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# Current Nutritional status and Its Associated Factors among Children age from 6-59 months in Debre Tabor town Amhara Region of Ethiopia 2019: A Multi-center community-based cross-sectional study

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## Abstract

**Objectives:** Wasting is acute malnutrition that has harmful short-term consequences for children and it is determined by inadequate diet. This study was aimed to assess the prevalence and associated factors of wasting among children age 6-59 months at Debre Tabor town Ethiopia, 2019.

**Method:** A community-based cross-sectional study was conducted on a sample of 436 participants. Bivariable and multivariable logistic regression analyses were done to see which independent variables have an association with the dependent variable, and a *P* value of less than 0.05 was considered as significant at 95% CI.

**Results:** The result revealed that wasting for children age 6-59 months was 6.2 %( 95% CI 3.9%-8.5 %,). Children with the age group of 6-11 months were 4.3 times more likely to have wasted than those age group of 24-59 months. Similarly, parents who have poor wealth status in their family are 3.1 times more likely to have wasted children than those who have rich wealth status in their family.

**Conclusion:** Undernutrition especially current (wasting) is still an important public health problem in children with an age group of 6-59 months. Age of the child, wealth status of the family, and giving the first birth before 20 years of age were significantly associated with wasting. Therefore, family wealth status should be modified, create awareness to the mothers regarding maternal and child health care and responsible bodies should be designed for further nutritional intervention programs.


**Keywords:** Wasting, Children, Debre Tabor, Ethiopia

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## Introduction

Wasting is acute malnutrition that has harmful short-term consequences for children and it is determined by inadequate diet. Furthermore, it is a direct cause of mortality among children 6-59 months of age(1). Wasting is a state of nutritional deficiency that brings severe health consequences, the most immediate being a pointed risk of mortality(2).

Globally wasting accounts for more than 51 million children(3). Each year more than 800,000 deaths are attributed to wasting. Moreover, approximately 13% of worldwide deaths among children under 5 years of age were attributed to wasting in 2015, representing 875,000 preventable child deaths(2). There has been less progress regarding reducing the number of wasted children worldwide (4). Africa and Asia stand the greatest point of wasting(4).In Ghana 9.9%(5), East Africa 6%(6), in Uganda 12%(7), Study done in Ethiopia 17%(8), in Somalia regional state of Ethiopia 20%(9) in south Ethiopia 14.6%(10), East Bedawacho District South Ethiopia 7.6%(10) in Sodozuriasouth Ethiopia 11.1%(6), Damot gale south Ethiopia 9%(11), in Afar regional state of Northeast Ethiopia 16.2%(12) in Northern Ethiopia 24.6%(13) in Lalibela Amhara region 8.9%(14), In Gondar city Northwest Ethiopia 7.3% (15), in Western Amhara 11.6%(16) in East Belesa District Northwest Ethiopia 16%(17).

According to the Ethiopia Demographic and Health Survey (EDHS) of 2019, the prevalence of wasting was 7 %(18). The prevalence of wasting has decreased considerably, from 12 % in 2005 to 7 % in 2019 but in Ethiopia, the burden of child wasting has continued as a severe public health problem for decades(18).

About one-third of deaths among children below 5 years of age were attributed to Under-nutrition and it can lead children to be at greater risk of death and severe illness due to common childhood infections and consequently leads children to low school performance, physical and mental impairment (13, 19).

According to the revision of the literature, the following contributing factors of wasting in children were intra-uterine growth retardation, low birth weight, inadequate exclusive breastfeeding, inappropriate complementary feeding, low maternal education, low nutritional knowledge, insufficient energy and less micro-nutrient intake, birth spacing, socio-economic background, less food availability, poor sanitation, poor health services, low vaccination coverage, and infectious diseases(3, 20-23). As a result, this study was aimed to assess the

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burden of wasting among children aged 6–59 months at Debre Tabor Town, North West Ethiopia.

## Methods and Materials

### Study design

A cross-sectional study was conducted in Debre Tabor Town Northwest, Ethiopia, from March 1 to 30, 2019. The source population was all children aged 6-59 months in Debre Tabor Town during the specified study period. The study population was all selected children aged 6-59 months in Debre Tabor town during the specified study period. All children aged 6-59 months and their mothers with complete information. Averbal consent was taken from mothers/guardians. Socio-demographic, maternal, and child characteristics were used as independent variables.

### Patient and Public Involvement

None

### Sample size and sample size determination

The sample size for the study was determined using the assumptions of single population proportion formula assuming the prevalence of wasting of 16% (17), 5% margin of error, 95% confidence level, adding 10% for possible non-response rate, design effect of 2, the calculated sample size was 454.

Out of 6kebeles, 4 kebeles were selected randomly. The total sample size was allocated to each kebele proportionally. Households were selected using systematic random sampling and when there is more than one child 6-59 months of age in the selected household, a lottery method was used to randomly select the child.

### Data Collection Tools and Data Quality Control

A structured questionnaire was used and mothers/guardians were interviewed face to face. Four bachelor's degree graduates with prior experience in data collection and fluent speakers of the local language were recruited.

The training was given to data collectors and supervisors about the questionnaire, selecting study participants, anthropometric measurements, and ethics. They were also standardized on taking

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anthropometric measurements. The questionnaire was pretested on 5% of the actual sample size other than the study area. The length of a child (aged 6–23 months) was measured with a horizontal wooden length board in a recumbent position. The height of a child (aged 24–59 months) was measured with a vertical wooden height board while the child standing upright on the board. The length and height measurements were read to the nearest 0.1 cm. Weight was measured using a Seca digital weight scale and read to the nearest 0.1 kg. All measurements were taken twice and the mean was used for analysis. Supervisors checked the completeness and consistency of the questionnaire.

## Dependent Variable

- Wasting (below-2SD) children age from 6-59 months

## Independent Variables

- Socio-economic and demographic variables (age, educational level, marital status, family wealth, and family size)
- MaternalCharacteristics (ANC start month, family planning use, age at first birth)
- Childs' Characteristics (age, sex of the child)

## Operational definitions

Wasting is the weight-for-height z-score (WHZ) is below G 2 SD of the WHO median standard curve(4).

## Data analysis

Data was checked, sorted, categorized, and coded. After coding data, it was fed to the computer to make them ready for processing and analysis. Data was entered into the EPI info version (7.2.0.1) and analyzed by using the SPSS 20.0 statistical program. Anthro software was used to convert nutritional data into Z-scores of the indices; weight-for-height taking age, sex, weight, and height into consideration using WHO standards. Tables and charts were used to present results.

Binary logistic regression was used to identify variables associated with wasting, and variables significant at P<0.25 were entered into the final multivariable logistic regression model to identify significant factors at [illegible]

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## Ethical consideration

Ethical clearance was obtained from the school of the nursing ethical review committee on behalf of the University of Gondar. An official letter was written by a school of nursing to the DebreTabor town administrative health department office. Informed verbal consent was obtained from mothers/guardians before data collection. Privacy and confidentiality of respondents were secured.

## Result

### Socio-Demographic Factors of the Study Participants

From a total of 454 proposed study participants, 436 with a 96% response rate were included in the analysis. Among the total participants, 388 (89%) were married in their marital status and the majority 297(68.1%) were fathers who have secondary and above education level. The majority of the 176(40.4%) were rich in family wealth status **(Table 1).**

Table-1 Characteristics of Participants for Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia, 2019

| Characteristics | Categories | Total N=436 | Status of a child | |
|---|---|---|---|---|
| | | | Wasted | Not wasted |
| Mothers' age group Mean=31±5.41 SD | 20-24 | 31(7.1%) | 6 | 25 |
| | 25-29 | 181(41.5%) | 11 | 170 |
| | O'4 | 224(51.4%) | 10 | 214 |
| Mother age group at first birth | 20-25 | 97(22.2%) | 12 | 85 |
| | 26-29 | 238(54.6%) | 8 | 230 |
| | O'4 | 101(23.2%) | 7 | 94 |
| Mothers' educational level | No formal education | 99(22.7%) | 8 | 91 |
| | Primary education | 105(24.1%) | 7 | 98 |
| | Secondary education and above | 23253.2%) | 12 | 220 |
| Fathers' educational level | No formal education | 56(12.8%) | 5 | 51 |
| | Primary education | 83(19%) | 9 | 74 |
| | Secondary education and above | 297(68.1%) | 13 | 284 |
| Marital status of a mother | Married | 388(89%) | 20 | 368 |

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| | | | | |
|---|---|---|---|---|
| | Single | 48(11%) | 7 | 48 |
| Family planning use | Yes | 323(74.1%) | 19 | 304 |
| | No | 113(25.9) | 8 | 105 |
| ANC start month | J months | 291(66.7%) | 18 | 273 |
| | >3 months | 145(33.3%) | 9 | 136 |
| Family size | Less than five | 350(80.3%) | 20 | 330 |
| | Greater than equal to five | 86(19.7%) | 7 | 79 |
| Sex of child | Male | 233(53.4%) | 11 | 222 |
| | Female | 203(46.6%) | 16 | 187 |
| Child age | 6-11 months | 131(30%) | 13 | 118 |
| | 12-23 months | 105(24.1%) | 8 | 97 |
| | 24-59 months | 200(45.9%) | 6 | 194 |
| Family wealth status | Poor | 142(32.6%) | 14 | 128 |
| | Medium | 118(27.1%) | 8 | 110 |
| | Rich | 176(40.4%) | 5 | 171 |

***SD: Standard Deviation.***

**Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia**

From the total participants of the survey age from 6 to 59 months of children, 6.2% (95% CI 3.9%-8.5%) were found wasted.

