result was entered into ENA to calcu-
late Z-score. The collected data and result of Z-score
were entered into SPSS version 20.0. Multi-collinearity
was assessed through VIF and was found satisfied. Vari-
able with a p-value less than .25 on bi-variate analysis
were entered into the multivariable analysis. On multi-
variant logistic regression analysis adjusted odds ratio
with its 95% confidence interval was used to ascertain
the association between dependent and independent
variables. The level of significance was taken at α < .05.

**Results**

**Socio-demographic characteristics**

Totally 394 under-five children with a response rate of
98.5% were participated in the study. Out of this 222
(56.3%) of participants were under-five female children.
Orthodox christianity was the dominant religion con-
sisting of 341 (86.5%) and 360 (91.4%) of the head of
households were father. Almost all children were deliv-
ered at health facilities and cared by their mother but
104 (26.4%) decided on the use of money by mother
and father jointly (Additional file 1: Table S1).
The main reason to stop taking breast feeding of
under-five children was 167 (78%) because of age, and
392 (99.5%) of children was immunized according to
their age. Among the children, 89 (22.6%) were experi-
enced diarrhea in the last 2 weeks (Table 1).
Seventy-six (19.3%) of mothers gave their first birth
before 18 years, in addition 283 (71.8%) and 368 (93.4%)
of mothers were taken extra food during pregnancy and
lactation respectively. A total of 388 (98.5%) of mothers
had ANC follow up and 303 (76.9%) used FP but Depo-
Provera were used by 230 (75.9%) mothers.
In all of the households, the sources of drinking water
were tap water, and all households had nearby water
source and latrine (Table 2).

**Prevalence of under-five stunting**

In this study the overall prevalence of stunting was 194
(49.2%).

**Factors associated with under-five stunting**

Before multivariate analysis, multi-collinearity diagno-
sis was assessed and was not found. On multivariate
analysis sex of the child and presence of washing facili-
ties nearby latrine were significantly associated with
stunting (Table 3).
Prevalence of under-five stunting was high in Wukro town. The study noted that sex of the child, absence of diarrhea in the last 2 weeks, and presence of washing facilities nearby latrine were significantly associated with under-five stunting. There is high prevalence of under-five stunting which could possibly alarm the government on children's failure to grow physically and mentally that result in poor productivity and school performance during adolescent and adulthood time.

According to this study 376 (95.4%) of under-five children were initiated breast feeding within 1 h of delivery, which is comparably higher than study done in Oromia Region [8]. The difference might be due to dissemination of information on the advantage of early initiation breast feeding through Medias and health care workers and the possible reason for this is due time difference.

The result of this study indicated that 96 (24.3%) and 98 (24.9%) of under-five children were stunted and severely stunted respectively. This is consistent with the study conducted in Shire Endassilasie, Tigray [9] but comparatively lower than miniEDHS, 2014, [6]. The discrepancy might be due to small sample size compared to that of national data of mini EDHS, 2014.

According to this study female under-five children were lower odds (35.4%) of stunting compared to male. This is consistent with the study conducted in Somali region [10]. Most of the studies in Ethiopia indicated that male children are more stunted than their counterparts. The prevalence of stunting in the study area was 49.2% which was almost comparable with studies conducted in Amhara region (51.1%) [11], Sidama zone (50.3%) [12], and Oromia Regional State (47.6%), [8] but relatively higher than the national figure (38%) [13], and other parts of the country, like 26.6% in southern region [14] and 24.9% in Northwest Ethiopia [15]. However, it was lower than the finding from Southeast Amhara region (60.6%) [16].

