Prevalence and Factors Associated with Anaemia Among Pregnant Women in Hossana Town, Southern Ethiopia: A Cross-Sectional Study

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ABSTRACT

Introduction: Anaemia during pregnancy is an important factor to maternal mortality, morbidity and poor foetal outcomes. It remains one of the utmost unresolved public health problems in developing countries, including Ethiopia. This study aimed to assess the prevalence and associated factors of anaemia among pregnant women in the public health facilities of Hossana Town, Southern Ethiopia.

Methods: A facility-based cross-sectional study was conducted among 284 pregnant women using systematic random sampling from 1 to 30 April 2019. Face-to-face interviews and chart reviews were used to collect the data. Data entry was done using Epi Data 3.1, and data were exported to SPSS 24 for analysis. Both bivariate and multivariable logistic regression analyses were used to identify the associated factors at 95% CI.

Results: The overall prevalence of anaemia was found to be 75 (26.4%), among which 45 (60%), 28 (37.3%) and two (2.7%) were mild, moderate, and severe anaemia respectively. The factors associated with anaemia included maternal education (unable to write and read) (AOR = 5.1; 95% CI-1.3, 20.6), the lack of information about it (AOR = 2.3; 95% CI-1.2, 7.0), short birth interval (AOR = 2.6; 95% CI-1.1, 6.5), having history of heavy menstrual bleeding before the current pregnancy (AOR = 4.3; 95% CI-1.3, 14.0), did not eat food of an animal origin within a week (AOR = 3.2, 95% CI - 1.2, 8.9) and meal frequency of less than three times per day (AOR = 2.9; 95% CI - 1.2, 6.8).

Conclusions: The findings of this study indicate that anaemia is an unresolved public health problem in the study area. Pre-pregnancy counselling, dietary advice, and iron supplementation are recommended to avert anaemia during pregnancy.

Keywords: Anaemia; Prevalence; Pregnant women
INTRODUCTION
Anaemia in pregnancy is defined as a haemoglobin concentration of less than 110 g/L at first and third trimesters (Less than 11 g/dL), and 10.5 g/dl in the second trimester in venous blood, and it is categorised as mild (10.0 – 10.9 g/dl), moderate (7.0 – 9.9 g/dl) and severe < 7 g/dl.¹ In 2016, the global prevalence of anaemia in pregnant women was 40.1%. However, it varies from region to region, with figures of 48.1% in South East Asia, 46.2% in Africa, 40.9% in Eastern Mediterranean, 33% in Eastern Pacific, 26.5% in Europe and 25.5% in America.² Iron deficiency is a major cause of anaemia globally.²³ It is an important contributor to maternal mortality, morbidity and poor foetal outcomes.⁴⁻⁵

Anaemia has significant consequences in the health of mothers and their children.² With regards to maternal health, the effects can include increased cardiovascular strain, reduced mental and physical performance, an increased risk of postpartum anaemia and postpartum haemorrhage, a lower ability to tolerate blood loss – leading to circulatory shock and effects on thyroid and immune functions.⁶⁻⁸ Furthermore, severe anaemia may require blood transfusion, particularly if there is also significant blood loss during delivery.⁹ Existing evidence shows that anaemia in pregnancy increases the risk of low birth weight, preterm delivery, increased perinatal and neonatal mortality, birth asphyxia, IUFD, intrauterine growth restriction as well as NICU admission.³⁵⁻⁷⁻¹⁰⁻¹² In addition, observational study indicates that iron deficiency leads to poorer cognitive, motor, and social-emotional function, as well as persistent neurophysiologic differences.¹³

The Ethiopian Government has developed a national nutrition programme to give comprehensive and routine nutritional assessments and routine iron and folic acid supplementation and deworming during pregnancy to improve the micronutrient deficiency among pregnant women.¹⁴ Despite this strategy, the issue of anaemia during pregnancy remains unresolved in Ethiopia. Various studies conducted in different places have revealed that the rates of anaemia during pregnancy and factors vary.¹⁵⁻¹⁷ Evidently probing the anaemia during pregnancy, it is important to conduct studies in various fields for identifying and designing appropriate interventions to prevent the problem. Therefore, this study aimed to assess the prevalence and predictors of anaemia among pregnant women in the public health facilities of Hossana Town, Southern Ethiopia.