**Factors Associated with wasting among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia**

Bivariable and multivariable logistic regression analyses were used to determine factors affecting the wasting of children age from 6 to 59 months. The bivariable analysis showed that birth order, sex of the child, age of the mother at first birth, marital status of the participant, mothers' educational level, fathers' educational level, place of delivery,

Bivariable and multivariable logistic regression analyses were used to determine factors affecting the wasted of children age from 6 to 59 months. The bivariable analysis showed that the educational status of the father, educational status of the mother, age of the child, wealth status of the family, age of the mother, and age of the mother at first birth was associated with wasting considering *p*For adjusting potential confounders those variables which were

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significant at bivariable analysis were entered into multivariable logistic regression. The result revealed that the age of the child, wealth status of the family, and age of the mother at first birth were significantly associated with wasting for children age 6–59 months. However, the remaining listed above variables were not significant at a $p$□ of 0.05

Children with an age group of 6-11 months were 4.3 times more likely to have wasted than those children with an age group of 24-59 months [AOR: 4.3; 95% CI: 1.5–12.5]. Similarly, parents who have poor wealth status in their family 3.1 times more likely to have wasted children than those who have rich wealth status in their family [AOR: 3.1 (1.01–9.35)]. Children of mothers' who give first birth at the age group of 20-25 years of age were 4.3 times more likely to have wasted than those who give birth at the age group of greater than 30 years **(Table-2)**

**Table 2** Bivariate and Multivariable Logistic Regression Analyses for Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia, 2019

| Variables | Categories | Total N=436 | Status of children | | AOR/95%CI |
|---|---|---|---|---|---|
| | | | Wasted | Not Wasted | |
| Mothers' education | No formal education | 99(22.7%) | 8 | 91 | 2.11(0.57-7.81) |
| | Primary education | 105(24.1%) | 7 | 98 | 2.24(0.78-6.44) |
| | Secondary education and above | 232(53.2%) | 12 | 220 | 1 |
| Fathers' education | No formal education | 56(12.8%) | 5 | 51 | 1.01(0.32-3.15) |
| | Primary education | 83(19.1%) | 9 | 74 | 0.93(0.33-2.63) |
| | Secondary education and above | 297(68.1%) | 13 | 284 | 1 |
| Mothers'age group | 20-24 | 31(7.1%) | 6 | 25 | 3.09(0.87-10.95) |
| | 25-29 | 181(41.5%) | 11 | 170 | 1.63(0.63-4.19) |
| | O'4 | 224(51.4%) | 10 | 214 | 1 |
| Mothers'age group at first birth | 20-25 | 97(22.2%) | 12 | 85 | **4.35(1.56-12.5)** |
| | 26-29 | 238(54.6%) | 8 | 230 | 0.67(0.22-2.00) |
| | O'4 | 101(23.2%) | 7 | 94 | 1 |
| Child age | 6-11 months | 131(30%) | 13 | 118 | **4.32(1.49-12.55)** |
| | 12-23 months | 105(24.1%) | 8 | 97 | 2.58(0.82-8.1) |
| | 24-59 months | 200(45.9%) | 6 | 194 | 1 |

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| | | | | | |
|---|---|---|---|---|---|
| Family wealth | Poor | 142(32.6%) | 14 | 128 | **3.07(1.01-9.35)** |
| | Medium | 118(27.1%) | 8 | 110 | 2.53(0.76-8.38) |
| | Rich | 176(40.4) | 5 | 171 | 1 |

***Notes: 1=reference group, *significant p-value<0.05, CI, confidence interval; COR, crude odds ratio; AOR, adjusted odds ratio.***

## Discussion

Under-nutrition among children age 6-59 months of age is still a major public health problem in developing countries, including Ethiopia. The magnitude of wasting in this study was 6.2 %( 95% CI 3.9%-8.5%).

Age of the child, wealth status of the family, and giving the first birth before 20 years of age was associated with higher odds of wasting.

This study was in line with the study done at Gondar city Northwest Ethiopia 7.3%(15), East Bedawacho District South Ethiopia 7.6%(10), WolaytaSodo Town, Southern Ethiopia 7.8%(24) EDHS 2019 7%(18) and in East Africa 6% (6). However, this study was lower as evaluated to the study done in East Belesa District Northwest Ethiopia16%(17), in Western Amhara Region Ethiopia 11.6%(16), Norther Ethiopia 24.6%(13), Afar regional state Northeast Ethiopia 16.2%(12), Damot gale South Ethiopia 9%(11), Sodozuria South Ethiopia 11.1%(6), in South Ethiopia 14.6%(10), Somalia regional state of Ethiopia 20%(9), a study done in Ethiopia 20%(8), Uganda 12%(7), in Ghana 9.9%(5). The possible reason might be due to different study periods and most studies were nationwide while this study was specific to Debretabor town Ethiopia.

In the present study children's age was one of the predictors of wasting among children age 6-59 months. Children who had 6-11 months of age were 4.3 times more likely to have wasted than 24-59 months of age. The result is supported by the research done in North ShewaOromia, Ethiopia(20), Lalibela, Northern Ethiopia(14), Uganda(25), Myanmar South Asia(26). The possible justification might be with increase the child age the frequency of wasting decrease due to the increased susceptibility of younger children to infection/illness(22).

Another predictor of wasting for children age 6-59 months was family wealth status. In this study families who have poor wealth status 3.1 times more likely to have wasted children than those families who have rich wealth status. This study is supported by the study done in Uganda(7), Gondar town northwest Ethiopia(15), Dabat, northwest Ethiopia(8). The possible reason might

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be due to children who have poor family wealth status lack adequate nutrition's in their household, and this leads to a nutritional imbalance between demand and supply.

The last predictor of wasting for this study was maternal age at first birth. Children of mothers who give first birth at the age group of 20-24 years of age were 4.3 times more likely to have wasted children than those who gave birth at the age group of greater than 30 years. The possible reasons might be due to the high demand for nutrition at first conception, again this leads to the child being wasted. Furthermore, the income of Youngers has a great impact on their family nutritional status since most of the Youngerswithin the age group of 20-24 are unemployed.

## Limitations of the Study

The present study has some limitations. It was focused on children's characteristics rather than environmental factors, and also the study is cross-sectional it does not show a cause-effect relationship between wasting and associated factors.

## Conclusion

Undernutrition especially wasting is still an important public health problem in children with an age group of 6-59 months. Age of the child, wealth status of the family, and giving the first birth before 20 years of age were significantly associated with wasting. Therefore, family wealth status should be modified, create awareness to mothers regarding maternal and child health care and responsible bodies should be designed for further nutritional intervention programs.

### Abbreviations

ANC= Ante Natal Care, AOR=Adjusted Odds Ratio, CI=Confidence Interval, COR=Crude Odds Ratio, HH= House Holds, KM=Kilo Meter, PCA= Principal Component Analysis, SPSS=Statistical Package for Social Sciences, WHO=World Health Organization

## Declarations

**Ethical Approval and Consent to Participate:** Ethical clearance was obtained from the school of the nursing ethical review committee on behalf of the University of Gondar review board(RefNo, 1601/06/2011). The verbal informed consent was acceptable and approved by the ethical review board on the behalf of the University of Gondar.

A permission letter was obtained from the Debre Tabor town department of health. Participants were informed about voluntarism and that they can withdraw at any time of the study if they want not to respond. For those who were a volunteer to participate, verbal informed consent was

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obtained from the parent/legal guardian/ for the children involved in this study. At the end of the interview, participants were informed about wasting and associated potential effects.

**Consent to publication**: Not applicable

**Availability of the Data:** Data will be available upon request from the corresponding author.

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## Authors' Contribution:

All authors made substantial contributions to conception, design, acquisition of data, or analysis and interpretation of data. And 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. All authors have read and approved the final manuscript.

## Disclosure

The authors report no conflicts of interest

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# Wasting and Associated Factors among Children age from 6-59 months in Debre Tabor town Amhara Region of Ethiopia 2019: A Multi-center community-based cross-sectional study

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# Wasting and Associated Factors among Children age from 6-59 months in Debre Tabor town Amhara Region of Ethiopia 2019: A Multi-center community-based cross-sectional study

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## Abstract

**Objectives:** Wasting is acute malnutrition that has harmful short-term consequences for children and it is determined by inadequate diet. This study aimed to assess the prevalence and associated factors of wasting among children aged 6-59 months in Debre Tabor town Ethiopia.