### Discussion

### Table 1 Health care practice and morbidity of under-five children in Wukro town, Tigray, North Ethiopia, 2017–2018 (N = 394)

| Variable                              | Frequency | Percent (%) |
|---------------------------------------|-----------|-------------|
| Child ever taken to health facility   | Yes       | 144 36.5%   |
|                                       | No        | 250 63.5%   |
| Diarrhea in the last 2 week           | Yes       | 89 22.6%    |
|                                       | No        | 305 77.4%   |
| ARI in the last 2 week                | Yes       | 55 14.0%    |
|                                       | No        | 339 86.0%   |
| Fever in the last 2 week              | Yes       | 29 7.4%     |
|                                       | No        | 365 92.6%   |
| Measles in the last 2 week            | Yes       | 8 2.0%      |
|                                       | No        | 386 98.0%   |
| Time of initiation of Breast feeding  | Within one  hour | 376 95.4% |
|                                       | 1-24 hour | 17 4.3%     |
|                                       | After 24 hour | 1 0.3%  |
| Child still taking breast feeding     | Yes       | 181 45.9%   |
|                                       | No        | 213 54.1%   |
| Duration of breast feeding            | <24 month | 108 50.7%   |
|                                       | >=24 month | 105 49.3%  |
| Initiation of complementary feeding   | Before six month | 8 2.0%   |
|                                       | At 6 month | 334 84.8%  |
|                                       | >6 month   | 19 4.8%     |
|                                       | Not introduced still now | 33 8.4% |
| Materials used for complementary feeding | Cup | 148 41.0% |
|                                       | Bottle    | 69 19.1%    |
|                                       | Spoon     | 143 39.6%   |
|                                       | Hand      | 1 0.3%      |
| Vitamin A received in the last 6 month | Yes | 310 78.7% |
|                                       | No        | 84 21.3%    |
| Preceding birth interval of baby      | <=1 year  | 390 99.0%   |
|                                       | 1-2 year  | 4 1.0%      |
| Number of under five children         | 1         | 317 80.5%   |
|                                       | >=2        | 77 19.5%    |

### Table 2 Hygienic condition of household of under-five children in Wukro town, Tigray, North Ethiopia, 2017–2018, (N = 394)

| Variable                              | Frequency | Percent (%) |
|---------------------------------------|-----------|-------------|
| Type of latrine                       | Private pit/wooden slab | 115 29.2% |
|                                       | Private pit/cement slab | 279 70.8% |
| Presence of washing facilities nearby latrine | Yes | 258 65.5% |
|                                       | No        | 136 34.5%   |
| Use of soap for hand washing after toileting | Yes | 313 79.4% |
|                                       | No        | 81 20.6%    |
| Type of waste disposal method         | Open field | 1 0.3%   |
|                                       | Common pit | 393 99.7% |
| Care giver wash hand before preparing food | Yes | 392 99.5% |
|                                       | No        | 2 0.5%      |
| Floor of the house                    | Earth floor | 59 15%    |
|                                       | Ceramics floor | 335 85.0% |

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### Conclusion and recommendations

Based on the finding of this research significant numbers of mothers were not taken extra food during pregnancy and

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lactation. There was high prevalence of stunting of under-five children. Being male, and presence of washing facilities nearby latrine were associated with increased risk of stunting. Therefore, special emphasis should also be provided feeding of pregnant and lactating mothers and provision of washing facilities nearby latrine to each household is required. Further research on impact of malnutrition should be recommended.

Limitation of the study

- The nature of study design could not show seasonal variation and temporal relationship of cause and effect of cause and outcome.
- There is potential recall bias among respondents answering questions relating to events happening in the past like as history of diarrhea.

Additional file

Additional file 1: Table S1. Socio-demographic characteristics of households of under five children in Wukro town, eastern zone, Tigray regional state, North Ethiopia, 2017–2018.
Funding
Adigrat University (AGU/CMHS/034/09): the funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Availability of data and materials
The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.

Ethics approval and consent to participate
Ethical clearance and approval was obtained from Adigrat University, college of medicine and health science ethical review board. The committee’s reference number was AGU/CMHS/034/09. Official cooperation letter was written from Tigray regional health bureau to Wukro town administration health office. Official letter was obtained from Wukro town health office to each selected kebele. After explaining about the purpose, and the possible benefit of the study; written permission was obtained from each respondents. Parents/care giver of the child gave their written consent for the study. The major participants of the study were care giver/mother of under-five children.

Consent for publication
Not applicable for this section.

Competing interests
The authors declare that they have no competing interests.

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