METHODS
This facility-based, cross-sectional study was conducted from 1 to 30 April 2019 in Hossana Town’s public health facilities. The town is 194 km and 232 km away from Addis Ababa and Hawassa, respectively. The total reproductive age group was 25,709 and estimated pregnancy was 3,820 which constituted 3.5% of the population. According to the annual report of the town’s health office, the physical health services coverage was estimated to be 100%.¹⁸ The town has one hospital, three health centres and eight urban health extension workers offices, which are all Government run. It has one hospital, 35 pharmacies, 22 primary clinics, 19 medium clinics, two dental clinics and two eye clinics, all of which are private-owned facilities.

The study population were pregnant women attending an antenatal care unit in public health facilities during the study period, and the study samples were selected pregnant mothers from this group. Women who could not communicate were excluded. The sample size was determined using a single population proportion formula considering the following assumptions: a margin of error of 5% with a 95% confidence interval, the 25.5% prevalence of anaemia among pregnant women from a study done in Mizan Tepi, Ethiopia¹⁹ and a non-response rate of 10%. The final sample size then became 292. Systematic sampling was used to select the study participants, and all public health facilities in Hosanna Town were included (i.e. Wachemo University Nigist Eleni Mohammed Memorial Teaching Hospital, Hosanna Health Centre, Bobicho Health Centre and Lich Amba Health Centre). The desired number of study participants was allocated proportionally for each health facility based on the flow of daily clients, which was estimated based on the previous month’s client flow in each health facility. The K value (k = 3) was estimated by dividing the total number of pregnant women attending an antenatal care unit in public health facilities in the previous month by the sample size. The first mother was selected from 1 to 3 from the first day of the pregnant women attending an antenatal care unit using the lottery.
method in each facility and preceded by adding the third one until the required sample size was achieved.

According to the average monthly report of the each facility, the average monthly ANC follow up of Wachemo University Nigist Eleni Mohammed Memorial Teaching Hospital, Bobicho Health Center and Lich Amba Health Centre and Hossana Health Centre were 486, 130, 134 and 150, respectively. Finally, 158, 42, 43, and 49 pregnant women were allocated for Wachemo University Nigist Eleni Mohammed Memorial Teaching Hospital, Bobicho Health Centre and Lich Amba Health Centre and Hossana Health Centers, respectively.

The data were collected by face to face, interviewer-administered, structured questionnaires and reviewing the charts of the participants (to retrieve the lab results for haemoglobin and stool examinations). The questionnaire was adapted from related published research by considering the purpose of the study and local situation. The questionnaire comprised socio-demographic

Table 1. Socio-demographic Characteristics of the Respondents (n = 284)

| Variables          | Categories   | Frequency | Percent |
|--------------------|--------------|-----------|---------|
| Age in years       | 18 - 22      | 94        | 33.1    |
|                    | 23 - 34      | 152       | 53.5    |
|                    | ≥ 35         | 38        | 13.4    |
| Marital status     | Married      | 277       | 97.5    |
|                    | Other        | 7         | 2.5     |
| Ethnicity          | Hadiya       | 196       | 68.7    |
|                    | Kambata      | 44        | 15.5    |
|                    | Silti        | 19        | 6.7     |
|                    | Amhara       | 13        | 4.6     |
|                    | Gurage       | 12        | 4.2     |
| Religion           | Orthodox     | 32        | 11.2    |
|                    | Protestant   | 218       | 76.8    |
|                    | Catholic     | 6         | 2.1     |
|                    | Muslim       | 28        | 9.9     |
| Education status   | Unable to read and write | 44 | 15.5 |
|                    | Primary level | 176 | 62.0 |
|                    | Secondary and above | 64 | 22.5 |
| Occupation of women| House wives  | 153       | 53.9    |
|                    | Merchant     | 61        | 21.5    |
|                    | Government employee | 51 | 18   |
|                    | Students     | 19        | 6.6     |
| Size of household  | ≤ 3          | 44        | 15.5    |
|                    | 3 - 5        | 202       | 71.1    |
|                    | ≥ 6          | 38        | 13.4    |
| Family monthly income in Ethiopian birr | < 2000        | 89        | 31.3    |
|                    | 2000 - 4500  | 135       | 47.5    |
|                    | > 4500       | 60        | 21.1    |