**Method:** A community-based cross-sectional study was conducted on a sample of 436 participants. Weight-for-height z-score (WHZ), which is below -2 SD of the WHO median standard curve, was used to measure wasting. Logistic regression analyses were done to see which independent variables have an association with the dependent variable, and a *P* value of less than 0.05 was considered significant at 95% CI.

**Results:** The result revealed that wasting for children aged 6-59 months was 6.2%. Children in the age group of 6-11 months were 4.3 times more likely to have wasted than those age group of 24-59 months [AOR: 4.3; 95% CI: 1.5–12.5]. Similarly, parents who have poor wealth status in their family are 3.1 times more likely to have wasted children than those who have rich wealth status in their family [AOR: 3.1 (1.01–9.35)]. Moreover, Mothers who gave first birth at the age group of 20-25 years of age were 4.3 times more likely to have wasted children than those who gave birth at an age group of greater than 30 years [AOR: (4.3(1.56-12.5)].

**Conclusion:** Wasting is still an important public health problem in children in the age group of 6-59 months. The age of the child, the wealth status of the family, and giving the first birth before 20 years of age were significantly associated with wasting. Therefore, the government of Ethiopia's further attention should be paid to the wealth status of the family, create awareness among the mothers regarding childhood under-nutrition care and the government should be designed further nutritional intervention programs.


**Keywords:** Wasting, Children, Debre Tabor, Ethiopia

**Strengths and limitations of this study**

- This study strives for local policy-makers and responsible bodies
- Because it was community-based, the study might have experienced fewer instances of bias.
- It may not be a sweeping statement to other age groups of children
- It was focused on children's characteristics rather than environmental factors
- The study is cross-sectional it does not show a cause-effect relationship between wasting and associated factors, and the usage of a single outcome measurement technique.



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## Introduction

In low- and middle-income nations, under-nutrition is the most prevalent type of malnutrition shows up as stunting, underweight, wasting, and a lack of vitamins and minerals. Consequently; it is one of the main causes of morbidity and mortality in children(1).

The Ethiopian government is dedicated to enhancing the nutritional condition of its people. By way of the creation of a National Nutrition Strategy (NNS) in 2008 and a National Nutrition Program that followed, the government has likewise shown a significant governmental commitment to nutrition (2008-2015). The **Seqota Declaration**, a high-level commitment to eradicating child undernourishment by 2030, is a part of the follow-up National Nutrition Program II (NNP II), which was introduced in December 2016(2).

Wasting is acute malnutrition that has harmful short-term consequences for children and it is determined by inadequate diet. Furthermore, it is a direct cause of mortality among children 6-59 months of age(3). Wasting is a state of nutritional deficiency that brings severe health consequences, the most immediate being a pointed risk of mortality(4).

Globally wasting accounts for more than 51 million children(5). Each year more than 800,000 deaths are attributed to wasting. Moreover, approximately 13% of worldwide deaths among children under 5 years of age were attributed to wasting in 2015, representing 875,000 preventable child deaths(4). There has been less progress in reducing the number of wasted children worldwide (6). Africa and Asia stand the greatest point of wasting(6).In Ghana 9.9%(7), East Africa 6%(8), Uganda 12%(9), the Study done in Ethiopia 17%(10), in Somalia regional state of Ethiopia 20%(11) in south Ethiopia 14.6%(12), East Bedawacho District South Ethiopia 7.6%(12) in Sodozuriasouth Ethiopia 11.1%(8), Damot gale south Ethiopia 9%(13), in Afar regional state of Northeast Ethiopia 16.2%(14) in Northern Ethiopia 24.6%(15) in Lalibela Amhara region 8.9%(16), In Gondar city Northwest Ethiopia 7.3% (17), in Western Amhara 11.6%(18) in East Belesa District Northwest Ethiopia 16%(19).

According to the Ethiopia Demographic and Health Survey (EDHS) of 2019, the prevalence of wasting was 7 %(20). The prevalence of wasting has decreased considerably, from 12 % in 2005 to 7 % in 2019 but in Ethiopia, the burden of child wasting has continued as a severe public health problem for decades(20).

About one-third of deaths among children below 5 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



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infections and consequently leads children to low school performance, and physical and mental impairment (15, 21).

According to the revision of the literature, the following contributing factors of wasting in children were intra-uterine growth retardation, low birth weight, inadequate exclusive breastfeeding, inappropriate complementary feeding, low maternal education, low nutritional knowledge, insufficient energy, and less micro-nutrient intake, birth spacing, socio-economic background, less food availability, poor sanitation, poor health services, low vaccination coverage, and infectious diseases**(5,** 22-25**)**. Even though studies have mentioned different factors affecting the existence of waste in children, no studies have been done in this study area. The other reasons for conducting this study included the need to contribute data encoding on the nutritional health of under-five children and the growing interest of governments and development organizations in the relationship between nutritional health and the requirement for a national school health policy particularly, for the study area generally for Ethiopia.

Therefore, this study aimed to assess the burden and associated of wasting among children aged 6–59 months at Debre Tabor Town, North West Ethiopia.

## Methods and Materials

### Study design

A cross-sectional study was conducted in Debre Tabor Town Northwest, Ethiopia, from March 1 to 30, 2019. The source population was all children aged 6-59 months in Debre Tabor Town during the specified study period. The study population was all selected children aged 6-59 months in Debre Tabor town during the specified study period. All children aged 6-59 months and their mothers with complete information. Verbal consent was taken from mothers/guardians. Socio-demographic, maternal, and child characteristics were used as independent variables.

### Patient and Public Involvement

None

### Sample size determination and sampling procedure

The sample size for the study was determined using the assumptions of single population proportion formula assuming the prevalence of wasting of 16% (19), 5% margin of error, 95% confidence level, added 10% for possible non-response rate, and design effect of 2, the calculated sample size was 454.



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Out of 6 kebeles (the smallest administrative unit in Ethiopia), 4 kebeles were selected randomly. The total sample size was allocated to each kebele proportionally. Households were selected using systematically (Even if proportional allocation was done for each cluster, for further issue of representativeness, the data collectors were started randomly from one household, and the first non-registered question was, "Have 6–59 month-old children in this household?" If not, the assigned data collectors on each cluster were gone to the next household), and when there is more than one child 6-59 months of age in the selected household, a lottery method was used to randomly select the child.

## Data Collection Tools and Data Quality Control

A structured questionnaire (Questionnaires were created using information from other studies on related subjects and WHO STEPS for child malnutrition surveillance. However, a wealth status-related questionnaire from the 2016 Ethiopian Demographic Health Survey (EDHS) was adopted)) was used and mothers/guardians were interviewed face to face. Four bachelor's degree graduates with prior experience in data collection and fluent speakers of the local language were recruited.

The training was given to data collectors and supervisors about the questionnaire, selecting study participants, anthropometric measurements, and ethics. They were also standardized for taking anthropometric measurements. The questionnaire was pretested on 5% of the actual sample size other than the study area. The length of a child (aged 6–23 months) was measured with a horizontal wooden length board in a recumbent position. The height of a child (aged 24–59 months) was measured with a vertical wooden height board while the child standing upright on the board. The length and height measurements were read to the nearest 0.1 cm. Weight was measured using a Seca digital weight scale and read to the nearest 0.1 kg. All measurements were taken twice and the mean was used for analysis. Supervisors checked the completeness and consistency of the questionnaire.

## Dependent Variable

- Wasting (below-2SD WHO Z score) children aged 6-59 months

## Independent Variables

- Socio-economic and demographic variables (age, educational level, marital status, family wealth, and family size)
- Maternal Characteristics (ANC start month, family planning use, age at first birth)



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- Childs's Characteristics (age, sex of the child)

## Operational definitions

Wasting is the weight-for-height z-score (WHZ) is below − 2 SD of the WHO median standard curve(6).

## Data analysis

Data was checked, sorted, categorized, and coded. After coding data, it was fed to the computer to make them ready for processing and analysis. Data was entered into the EPI info version (7.2.0.1) and analyzed by using the SPSS 20.0 statistical program. Anthro software was used to convert nutritional data into Z-scores of the indices; weight-for-height taking age, sex, weight, and height into consideration using WHO standards, and principal component analysis (PCA) was used to compute family wealth status. Tables and charts were used to present the results.

Binary logistic regression was used to identify variables associated with wasting, and variables significant at P<0.25 were entered into the final multivariable logistic regression model to identify significant factors at P≤0.05.

## Ethical consideration

Ethical clearance was obtained from the school of Nursing ethical review committee on behalf of the University of Gondar. An official letter was written by a school of nursing to the DebreTabor town administrative health department office. Informed verbal consent was obtained from mothers/guardians before data collection. The privacy and confidentiality of respondents were secured. At the end of the interview, participants were informed about wasting and its associated potential effects, and wasted children were linked to the nearest health institution.

