Research Article

Prevalence of Undernutrition and Its Associated Factors among Children below Five Years of Age in Bure Town, West Gojjam Zone, Amhara National Regional State, Northwest Ethiopia

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Background. Malnutrition is the major public health problem over the world. Developing countries are highly affected. Asian and Sub-Saharan African countries, including Ethiopia, contribute the highest of all. The main aim of this study was to assess the prevalence of undernutrition and its associated factors among children below five years of age. *Methods*. Community-based cross-sectional survey was conducted on 342 study participants. Simple random sampling technique was used to select sampling kebeles and study units. Weight and height were measured using calibrated instruments. The data were entered into EpiData version 3.1 software and calculated using SPSS version 20.0 statistical software and/or World Health Organization Anthro software with aid of Stat/Transfer. *Results*. Overall prevalence of undernutrition was 35.5%, of which 85 (24.9%), 38 (11.1%), and 49 (14.3%) were stunting, wasting, and underweight, respectively. Male children were more affected in both severe and moderate nutritional

1. Background

Malnutrition is one of the major public health problems all over the world. Currently, it faces and associated with more than 41% of the deaths that occur annually in children from 6 to 24 months of age in developing countries, which were approximately 2.3 million [1].

Worldwide, 165 million children below five years of age were affected with undernutrition, of which 26% were stunted. This figure reduced by 35% from 253 million in 1990. The prevalence of stunting was 36% in Africa and 27% in Asia. These remain a public health problem, one that often goes unrecognized. More than 90% of stunted children in the world have been living in Africa and Asia. An estimated 80% of world's stunted children lived in just fourteen countries (India, Nigeria, China, Pakistan, Indonesia, Bangladesh, Ethiopia, Democratic Republic of Congo, Philippines, United Republic of Tanzania, Egypt, Kenya, Uganda, and Sudan). Sub-Saharan Africa and South Asia were the home to three-fourths of the world's stunted children, 40% and 39%, respectively [2–4].

Globally, an estimated 101 million children below five years of age were underweight. These accounted for 16% of children below five years of age. The prevalence was the

highest, which was 33%, followed by Sub-Saharan Africa, which was 21%. These were 59 million in South Asia, while 30 million were in sub-Saharan Africa [4]. Globally, the prevalence has declined, from 25% in 1990 to 16% in 2013; these reduced by 37% [3].

The other predictor of undernutrition is wasting. Globally, 52 million children below five years of age were moderately or severely wasted, 11% decrease from 58 million in 1990. More than 29 million children below five years of age, an estimated 5%, suffered from severe wasting [4].

Wasting was decreased by 36% from 1990, which was 159 million, while 51 million children below five years of age were wasted, and 17 million were severely wasted in 2013. The prevalence in 2013 was 8% and closely a third of that was for severe wasting, totaling 3% and approximately two-thirds of all wasted children who lived in Asia and one-third in Africa [3]. The prevalence of wasting was the highest in South Asia, which was approximately 16%. This moderate or severe wasting was the highest in India, which had more than 25 million wasted children [3].

About one-third of deaths among children below five years of age were attributed to undernutrition and it can lead children to be at greater risk of death and severe illness due to common childhood infections, such as pneumonia, diarrhea, malaria, human immunodeficiency virus, or AIDS and measles [3]. World Health Organization (WHO) in 2001 reported that 54% of all childhood mortality was attributable, directly or indirectly, to malnutrition [5].

It is not only an important cause of mortality and morbidity but also leads to physical and mental impairment in children. Health and physical consequences of prolonged states of malnourishment among children were delay in their physical growth, lower intellectual quotient, poor cognitive ability, decreased economic productivity, decreased reproductive performance, poor school achievement and poor school performance, greater behavioral problems and deficient social skills, and susceptibility to contracting diseases [6–14].

In Ethiopia, the levels of undernutrition were not decreased significantly. The 2011 EDHS report showed that stunting was 58% in 2000, 51% in 2005, and 44% in 2011. This report also showed that wasting was 12% from 2000 to 2005 and 10% in 2011. The third predictor is underweight, which was 41% in 2000, 33% in 2005, and 29% in 2011 [15]. The national trend showed that stunting and underweight prevalence continued to decrease but at a slow pace. The above trend showed that prevalence of wasting was not declined for three consecutive surveys. Therefore, the main aim of this study was to assess the prevalence of undernutrition and its associated factors among children below five years of age in Bure town.