## Result

### Socio-Demographic Factors of the Study Participants

From a total of 454 proposed study participants, 436 with a 96% response rate were included in the analysis. Among the total participants, 388 (89%) were married in their marital status and the majority 297(68.1%) were fathers who have secondary and above education level. The majority of the 176(40.4%) were rich in family wealth status **(Table 1).**



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Table-1 Characteristics of Participants for Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia, 2019 (N=436)

| Characteristics | Categories | Total | Status of a child | |
|---|---|---|---|---|
| | | | Wasted | Not wasted |
| Mothers' age group Mean=31±5.41 SD | 20-24 | 31(7.1%) | 6(1.4%) | 25(5.7%) |
| | 25-29 | 181(41.5%) | 11(2.5%) | 170(39.0%) |
| | ≥30 | 224(51.4%) | 10(2.3%) | 214(49.1%) |
| Mother age group at first birth | 20-25 | 97(22.2%) | 12(2.8%) | 85(19.4%) |
| | 26-29 | 238(54.6%) | 8(1.8%) | 230(52.8%) |
| | ≥30 | 101(23.2%) | 7(1.6%) | 94(21.6%) |
| Mothers' educational level | No formal education | 99(22.7%) | 8(1.8%) | 91(20.9%) |
| | Primary education | 105(24.1%) | 7(1.6%) | 98(22.5%) |
| | Secondary education and above | 232(53.2%) | 12(2.8%) | 220(50.4%) |
| Fathers' educational level | No formal education | 56(12.8%) | 5(1.1%) | 51(11.7%) |
| | Primary education | 83(19%) | 9(2.0%) | 74(19.0%) |
| | Secondary education and above | 297(68.1%) | 13(3.0%) | 284(65.1%) |
| Mothers' occupational status | House wife | 215(49.3%) | 17(3.9%) | 198(45.4%) |
| | Merchant | 62(14.2%) | 2(0.5%) | 60(13.7%) |
| | Government employ | 108(24.8%) | 3(0.7%) | 105(24.1%) |
| | Others* | 51(11.7%) | 5(1.1%) | 46(10.6%) |
| Fathers' occupational status | Merchant | 122(27.9%) | 6(1.4%) | 116(26.5%) |
| | Government employ | 201(46.1%) | 7(1.6%) | 194(44.5%) |
| | Others* | 113(25.9%) | 14(3.2%) | 99(22.7%) |
| Marital status of a mother | Married | 388(89%) | 20(4.6%) | 368(84.4%) |
| | Single | 48(11%) | 7(1.6%) | 48(9.4%) |
| Family planning use | Yes | 323(74.1%) | 19(4.4%) | 304(69.7%) |
| | No | 113(25.9) | 8(1.8%) | 105(24.5%) |
| ANC start month | ≤3 months | 291(66.7%) | 18(4.1%) | 273(62.6%) |
| | >3 months | 145(33.3%) | 9(2.0%) | 136(31.3%) |
| Family size | Less than five | 350(80.3%) | 20(4.6%) | 330(75.7%) |



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| | | | | |
|---|---|---|---|---|
| | Greater than equal to five | 86(19.7%) | 7(1.6%) | 79(18.1%) |
| Sex of child | Male | 233(53.4%) | 11(2.5%) | 222(50.9%) |
| | Female | 203(46.6%) | 16(3.7%) | 187(42.9%) |
| Child age | 6-11 months | 131(30%) | 13(3.0%) | 118(27.0%) |
| | 12-23 months | 105(24.1%) | 8(1.8%) | 97(22.3%) |
| | 24-59 months | 200(45.9%) | 6(1.4%) | 194(4.5%) |
| Family wealth status | Poor | 142(32.6%) | 14(3.2%) | 128(29.4%) |
| | Medium | 118(27.1%) | 8(1.8%) | 110(25.3%) |
| | Rich | 176(40.4%) | 5(1.1%) | 171(39.3%) |

***Daily laborer, SD: Standard Deviation.***

**Wasting among Children aged from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia**

Of the total participants of the survey aged from 6 to 59 months of children, 6.2% (95% CI 3.9%-8.5%) were found wasted **(figure 1).**

***Figure 1: Prevalence of wasting among children aged from 6–59 months in Debre Tabor town Amhara Region of Ethiopia, 2019.***

**Factors Associated with wasting among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia**

Bivariable and multivariable logistic regression analyses were used to determine factors affecting the wasted of children aged from 6 to 59 months. The bivariable analysis showed that the educational status of the father, educational status of the mother, age of the child, wealth status of the family, age of the mother, and age of the mother at first birth were associated with wasting considering *p*-value <0.2. For adjusting potential confounders those variables which were significant at bivariable analysis were entered into multivariable logistic regression. The result revealed that the age of the child, wealth status of the family, and age of the mother at first birth were significantly associated with wasting for children aged 6–59 months. However, the remaining listed variables were not significant at a *p*-value < 0.05

Children in the age group of 6-11 months were 4.3 times more likely to have wasted than those children in the age group of 24-59 months [AOR: 4.3; 95% CI: 1.5–12.5]. Similarly, parents who have poor wealth status in their family are 3.1 times more likely to have wasted children than those who have rich wealth status in their family [AOR: 3.1 (1.01–9.35)]. Children of



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mothers who give first birth at the age group of 20-25 years of age were 4.3 times more likely to have wasted than those who give birth at the age group of greater than 30 years **(Table-2)**

**Table 2** Bivariate and Multivariable Logistic Regression Analyses for Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia, 2019 (N=436)

| Variables | Categories | COR/95%CI | AOR/95%CI |
|---|---|---|---|
| Mothers' education | No formal education | 1.61(0.63-4.07) | 2.11(0.57-7.81) |
| | Primary education | 1.31(0.50-3.42 | 2.24(0.78-6.44) |
| | Secondary education and above | 1 | 1 |
| Fathers' education | No formal education | 2.14(0.73-6.27) | 1.01(0.32-3.15) |
| | Primary education | 1.31(0.50-3.64) | 0.93(0.33-2.63) |
| | Secondary education and above | 1 | 1 |
| Mothers' age group | 20-24 | 5.13(1.72-15.33) | 3.09(0.87-10.95) |
| | 25-29 | 1.39(0.57-3.33) | 1.63(0.63-4.19) |
| | ≥30 | 1 | 1 |
| Mothers' age group at first birth | 20-25 | 4.06(1.31-9.62) | **4.35(1.56-12.5)** |
| | 26-29 | 1.89(0.71-5.03) | 0.67(0.22-2.00) |
| | ≥30 | 1 | 1 |
| Child age | 6-11 months | 2.56(1.31-9.62) | **4.32(1.49-12.55)** |
| | 12-23 months | 2.67(0.90-7.90) | 2.58(0.82-8.1) |
| | 24-59 months | 1 | 1 |
| Family wealth | Poor | 3.74(1.31-10.65) | **3.07(1.01-9.35)** |
| | Medium | 2.49(0.79-7.79) | 2.53(0.76-8.38) |
| | Rich | 1 | 1 |

***Note: 1=reference group, *significant p-value<0.05, CI, Confidence Interval; COR, Crude odds ratio; AOR, Adjusted odds ratio.***



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## Discussion

The assessment of wasting in this study is based on the reference population of referenced children, as advised by WHO Standard deviation units from the median for the reference groups are used to express the weight-for-height. Wasted children are those who are less than minus two standard deviations from the median reference population.

Undernutrition among children aged 6-59 months of age is still a major public health problem in developing countries, including Ethiopia. The magnitude of wasting in this study was 6.2 % (95% CI 3.9%-8.5%). Age of the child, the wealth status of the family, and giving the first birth before 20 years of age were associated with higher odds of wasting for this age group. The magnitude of wasting had been found in different study settings from local to global.

This study was in line with the study done at Gondar city Northwest Ethiopia 7.3%(17), East Bedawacho District South Ethiopia 7.6%(12), WolaytaSodo Town, Southern Ethiopia 7.8%(26) EDHS 2019 7%(20) and in East Africa 6% (8).

However, this study was lower as evaluated to the study done in East Belesa District Northwest Ethiopia16%(19), in Western Amhara Region Ethiopia 11.6%(18), Norther Ethiopia 24.6%(15), Afar regional state Northeast Ethiopia 16.2%(14), Damot gale South Ethiopia 9%(13), Sodozuria South Ethiopia 11.1%(8), in South Ethiopia 14.6%(12), Somalia regional state of Ethiopia 20%(11), a study done in Ethiopia 20%(10), Uganda 12%(9), in Ghana 9.9%(7). The possible reason might be due to different study periods and most studies were nationwide while this study was specific to Debretabor town Ethiopia. The continuation magnitude of wasting in this study was determined by significantly associated factors.

In the present study children's age was one of the predictors of wasting among children aged 6-59 months. Children who had 6-11 months of age were more likely to have wasted than 24-59 months of age. The result is supported by the research done in North ShewaOromia, Ethiopia(22), Lalibela, Northern Ethiopia(16), Uganda(27), Myanmar South Asia(28). The possible justification might be with an increase in the child's age the frequency of wasting decreases due to the increased susceptibility of younger children to infection/illness(24).

Another predictor of wasting for children aged 6-59 months was family wealth status. In this study families who have poor wealth status were more likely to have wasted children than those families who have rich wealth status. This study is supported by the study done in Uganda(9), Gondar town northwest Ethiopia(17), Dabat, northwest Ethiopia(10). The possible reason might



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be due to children who have poor family wealth status lack adequate nutrition in their household, and this leads to a nutritional imbalance between demand and supply.

The last predictor of wasting for this study was maternal age at first birth. Children of mothers who give first birth at the age group of 20-24 years of age were more likely to have wasted children than those who gave birth at the age group of greater than 30 years. The possible reasons might be due to the high demand for nutrition at first conception, again which leads to the child being wasted. Furthermore, the income of youngsters has a great impact on their family's nutritional status since most of the Younger within the age group of 20-24 are unemployed.

Overall, the implication of this study was the prevalence of wasting along with any potential contributing factors in the area that hadn't previously been the subject of study. In the meantime, for policymakers to develop effective intervention measures, assessments of children's nutritional status are crucial tools. Besides, childhood undernutrition exposures have an impact on an individual's quality of life, employment capability, physical development, and health throughout their entire lifetime. Furthermore, *to save future generations, the under-5-year-old children's nutritional needs should be at the center of all nutrition programs planned by the town health office. This demands special attention at every level, starting from kebeles. To address the issues of wasting and other health-related obstacles at the community level, a community-based nutrition program targeting under-five children should be implemented, and the presented (like SEQOTA DECLARATION) programs should be also strengthened and widened.*

## Conclusion

Undernutrition especially wasting is still an important public health problem in children in the age group of 6-59 months. The age of the child, the wealth status of the family, and giving the first birth before 20 years of age were significantly associated with wasting. Therefore, the government of Ethiopia's further attention should be paid to the wealth status of the family, create awareness among the mothers regarding childhood under-nutrition care and the government should be designed further nutritional intervention programs. The researchers also suggested future research based on trend analysis, which was required to determine the trend in under-five wasting and key determinants to meet the targets of the sustainable development goals.



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**Abbreviations**

ANC= Ante Natal Care, AOR=Adjusted Odds Ratio, CI=Confidence Interval, COR=Crude Odds Ratio, HH= House Holds, KM=Kilo Meter, PCA= Principal Component Analysis, SPSS=Statistical Package for Social Sciences, WHO=World Health Organization

## Declarations

**Ethical Approval and Consent to Participate:** Ethical clearance was obtained from the school of the nursing ethical review committee on behalf of the University of Gondar review board (RefNo, 1601/06/2011). The verbal informed consent was acceptable and approved by the ethical review board on the behalf of the University of Gondar.

A permission letter was obtained from the Debre Tabor town department of health. Participants were informed about voluntarism and that they can withdraw at any time during the study if they did want not to respond. For those who were a volunteer to participate, verbal informed consent was obtained from the parent/legal guardian/ for the children involved in this study. At the end of the interview, participants were informed about wasting and its associated potential effects, and wasted children were linked to the nearest health institution.

**Consent to publication**: Not applicable

**Availability of the Data:** Data will be available upon request from the corresponding author.

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## Authors' Contribution:

Authors (BDG, KAAz, NST, LYZ, and GMA) made substantial contributions to the conception, design, acquisition of data, or analysis and interpretation of data. And (NST, BDG, TDE and KAA) 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. All authors have read and approved the final manuscript.

## Disclosure

The authors report no conflicts of interest



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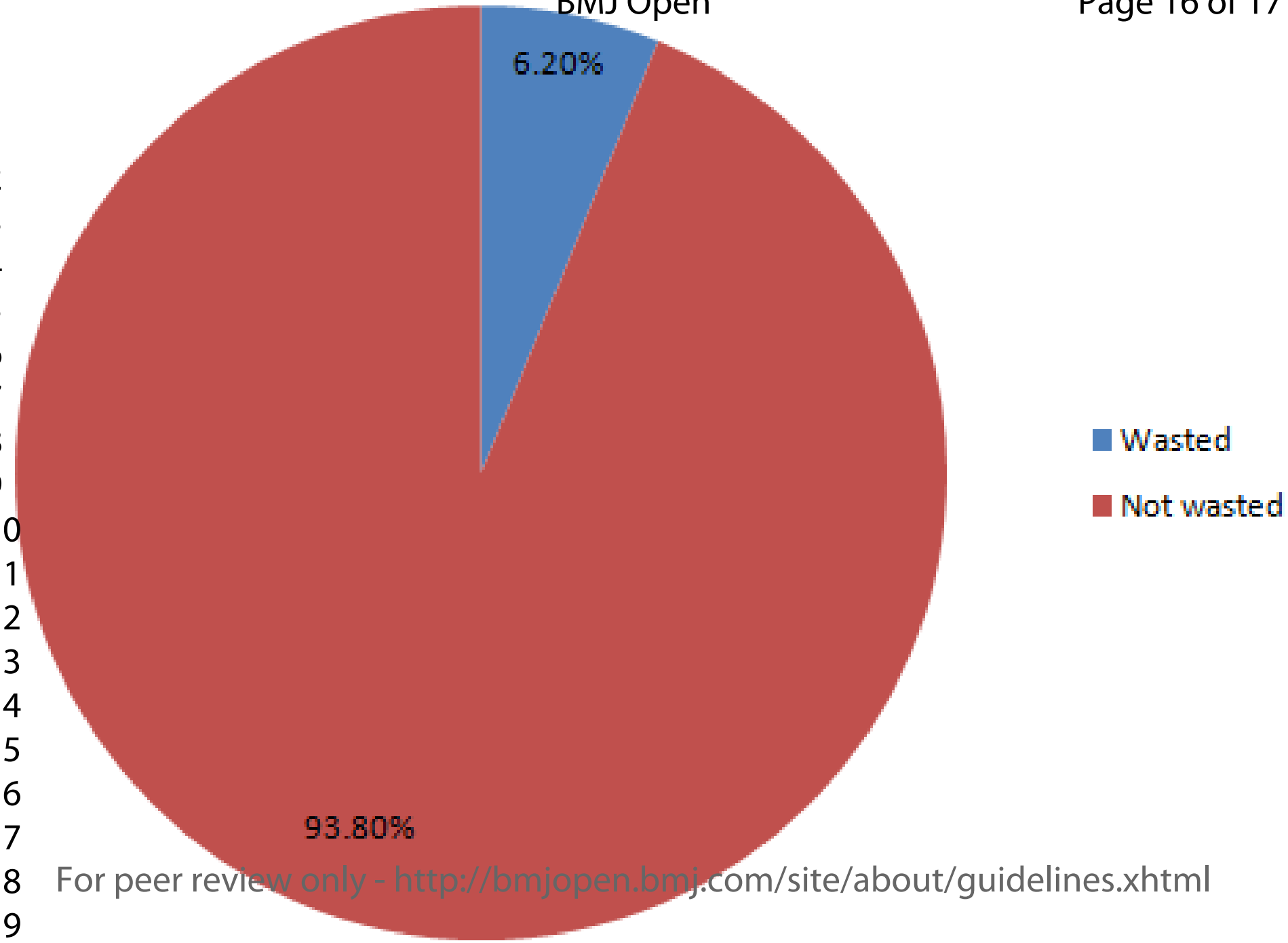


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**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

| Section/Topic | Item # | Recommendation | Reported on page # |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | 1 and 2 |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 3 and 4 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 4 |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | 4 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 4, 5, and 6 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants | 5 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 5 and 6 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 4,and 5 |
| Bias | 9 | Describe any efforts to address potential sources of bias | *5* |
| Study size | 10 | Explain how the study size was arrived at | 4 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 6 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 6 |
| | | (*b*) Describe any methods used to examine subgroups and interactions | 6 |
| | | (*c*) Explain how missing data were addressed | |
| | | (*d*) If applicable, describe analytical methods taking account of sampling strategy | |
| | | (*e*) Describe any sensitivity analyses | |
| **Results** | | | |

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| | | | |
|---|---|---|---|
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 6 |
| | | (b) Give reasons for non-participation at each stage | |
| | | (c) Consider use of a flow diagram | |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 6, 7, and 8 |
| | | (b) Indicate number of participants with missing data for each variable of interest | |
| Outcome data | 15* | Report numbers of outcome events or summary measures | 8 |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 8 |
| | | (*b*) Report category boundaries when continuous variables were categorized | |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 10 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 2 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 10 and 11 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 13 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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# Wasting and Associated Factors among Children age from 6-59 months in Debre Tabor town Amhara Region of Ethiopia 2019: A Multi-center community-based cross-sectional study

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# Wasting and Associated Factors among Children age from 6-59 months in Debre Tabor Town Amhara Region of Ethiopia 2019: A Multi-center community-based cross-sectional study

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## Abstract

**Objectives:** Wasting is acute malnutrition that has harmful short-term consequences for children and is determined by an inadequate diet. This study aimed to assess the prevalence and associated factors of wasting among children aged 6–59 months in Debre Tabor town, Ethiopia.