2. Methods

2.1. Setting. This study was conducted in Bure town, which is found at 411 km far from the capital of Ethiopia, Addis Ababa, and about 148 km from the capital of Amhara regional state, Bahir Dar. Geographically, it is found that, 700–2750 meters above sea level, average rainfall is 1750 mL and the temperature variation ranges from 17 to 27 degree centigrade. The town has eight Kebeles and total population of 52,164, out of which 25,169 were males and 26,995 were females.

2.2. Design. A community-based cross-sectional study design was conducted from April 24 to May 12, 2015.

2.3. Population. All children below five years of age in the town were the source population and those children below five years of age who lived in selected kebeles were the study population. All houses selected by lottery method were sampled houses and children below five years of age who lived in these houses were the study unit.

2.4. Sample Size and Sampling Techniques. To determine the sample size, single population proportion formula was used. The sample size of the study was determined into the consideration of 95% confidence interval, 5% margin of error, and 28.2% prevalence of undernutrition from previous study in Gumbrit [16]. After including 10% nonresponse rates, 342 individuals were included in the study. From all kebeles of Bure, two of them were selected using simple random sampling technique. Households and study units were also selected using simple random sampling method. All children below five years of age were included in the study.

2.5. Variables. Sociodemographic characteristics (family income, maternal education, paternal education, maternal occupation, paternal occupation, religion, family size, and maternal age) and child characteristics (child sex, child age, low birth weight, and gestational age) were independent variables. Stunting, wasting, and underweight were the dependent variables.

2.6. Data Collection Tool. Data were collected using a structured questionnaire. The questionnaire was prepared in English language, and then it was translated into a local language, Amharic, by language experts. Comparison was made on the consistency of the two versions.

2.7. Measurements. Anthropometric measurements (weight and height) were done according to WHO standard manual [17]. A portable stadiometer was used to measure older children (above two years) and calibrated length board was used for younger children (less than two years). Older children were measured at standing position, while younger children less than two years were measured at lie down position. The child was measured without shoes, hats, and hair ornaments. During measurement their head, shoulders, buttocks, and heels were attached with the vertical surface of the stadiometer. The height measurement was recorded to the nearest 0.1 cm.

Weight was measured using infant and toddler weighting scales. The scale was zeroed for each measurement. Each child was measured with bare foot and light clothing. Infants were measured in supine position and older children were measured in sitting position. Weight was recorded immediately after measurement to the nearest 0.1 kg. Underweight,

wasting, and stunting were computed using weight and height measurement.

3. Standard Definition

Underweight is weight for age, stunting is height for age, and wasting is weight for height, which are <−2 SD of the WHO Growth Standard chart [18].

3.1. Data Quality Control. Pretest was done out of sampling kebeles. Necessary information and correction were made on the clarity of language and workability of the questionnaire. The questionnaire was modified based on the pretest findings. Training was provided for data collectors and supervisors on the purpose of the study, procedure, and techniques of interview. Training was provided for data collectors on how to position and measure the child and calibrate the instruments. Investigators made close monitoring and supportive supervision throughout the data collection period.

3.2. Analysis. Data were entered into EpiData version 3.1 and transferred into SPSS version 20.0 software for further analysis. Thereafter, the data were imported to WHO Anthro software with the aid of Stat/Transfer software to compute individual level nutritional survey. Data were checked for its' completeness and consistency. Data were analyzed using binary logistic regression analysis. Statistical associations were checked by 95% CI and odds ratio. Those variables which had p value less than 0.2 in binary logistical regression analysis were eligible for multiple logistic regressions. Finally, adjusted odds ratio was checked and the significant variables were considered as associated factors for undernutrition. The data were presented using tables, graphs, and text.

3.3. Ethics. Ethical approval was obtained from Debre Markos University Medicine and Health Science College's ethical review committee. Verbal consent was obtained from each parent. We assured that the information obtained from them was maintained.

4. Results

4.1. Sociodemographic Characteristics. Three hundred forty-two study participants were included in the study. The response rate was 100%. Among all participants, 174 (50.9%) and 168 (49.1%) were females and males, respectively. The mean age of the children and mothers was 28.94 ± 16.418 months and 28.48 ± 6.2 years, respectively. Most, 319 (93.3%) of the caretakers and/or mothers, were orthodox Christians.