**Design:** This study was a community-based cross-sectional

**Setting:** The study was conducted at Debre Tabor Town, Ethiopia.

**Participants:** A total of 436 children aged 6-59 months participants were enrolled.

**Outcome measures:** A weight-for-height z-score (WHZ), which is below -2 SD of the WHO median standard curve, was used to measure wasting. Logistic regression analyses were done to see which independent variables have an association with the dependent variable, and a *P* value of less than 0.05 was considered significant at the 95% CI.

**Results:** The result revealed that wasting in children aged 6–59 months was 6.2%. Children in the age group of 6–11 months were 4.3 times more likely to have wasted than those in the age group of 24-59 months [AOR: 4.3; 95% CI: 1.5–12.5]. Similarly, parents who have poor wealth status in their family are 3.1 times more likely to have wasted children than those who have rich wealth status in their family [AOR: 3.1 (1.01–9.35)]. Moreover, mothers who gave birth at the age group of 20–25 years were 4.3 times more likely to have wasted children than those who gave birth at an age group of greater than 30 years [AOR: 4.3 (4.3 (1.56–12.5)].

**Conclusion:** Wasting is still an important public health problem for children in the age group of 6–59 months. The age of the child, the wealth status of the family, and giving birth before 20 years of age were significantly associated with wasting.

Therefore, the government of Ethiopia should pay further attention to the wealth status of the family; create awareness among the mothers regarding childhood under-nutrition care, and design further nutritional intervention programs.


**Keywords:** Wasting, Children, Debre Tabor, Ethiopia

**Strengths and limitations of this study**

- This study strives for local policymakers and responsible bodies.
- Because it was community-based, the study might have experienced fewer instances of bias.
- It may not be a sweeping statement for other age groups of children.
- It was focused on children's characteristics rather than environmental factors.
- The study is cross-sectional; it does not show a cause-and-effect relationship between wasting and associated factors, and it uses a single outcome measurement technique.



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## Introduction

In low- and middle-income nations, under-nutrition is the most prevalent type of malnutrition. It shows up as stunting, underweight, wasting, and a lack of vitamins and minerals. Consequently, it is one of the main causes of morbidity and mortality in children.(1).

The Ethiopian government is dedicated to enhancing the nutritional condition of its people. By way of the creation of a National Nutrition Strategy (NNS) in 2008 and a National Nutrition Program that followed, the government has likewise shown a significant governmental commitment to nutrition (2008-2015). The **Seqota Declaration**, a high-level commitment to eradicating child undernourishment by 2030, is a part of the follow-up National Nutrition Program II (NNP II), which was introduced in December 2016(2).

Wasting is acute malnutrition that has harmful short-term consequences for children and is determined by an inadequate diet. Furthermore, it is a direct cause of mortality among children 6–59 months of age(3). Wasting is a state of nutritional deficiency that brings severe health consequences, the most immediate being a pointed risk of mortality(4).

Globally, wasting accounts for more than 51 million children(5). Each year, more than 800,000 deaths are attributed to wasting. Moreover, approximately 13% of worldwide deaths among children under 5 years of age were attributed to wasting in 2015, representing 875,000 preventable child deaths(4). There has been less progress in reducing the number of wasted children worldwide (6). Africa and Asia stand the greatest point of wasting(6).In Ghana 9.9%(7), East Africa 6%(8), Uganda 12%(9), the Study done in Ethiopia 17%(10), in Somalia regional state of Ethiopia 20%(11) in south Ethiopia 14.6%(12), East Bedawacho District South Ethiopia 7.6%(12) in Sodozuriasouth Ethiopia 11.1%(8), Damot gale south Ethiopia 9%(13), in Afar regional state of Northeast Ethiopia 16.2%(14) in Northern Ethiopia 24.6%(15) in Lalibela Amhara region 8.9%(16), In Gondar city Northwest Ethiopia 7.3% (17), in Western Amhara 11.6%(18) in East Belesa District Northwest Ethiopia 16%(19).

According to the Ethiopia Demographic and Health Survey (EDHS) of 2019, the prevalence of wasting was 7 %(20). The prevalence of wasting has decreased considerably, from 12 % in 2005 to 7 % in 2019 but in Ethiopia, the burden of child wasting has continued as a severe public health problem for decades(20).

About one-third of deaths among children below 5 years of age were attributed to under nutrition, which can lead children to be at greater risk of death and severe illness due to common



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childhood infections and consequently lead to low school performance and physical and mental impairment(15, 21).

According to the revision of the literature, the following contributing factors to wasting in children were: intra-uterine growth retardation, low birth weight, inadequate exclusive breastfeeding, inappropriate complementary feeding, low maternal education, low nutritional knowledge, insufficient energy, and less micro-nutrient intake; birth spacing; socio-economic background; less food availability; poor sanitation; poor health services; low vaccination coverage; and infectious diseases (5, 22-25).

Even though studies have mentioned different factors affecting the existence of waste in children, no studies have been done in this area. The other reasons for conducting this study included the need to contribute data encoding on the nutritional health of under-five children and the growing interest of governments and development organizations in the relationship between nutritional health and the requirement for a national school health policy, particularly in the study area of Ethiopia. Therefore, this study aimed to assess the burden and associated factors of wasting among children aged 6–59 months in Debre Tabor Town, North-West Ethiopia.

## Methods and Materials

### Study design

A cross-sectional study was conducted in Debre Tabor Town, Northwest Ethiopia, from March 1 to 30, 2019. The source population was all children aged 6–59 months in Debre Tabor Town during the specified study period. The study population consisted of all selected children aged 6–59 months in Debre Tabor town during the specified study period. All children aged 6–59 months and their mothers with complete information. Verbal consent was taken from mothers or guardians. Socio-demographic, maternal, and child characteristics were used as independent variables.

### Patient and Public Involvement

None

### Sample size determination and sampling procedure

The sample size for the study was determined using the assumptions of single population proportion formula assuming the prevalence of wasting of 16% (19), 5% margin of error, 95%



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confidence level, added 10% for possible non-response rate, and design effect of 2, the calculated sample size was 454.

Out of 6 kebeles (the smallest administrative unit in Ethiopia), 4 kebeles were selected randomly. The total sample size was allocated to each kebele proportionally. Households were selected systematically (even if proportional allocation was done for each cluster, for further issues of representativeness, the data collectors were started randomly from one household, and the first non-registered question was, "Have 6–59 month-old children in this household?" If not, the assigned data collectors on each cluster were moved to the next household, and when there is more than one child 6–59 months of age in the selected household, a lottery method is used to randomly select the child.

## Data Collection Tools and Data Quality Control

A structured questionnaire was created using information from other studies on related subjects and WHO STEPS for child malnutrition surveillance. However, a wealth status-related questionnaire from the 2016 Ethiopian Demographic Health Survey (EDHS) was adopted, and mothers and guardians were interviewed face-to-face. Four bachelor's degree graduates with prior experience in data collection and fluent speakers of the local language were recruited.

The training was given to data collectors and supervisors about the questionnaire, selecting study participants, anthropometric measurements, and ethics. They were also standardized for taking anthropometric measurements. The questionnaire was pretested on 5% of the actual sample size other than the study area. The length of a child (aged 6–23 months) was measured with a horizontal wooden length board in a recumbent position. The height of a child (aged 24–59 months) was measured with a vertical wooden height board while the child was standing upright on the board. The length and height measurements were read to the nearest 0.1 cm. The weight was measured using a Seca digital weight scale and read to the nearest 0.1 kg. All measurements were taken twice, and the mean was used for analysis. Supervisors checked the completeness and consistency of the questionnaire.

## Dependent Variable

- Wasting (below-2SD WHO Z score) children aged 6-59 months

## Independent Variables

- Socio-economic and demographic variables (age, educational level, marital status, family wealth, and family size)



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- Maternal Characteristics (ANC start month, family planning use, age at first birth)
- Childs's Characteristics (age, sex of the child)

## Operational definitions

Wasting is the weight-for-height z-score (WHZ) is below − 2 SD of the WHO median standard curve(6).

## Data analysis

The data was checked, sorted, categorized, and coded. After coding the data, it was fed to the computer to make it ready for processing and analysis. Data was entered into the EPI Info version (7.2.0.1) and analyzed using the SPSS 20.0 statistical program. Anthro software was used to convert nutritional data into Z-scores of the indices; weight-for-height took age, sex, weight, and height into consideration using WHO standards; and principal component analysis (PCA) was used to compute family wealth status. Tables and charts were used to present the results. Binary logistic regression was used to identify variables associated with wasting, and variables significant at P<0.25 were entered into the final multivariable logistic regression model to identify significant factors at P≤0.05.

## Ethical consideration

Ethical clearance was obtained from the School of Nursing ethical review committee on behalf of the University of Gondar. An official letter was written by a school of nursing to the Debre Tabor town administrative health department office. Informed verbal consent was obtained from mothers and guardians before data collection. The privacy and confidentiality of respondents were secured. At the end of the interview, participants were informed about wasting and its associated potential effects, and wasted children were linked to the nearest health institution.

## Result

### Socio-Demographic Factors of the Study Participants

From a total of 454 proposed study participants, 436 with a 96% response rate were included in the analysis. Among the total participants, 388 (89%) were married in their marital status, and the majority (297, or 68.1%) were fathers who have a secondary or above education level. The majority of the 176 (40.4%) were rich in family wealth status **(Table 1).**

Table-1 Characteristics of Participants for Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia, 2019 (N=436)



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| Characteristics | Categories | Total | Status of a child | |
|---|---|---|---|---|
| | | | Wasted | Not wasted |
| Mothers' age group<br>Mean=31±5.41 SD | 20-24 | 31(7.1%) | 6(1.4%) | 25(5.7%) |
| | 25-29 | 181(41.5%) | 11(2.5%) | 170(39.0%) |
| | ≥30 | 224(51.4%) | 10(2.3%) | 214(49.1%) |
| Mother age group at first birth | 20-25 | 97(22.2%) | 12(2.8%) | 85(19.4%) |
| | 26-29 | 238(54.6%) | 8(1.8%) | 230(52.8%) |
| | ≥30 | 101(23.2%) | 7(1.6%) | 94(21.6%) |
| Mothers' educational level | No formal education | 99(22.7%) | 8(1.8%) | 91(20.9%) |
| | Primary education | 105(24.1%) | 7(1.6%) | 98(22.5%) |
| | Secondary education and above | 232(53.2%) | 12(2.8%) | 220(50.4%) |
| Fathers' educational level | No formal education | 56(12.8%) | 5(1.1%) | 51(11.7%) |
| | Primary education | 83(19%) | 9(2.0%) | 74(19.0%) |
| | Secondary education and above | 297(68.1%) | 13(3.0%) | 284(65.1%) |
| Mothers' occupational status | Housewife | 215(49.3%) | 17(3.9%) | 198(45.4%) |
| | Merchant | 62(14.2%) | 2(0.5%) | 60(13.7%) |
| | Government employ | 108(24.8%) | 3(0.7%) | 105(24.1%) |
| | Others* | 51(11.7%) | 5(1.1%) | 46(10.6%) |
| Fathers' occupational status | Merchant | 122(27.9%) | 6(1.4%) | 116(26.5%) |
| | Government employ | 201(46.1%) | 7(1.6%) | 194(44.5%) |
| | Others* | 113(25.9%) | 14(3.2%) | 99(22.7%) |
| Marital status of a mother | Married | 388(89%) | 20(4.6%) | 368(84.4%) |
| | Single | 48(11%) | 7(1.6%) | 48(9.4%) |
| Family planning use | Yes | 323(74.1%) | 19(4.4%) | 304(69.7%) |
| | No | 113(25.9) | 8(1.8%) | 105(24.5%) |
| ANC start month | ≤3 months | 291(66.7%) | 18(4.1%) | 273(62.6%) |
| | >3 months | 145(33.3%) | 9(2.0%) | 136(31.3%) |
| Family size | Less than five | 350(80.3%) | 20(4.6%) | 330(75.7%) |
| | Greater than equal to five | 86(19.7%) | 7(1.6%) | 79(18.1%) |
| Sex of child | Male | 233(53.4%) | 11(2.5%) | 222(50.9%) |



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| | | | | |
|---|---|---|---|---|
| | Female | 203(46.6%) | 16(3.7%) | 187(42.9%) |
| Child age | 6-11 months | 131(30%) | 13(3.0%) | 118(27.0%) |
| | 12-23 months | 105(24.1%) | 8(1.8%) | 97(22.3%) |
| | 24-59 months | 200(45.9%) | 6(1.4%) | 194(4.5%) |
| Family wealth status | Poor | 142(32.6%) | 14(3.2%) | 128(29.4%) |
| | Medium | 118(27.1%) | 8(1.8%) | 110(25.3%) |
| | Rich | 176(40.4%) | 5(1.1%) | 171(39.3%) |

***Daily laborer, SD: Standard Deviation.***

**Wasting among Children aged from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia**

Of the total participants of the survey aged from 6 to 59 months of children, 6.2% (95% CI 3.9%-8.5%) were found wasted **(figure 1).**

***Figure 1: Prevalence of wasting among children aged from 6–59 months in Debre Tabor town Amhara Region of Ethiopia, 2019.***

**Factors Associated with Wasting among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia**

Bivariable and multivariable logistic regression analyses were used to determine factors affecting the waste of children aged from 6 to 59 months. The bivariable analysis showed that the educational status of the father, educational status of the mother, age of the child, wealth status of the family, age of the mother, and age of the mother at first birth were associated with wasting, considering a *p*-value <0.2. For adjusting potential confounders, those variables that were significant at bivariable analysis were entered into multivariable logistic regression. The result revealed that the age of the child, wealth status of the family, and age of the mother at first birth were significantly associated with wasting in children aged 6–59 months. However, the remaining listed variables were not significant at a *p*-value < 0.05

Children in the age group of 6–11 months were 4.3 times more likely to have wasted than those in the age group of 24-59 months [AOR: 4.3; 95% CI: 1.5–12.5]. Similarly, parents who have poor wealth status in their family are 3.1 times more likely to have wasted children than those who have rich wealth status in their family [AOR: 3.1 (1.01–9.35)]. Children of mothers who gave birth at the age group of 20–25 years were 4.3 times more likely to have wasted their lives than those who gave birth at the age group of greater than 30 years **(Table-2)**



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**Table 2** Bivariate and Multivariable Logistic Regression Analyses for Wasting Among Children Age from 6 to 59 Months in Debre Tabor Town Amhara Region of Ethiopia, 2019 (N=436)

| Variables | Categories | COR/95%CI | AOR/95%CI |
|---|---|---|---|
| Mothers' education | No formal education | 1.61(0.63-4.07) | 2.11(0.57-7.81) |
| | Primary education | 1.31(0.50-3.42 | 2.24(0.78-6.44) |
| | Secondary education and above | 1 | 1 |
| Fathers' education | No formal education | 2.14(0.73-6.27) | 1.01(0.32-3.15) |
| | Primary education | 1.31(0.50-3.64) | 0.93(0.33-2.63) |
| | Secondary education and above | 1 | 1 |
| Mothers' age group | 20-24 | 5.13(1.72-15.33) | 3.09(0.87-10.95) |
| | 25-29 | 1.39(0.57-3.33) | 1.63(0.63-4.19) |
| | ≥30 | 1 | 1 |
| Mothers' age group at first birth | 20-25 | 4.06(1.31-9.62) | **4.35(1.56-12.5)** |
| | 26-29 | 1.89(0.71-5.03) | 0.67(0.22-2.00) |
| | ≥30 | 1 | 1 |
| Child age | 6-11 months | 2.56(1.31-9.62) | **4.32(1.49-12.55)** |
| | 12-23 months | 2.67(0.90-7.90) | 2.58(0.82-8.1) |
| | 24-59 months | 1 | 1 |
| Family wealth | Poor | 3.74(1.31-10.65) | **3.07(1.01-9.35)** |
| | Medium | 2.49(0.79-7.79) | 2.53(0.76-8.38) |
| | Rich | 1 | 1 |

***Note: 1=reference group, *significant p-value<0.05, CI, Confidence Interval; COR, Crude odds ratio; AOR, Adjusted odds ratio.***

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## Discussion

The assessment of wasting in this study is based on the reference population of referenced children, as advised by the WHO. Standard deviation units from the median for the reference groups are used to express the weight-for-height. Wasted children are those who are less than minus two standard deviations from the median reference population.

Undernutrition among children aged 6–59 months is still a major public health problem in developing countries, including Ethiopia. The magnitude of wasting in this study was 6.2% (95% CI 3.9%–8.5%). The age of the child, the wealth status of the family, and giving the first birth before 20 years of age were associated with higher odds of wasting in this age group. The magnitude of wasting has been found in different study settings, from local to global.

This study was in line with the study done at Gondar City Northwest Ethiopia 7.3%(17), East Bedawacho District South Ethiopia 7.6%(12), WolaytaSodo Town, Southern Ethiopia 7.8%(26) EDHS 2019 7%(20) and in East Africa 6% (8).

However, this study was lower as evaluated to the study done in East Belesa District Northwest Ethiopia16%(19), in Western Amhara Region Ethiopia 11.6%(18), Norther Ethiopia 24.6%(15), Afar regional state Northeast Ethiopia 16.2%(14), Damot gale South Ethiopia 9%(13), Sodozuria South Ethiopia 11.1%(8), in South Ethiopia 14.6%(12), Somalia regional state of Ethiopia 20%(11), a study done in Ethiopia 20%(10), Uganda 12%(9), in Ghana 9.9%(7). The possible reason might be due to different study periods and most studies were nationwide while this study was specific to Debretabor town Ethiopia. The continuation magnitude of wasting in this study was determined by significantly associated factors.