Of the total parents, 107 (31.3%) and 37 (10.7%) could not read and write, respectively. Majority, 205 (59.9%) of mothers, were housewives. Out of 342 participants, 143 (41.8%) had monthly income of less than 750 birr (Table 1).

4.2. Undernutrition. The overall prevalence of undernutrition among children below five years of age was 35.5%, of

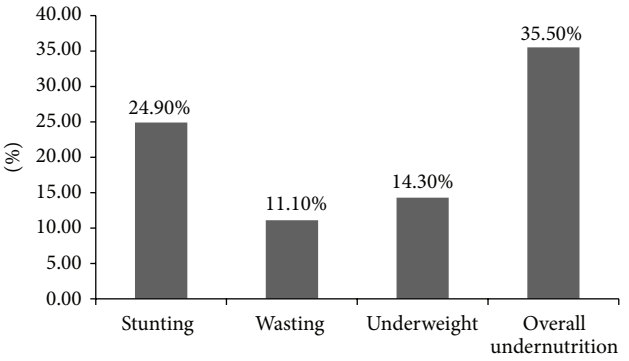

Figure 1: Magnitude of undernutrition among children below five years of age.

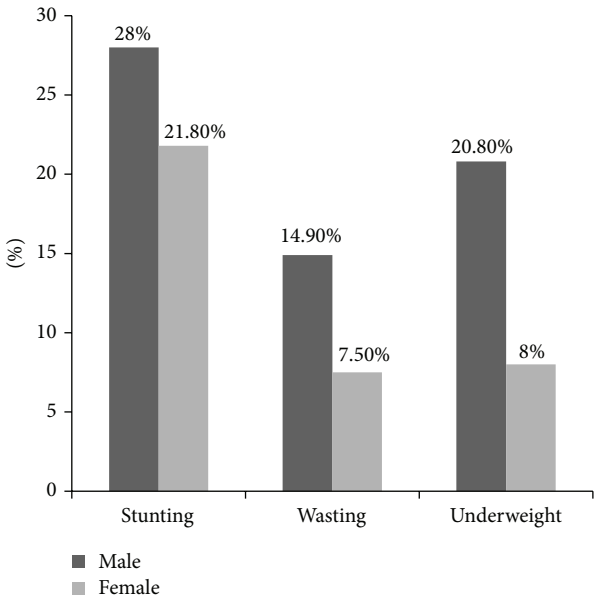

Figure 2: Prevalence of undernutrition regarding gender.

which 85 (24.9%), 38 (11.1%), and 49 (14.3%) were stunted, wasted, and underweight, respectively (Figure 1). Table 2 showed that 27 (7.9%), 15 (4.4%), and 11 (3.2%) children had severe stunting, wasting, and undernutrition, respectively (Table 2).

About 28%, 14.9%, and 20.8% of males were stunting, wasting, and underweight, correspondingly (Figure 2). Of those male children, 27 (10.7%), 12 (7.1%), and 10 (6%) were severely stunted, wasted, and underweight, respectively (Table 3).

In the age range of 12–23, 24 (32.9%) were stunted, and from 36 to 47 months, 18 (29.5%) and 13 (21.3%) were stunted and underweight, respectively (Table 4).

5. Risk Factors

In multiple logistic regression analysis, paternal educational status, diarrheal disease occurrence, and respiratory tract

Table 1: Socioeconomic and demographic variables of respondents in Bure town, West Gojjam Zone, northwest Ethiopia, in 2015.

Variables		Frequency	Percent
Sex	Male	168	49.1
	Female	174	50.9
Age	<12 months	57	17.3
	12–23 months	73	21.3
	24–35 months	78	22.8
	36–47 months	61	18.8
	48–59 months	71	20.8
Religion	Orthodox	319	93.3
	Others	23	5.6
Maternal educational status	Cannot read and write	107	31.3
	Can read and write	55	16.1
	Primary	64	18.7
	Secondary	77	22.5
	Tertiary	39	11.4
Paternal educational status	Cannot read and write	53	15.5
	Can read and write	89	26
	Primary	58	17
	Secondary	80	23.4
	Tertiary	62	18.1
Monthly income	<750	143	41.8
	750–1500	76	22.2
	>1500	123	36
Maternal occupational status	Housewife	205	59.9
	Government employee	44	12.9
	Private	31	9.1
	Others	62	18.1
Diarrhea in the last one month	Yes	42	12.3
	No	300	87.7
Respiratory tract infection in the last one month	Yes	46	13.5
	No	296	86.5

Table 2: Severity of undernutrition among children below five years of age.