In the present study children's age was one of the predictors of wasting among children aged 6-59 months. Children who had 6-11 months of age were more likely to have wasted than 24-59 months of age. The result is supported by the research done in North ShewaOromia, Ethiopia(22), Lalibela, Northern Ethiopia(16), Uganda(27), and Myanmar South Asia(28). The possible justification might be with an increase in the child's age the frequency of wasting decreases due to the increased susceptibility of younger children to infection/illness(24).

Another predictor of wasting for children aged 6-59 months was family wealth status. In this study families who have poor wealth status were more likely to have wasted children than those families who have rich wealth status. This study is supported by the study done in Uganda(9), Gondar town northwest Ethiopia(17), and Dabat, northwest Ethiopia(10). The possible reason



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might be that children who have poor family wealth status lack adequate nutrition in their household, which leads to a nutritional imbalance between demand and supply.

The last predictor of wasting for this study was maternal age at first birth. Children of mothers who gave birth at the age group of 20–24 years were more likely to have wasted children than those who gave birth at the age group of greater than 30 years. The possible reasons might be due to the high demand for nutrition at first conception, which again leads to the child being wasted. Furthermore, the income of youngsters has a great impact on their family's nutritional status since most of them within the age group of 20–24 are unemployed.

Overall, the implication of this study was the prevalence of wasting, along with any potential contributing factors in the area that hadn't previously been the subject of study. In the meantime, for policymakers to develop effective intervention measures, assessments of children's nutritional status are crucial tools. Besides, childhood undernutrition exposures have an impact on an individual's quality of life, employment capability, physical development, and health throughout their entire lifetime. Furthermore, to save future generations, the under-5-year-old children's nutritional needs should be at the center of all nutrition programs planned by the town health office. This demands special attention at every level, starting with kebeles. To address the issues of wasting and other health-related obstacles at the community level, a community-based nutrition program targeting under-five children should be implemented, and the presented (like the Seqota Declaration) programs should also be strengthened and widened.

## Conclusion

Under nutrition, especially wasting is still an important public health problem in children in the age group of 6–59 months. The age of the child, the wealth status of the family, and giving birth before 20 years of age were significantly associated with wasting. Therefore, the government of Ethiopia should pay further attention to the wealth status of the family; create awareness among the mothers regarding childhood under nutrition care, and design further nutritional intervention programs. The researchers also suggested future research based on trend analysis, which was required to determine the trend in under-five wasting and key determinants to meet the targets of the sustainable development goals.



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**Abbreviations**

ANC= Ante Natal Care, AOR=Adjusted Odds Ratio, CI=Confidence Interval, COR=Crude Odds Ratio, HH= House Holds, KM=Kilo Meter, PCA= Principal Component Analysis, SPSS=Statistical Package for Social Sciences, WHO=World Health Organization

## Declarations

**Ethical Approval and Consent to Participate:** Ethical clearance was obtained from the school of the nursing ethical review committee on behalf of the University of Gondar review board (RefNo, 1601/06/2011). The verbal informed consent was acceptable and approved by the ethical review board on behalf of the University of Gondar.

A permission letter was obtained from the Debre Tabor town Department of Health. Participants were informed about voluntarism and that they can withdraw at any time during the study if they did want not to respond. For those who were a volunteer to participate, verbal informed consent was obtained from the parent/legal guardian/ for the children involved in this study. At the end of the interview, participants were informed about wasting and its associated potential effects, and wasted children were linked to the nearest health institution.

**Consent to publication**: Not applicable

**Availability of the Data:** Data will be available upon request from the corresponding author.

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## Authors' Contribution:

Authors (BDG, KAAz, NST, LYZ, and GMA) made substantial contributions to the conception, design, acquisition of data, or analysis and interpretation of data. And (NST, BDG, TDE, and KAA) 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. All authors have read and approved the final manuscript.

## Disclosure



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The authors report no conflicts of interest

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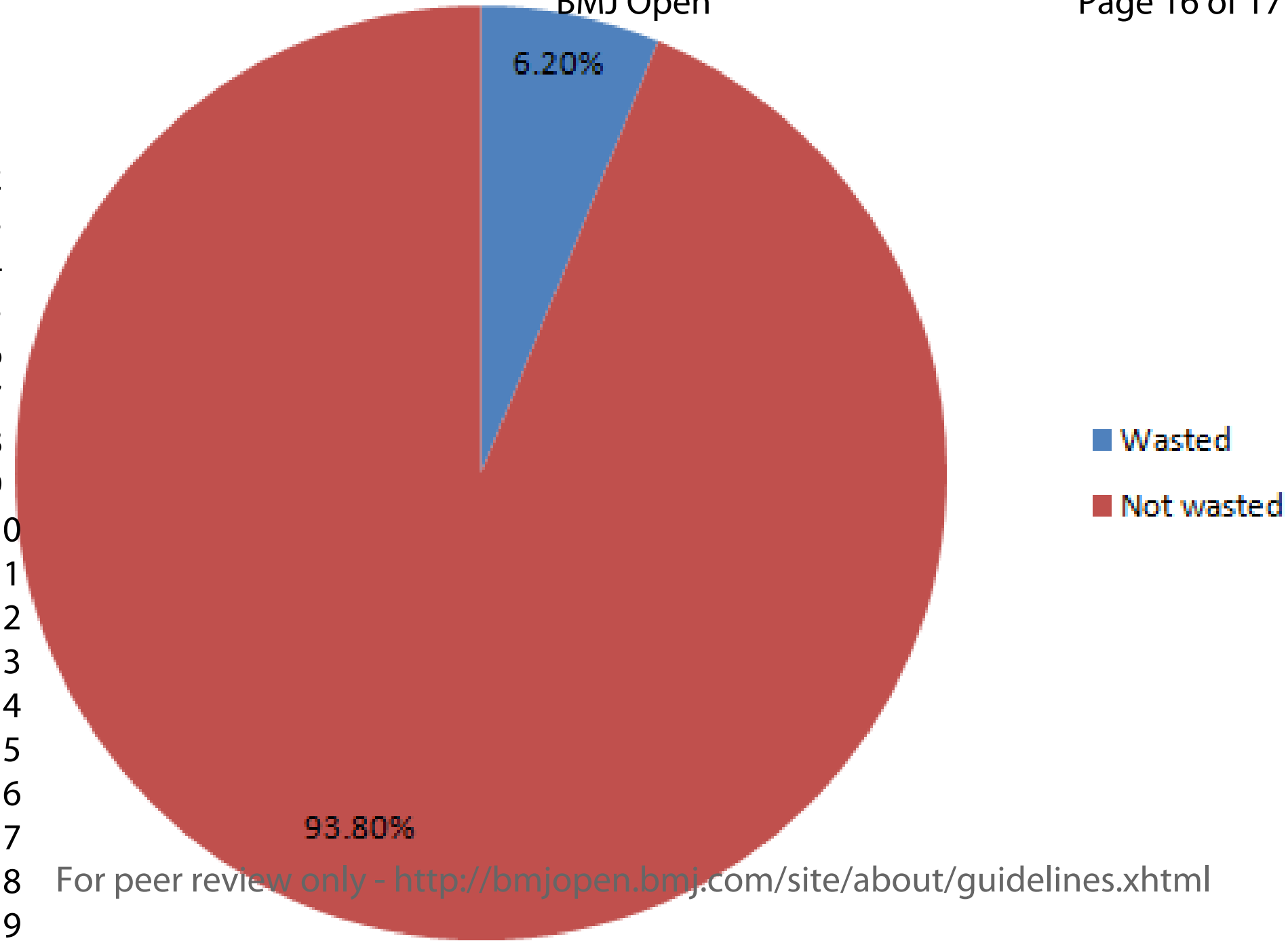


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**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

| Section/Topic | Item # | Recommendation | Reported on page # |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | 1 and 2 |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 3 and 4 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 4 |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | 4 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 4, 5, and 6 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants | 5 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 5 and 6 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 4,and 5 |
| Bias | 9 | Describe any efforts to address potential sources of bias | *5* |
| Study size | 10 | Explain how the study size was arrived at | 4 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 6 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 6 |
| | | (*b*) Describe any methods used to examine subgroups and interactions | 6 |
| | | (*c*) Explain how missing data were addressed | N/A |
| | | (*d*) If applicable, describe analytical methods taking account of sampling strategy | N/A |
| | | (*e*) Describe any sensitivity analyses | N/A |
| **Results** | | | |

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| | | | |
|---|---|---|---|
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 6 |
| | | (b) Give reasons for non-participation at each stage | N/A |
| | | (c) Consider use of a flow diagram | N/A |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 6, 7, and 8 |
| | | (b) Indicate number of participants with missing data for each variable of interest | N/A |
| Outcome data | 15* | Report numbers of outcome events or summary measures | 8 |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 8 |
| | | (*b*) Report category boundaries when continuous variables were categorized | N/A |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | N/A |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | N/A |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 10 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 2 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 10 and 11 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 5 and 6 |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 13 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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