Level of malnutrition		*N*	%
Stunting	Severe stunting	27	7.9
	Moderate stunting	58	17
Wasting	Severe wasting	15	4.4
	Moderate wasting	23	6.7
Underweight	Severe underweight	11	3.2
	Moderate	38	11.1

Table 3: Nutritional status of under five children by sex.

Variables	Stunting		Wasting		Underweight	
	N	%	*N*	%	*N*	%
Sex						
Male						
Severe	27	10.7	12	7.1	10	6
Moderate	29	17.3	13	7.7	25	14.9
Female						
Severe	9	5.2	3	1.7	1	0.6
Moderate	29	16.7	10	5.7	13	7.5

infection in the last one month were statistically significant variables for stunting. Those illiterate fathers (AOR = 5.38, 95% CI: 2.07–13.98) and fathers who could only read and write (AOR = 2.73, 95% CI: 1.11–6.72) were significantly associated with stunting.

Diarrheal disease (AOR: 2.621, 95% CI: 1.31–5.25) and acute respiratory tract infection in the last one month (AOR = 2.658, 95% CI: 1.34–5.28) were factors independently associated with stunting.

Maternal educational status, paternal educational status, monthly income, diarrhea (AOR = 9.452, 95% CI: 4.342–20.576), acute respiratory tract infection (AOR = 6.003, 95% CI: 2.757–13.074), preterm (AOR = 3.942, 95% CI: 1.121–13.85), and absence of antenatal follow-up (AOR = 4.45, 95% CI: 1.41–14.06) were factors associated with wasting.

Table 4: Nutritional status of children by age.

Age in months	Stunting *N* (%)	Wasting *N* (%)	Underweight *N* (%)
<12	9 (15.3)	9 (15.3)	7 (11.9)
12–23	24 (32.9)	7 (9.6)	8 (11)
24–35	16 (20.5)	8 (10.3)	14 (17.9)
36–47	18 (29.5)	7 (11.5)	13 (21.3)
48–58	18 (25.4)	7 (9.9)	7 (9.9)

Male sex (AOR = 2.91, 95% CI: 1.430–5.915), paternal educational status, preterm baby (AOR = 3.71, 95% CI: 1.05–13.11), antenatal follow-up (AOR = 10.50, 95% CI: 3.24–33.99), diarrheal disease (AOR = 3.306, 95% CI: 1.421–6.79), and acute respiratory tract infection (AOR = 2.42, 95% CI: 1.09–5.38) were factors which affected underweight children (Table 5).

6. Discussion

The overall undernutrition was 35.5%. The levels of stunting, wasting, and underweight were 24.9%, 11.1%, and 14.3%, respectively. The prevalence reported in this study is lower than the 2011 EDHS report, of which 44% was stunting and 29% was underweight [15].

In this study, prevalence of stunting was 24.9%. This is congruent with previous reports in Gumbrit [16], was 24%, China [19], was 20%, and Pakistan [20], was 21%. However, the finding of this study was lower than the 2013 UNICEF report in which the prevalence was 40% and 39% in Sub-Saharan Africa and in South Asia, respectively [3]. This is also lower than studies reported in Khartoum, Sudan (51%) [21], Botswana (38.7%) [22], India (49.36%) [23], Vietnam (36.3%) [24], Bule Hora, Ethiopia (47.6%) [25], Somalia region, Ethiopia (34.4%) [26], and North Wollo, Ethiopia (44.5%) [27]. These variations might be due to the policy direction from the government to reduce mortality rates below five years of age by two-thirds of 1990's mortality. The other discrepancy might be due to small sample size compared to the other studies. However, the prevalence of stunting in this study is higher than other studies reported in Nigeria [28], was 12.4%, South Africa [29], was 18%, and Nigeria [30], was 12.5%. These might be due to deference in maternal educational status and economic development.

In this study, prevalence of wasting was 11.1%. This is comparable with studies reported in Nigeria [28], was 9.5%, Vietnam [24], was 10.2%, Nigeria [30], was 8.5%, and eastern rural Ethiopia [31], was 7.4%, and the 2011 EDHS report [15], in which it was 10%.

On the other hand, the prevalence of wasting is markedly lower than the previous studies in 28.52% in India [23]. However, this was higher than studies in Rwanda [32], in which it was 3.1%. The possible explanation could be variation in sample size and study period. It might be also due to difference in socioeconomics and feeding habit.

Prevalence of underweight of this study was 14.3%. This is lower than other studies reported in Vietnam, 27.7% [24], Kenya, 26.5% [33], urban Union Council (UC) of Abbottabad District, 21% [20], and Nigeria, 14.8% [30]. However, this was higher than a report in Nigeria [28] and Ruanda [32], in which it was 2.5% and 8.5%, respectively. These may be varying according to the geographical location and the study population and health policy difference between the two countries.

This study revealed that 7.9%, 4.4%, and 3.2% had severe stunting, wasting, and underweight, respectively. These are congruent with the 2011 EDHS report in which 21% had severe stunting, 3% had severe wasting, and 9% were severely underweight [15].

This study revealed that male sex, parents' educational status, preterm babies, household monthly income, diarrhea, and respiratory tract infection in the last one month and those who had no antenatal follow-up were independently associated with outcome variables. Other comparable reports in rural China [19] and in Vietnam [24] indicated that LBW, multiparity, preterm birth, maternal education, and low household income were strongly associated with outcome variables. In another study in Somalia region, Ethiopia [26], age of the child, child sex, mothers' education, monthly income, and acute airway infections were factors associated with malnutrition. Another report in Butajira, Ethiopia, showed that male sex, low birth weight, poor maternal nutritional status, and rural residence were factors affecting infants' nutritional status [34]. Moreover, a report in North Wollo, Ethiopia [27], depicted that child age and sex were factors associated with outcome variables.

This study indicated that maternal educational status was independently associated with outcome variables. However, a study reported by Edris [16] showed that maternal education status had no significant association with nutritional status of the children. This could be attributed to the fact that the overwhelming majority of the mothers were illiterate and sample size was not adequate to detect differences [16].

A report of this study revealed that diarrhea and acute respiratory tract infections (ARTI) episodes in the last one month were important determinants of under nutrition. This concurred with findings in Nepal [35] which showed that diarrhea and ARTI were factors that contributed to children having malnutrition.

Although this study used standardized measurement tools and large sample size and included well-trained and professional nurses for collection of data which improved the quality of data, this study was limited to use other parameters of the nutritional assessment such as biochemical test and diversity dietary assessment.

6.1. Conclusion/Recommendation. Undernutrition was high among children below five years of age in Bure town. Although stunting and underweight were decreased as compared to 2011 EDHS report, the overall undernutrition was high. Males were more affected with undernutrition than females. Sex of the child, maternal educational status, low household income, preterm babies, lack of antenatal follow-up, diarrheal disease, and respiratory infections were factors that affected child's nutritional status.

Table 5: Logistic regression analysis of undernutrition among children below five years of age in Bure, West Gojjam Zone, Amhara regional state, northwest Ethiopia, in 2015 (N = 342).

Variables	Stunting			Wasting			Underweight		
	COR (95% CI)	AOR (95% CI)	p value	COR (95% CI)	AOR (95% CI)	p value	COR (95% CI)	AOR (95% CI)	p value
Sex									
Male				2.165 (1.068, 4.391)*	0.514 (0.211, 1.251)	0.143	3.008 (1.55, 5.825)*	2.91 (1.430, 5.915)*	0.003
Female				1	1		1		
Maternal education status									
Cannot read and write	3.03 (1.089, 8.447)*	1.43 (0.322, 6.33)	0.639	4.337 (1.217, 15.454)*	5.493 (1.270, 23.761)*	0.023			
Only read and write	2.322 (0.759, 7.10)	1.34 (0.303, 5.943)	0.698	4.826 (1.242, 18.756)*	5.929 (1.351, 26.09)*	0.018			
Primary education	2.661 (0.899, 7.88)	1.89 (0.462, 7.745)	0.375	3.029 (0.750, 12.234)	3.547 (0.829, 15.177)	0.088			
Secondary education	1.645 (0.550, 4.92)	1.51 (0.414, 5.49)	0.534	1	1	—			
Diploma or degree	1	1		2.056 (0.395, 10.694)	3.302 (0.512, 21.317)	0.209			
Father's educational status									
Cannot read and write	4.47 (1.78, 11.28)*	5.38 (2.07, 13.98)*	0.001	5.676 (1.119, 28.79)*	4.336 (0.789, 23.82)	0.091	6.56 (1.7, 25.18)*	4.40 (1.1, 17.44)*	0.035
Only read and write	2.36 (1.02, 5.46)*	2.73 (1.11, 6.72)*	0.029	5.000 (1.087, 23.00)*	5.344 (1.151, 24.82)*	0.032	3.28 (0.89, 12.03)	2.84 (0.74, 10.84)	0.127
Primary education	1	1	—	1	1	—	2.50 (0.62, 10.16)	1.238 (0.26, 6.02)	0.791
Secondary education	1.270 (0.486, 3.32)	2.08 (0.810, 5.33)	0.128	5.57 (1.209, 25.681)*	15.358 (1.15, 24.88)*	0.032	4.172 (1.19, 15.7)*	3.81 (1.01, 14.5)*	0.050
Diploma or degree	1.869 (0.785, 4.45)	1.16 (0.407, 3.31)	0.780	1.525 (0.246, 9.461)	1.461 (0.234, 9.123)	0.685	1	1	
Monthly income									
Less than 750	1.77 (1.013, 3.089)*	0.861 (0.37, 1.997)	0.728	2.695 (1.098, 1.098)*	2.685 (1.089, 6.620)*	0.032	2.51 (1.16, 5.44)*	1.64 (0.58, 4.66)	0.357
750–1500	0.77 (0.368, 1.609)	0.499 (0.21, 1.187)	0.116	2.804 (1.037, 1.037)*	3.077 (1.125, 8.415)*	0.029	2.33 (0.97, 5.62)	2.22 (0.75, 6.55)	0.150
>1500	1	1		1	1		1	1	
Gestational age									
Term				2.567 (0.603, 10.928)	4.923 (0.919, 26.379)	0.06	2.6 (0.75, 4.730)	3.72 (0.66, 20.89)	0.14
Preterm				2.931 (0.999, 8.598)	3.942 (1.121, 13.85)*	0.03	3.2 (1.21, 8.30)*	3.71 (1.05, 13.11)*	0.04
Postterm				1	1		1	1	
Diarrhea in the last 1 month									
Yes	3.39 (1.784, 6.442)*	2.621 (1.31, 5.25)*	0.007	9.061 (4.390, 18.702)	9.452 (4.342, 20.576)*	0.000	3.73 (1.83, 7.61)*	3.306 (1.421, 6.79)*	0.005
No	1	1		1			1		
RTI in the last one month									
Yes	2.58 (1.38, 4.83)*	2.658 (1.34, 5.28)*	0.005	5.710 (2.824, 11.54)*	6.003 (2.757, 13.074)*	0.000	2.57 (1.29, 5.10)*	2.420 (1.09, 5.38)*	0.03
No	1	1		1	1		1	1	
ANC follow-up									
Yes				1	1		1	1	
No				4.46 (1.44, 13.820)*	4.45 (1.41, 14.06)*	0.011	8 (2.75, 23.15)*	10.5 (3.24, 33.99)*	0.000

Note: COR, crude odds ratio; AOR, adjusted odds ratio; *, significant association; RTI, respiratory tract infection.

The government should be taking community-based interventions by giving priority to the poor households. Multisectorial partnership and networking are important for health promotion and minimizing child's food insecurity. Regional health bureau, zonal health department, and Woreda Health Office should be strengthening the health extension program to improve and provide necessary education on nutritional program, environmental sanitation, hygienic practice, breast feeding, and weaning practices.

Longitudinal and qualitative research shall be done on quantity and quality of nutrients and on the feeding habits of the community.

Competing Interests

The authors declare that there are no competing interests regarding the publication of this paper.

Authors' Contributions

All authors equally participated starting from conception to paper writing. Desalegne Amare, Ayenew Negesse, Baye Tsegaye, Birtukan Assefa, and Birehanu Ayenie participated in proposal writing, data collection, entry, analysis, and interpretation, and paper writing.

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