Table 2. Pregnancy and Health related Characteristics of the Respondents (n = 284)

| Variables                              | Categories                  | Frequency | Percent |
|----------------------------------------|-----------------------------|-----------|---------|
| Age at first delivery n year           | ≤ 18                        | 29        | 10.2    |
|                                        | 19 - 23                     | 134       | 47.2    |
|                                        | ≥ 24                        | 121       | 42.6    |
| Birth interval (n = 201)               | Short birth interval        | 136       | 67.7    |
|                                        | Optimum birth interval      | 65        | 32.3    |
| Place of previous delivery            | Home                        | 126       | 44.4    |
|                                        | Health institution          | 158       | 55.6    |
| Trimester an interview                 | First trimester             | 98        | 34.5    |
|                                        | Second trimester            | 96        | 33.8    |
| Number of ANC visit                   | Third trimester             | 90        | 31.7    |
|                                        | One-two times               | 136       | 47.9    |
|                                        | Three times                 | 99        | 34.9    |
|                                        | Four times                  | 49        | 17.2    |
| Utilized contraceptive method         | Yes                         | 231       | 81.3    |
|                                        | No                          | 53        | 18.7    |
| Iron supplementation on current pregnancy | Yes                  | 197       | 69.4    |
|                                        | No                          | 87        | 30.6    |
| History of heavy menstrual bleeding   | Yes                         | 29        | 10.2    |
|                                        | No                          | 255       | 89.8    |
| Heard about anaemia before pregnancy  | Yes                         | 232       | 81.7    |
|                                        | No                          | 52        | 18.3    |
| Had intestinal parasites              | Yes                         | 34        | 12.0    |
|                                        | No                          | 250       | 88.0    |
| Malaria attack in last one year       | Yes                         | 18        | 6.3     |
|                                        | No                          | 266       | 93.7    |
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Table 3. Nutritional Patterns and Prevalence of Anaemia among the Respondents (n = 284)

| Variables                        | Category         | Frequency | Percent |
|----------------------------------|------------------|-----------|---------|
| Meal frequency per day           | < 3 times        | 52        | 18.3    |
|                                  | 3 times          | 232       | 81.7    |
| Frequency of taking vegetables   | Daily            | 7         | 2.5     |
|                                  | 2 – 3 / week     | 113       | 40.2    |
|                                  | 4 – 6 / week     | 70        | 24.9    |
|                                  | Once / week      | 66        | 23.5    |
|                                  | Once / month     | 25        | 8.9     |
| Frequency of taking fruits       | Daily            | 27        | 9.5     |
|                                  | 2 - 3 / week     | 93        | 32.7    |
|                                  | 4 - 6 / week     | 63        | 22.2    |
|                                  | Once / week      | 54        | 19      |
|                                  | Once / month     | 46        | 16.2    |
|                                  | Never            | 1         | 0.4     |
| Frequency of taking cereals      | Daily            | 252       | 88.8    |
|                                  | 2 - 3 / week     | 14        | 4.9     |
|                                  | 4 - 6 / week     | 16        | 5.6     |
|                                  | Never            | 2         | 0.7     |
| Taking food of an animal origin  | No               | 47        | 16.5    |
| within a week                    | Yes              | 237       | 83.5    |
| Drank coffee after meal          | Everyday         | 208       | 73.2    |
|                                  | Occasionally     | 72        | 25.4    |
|                                  | Never            | 4         | 1.4     |
| Drank tea after meal             | Everyday         | 94        | 33.1    |
|                                  | Occasionally     | 122       | 43      |
|                                  | Never            | 68        | 23.9    |
| Anemia                           | Yes              | 75        | 26.4    |
|                                  | No               | 209       | 73.6    |

RESULTS

Total 284 women were interviewed in this study, with a response rate of 97.2%. More than half (53.5%) of the mothers were between 20 to 34 years of age, with a mean (± SD) 27.2 (± 4.9) years. The majority of mothers, 277 in total, were married (97.5%). In regards to ethnicity, 196 (68.7%) were of Hadiya ethnicity. In regards to religion, 218 (76.8%) were Protestants. In regards to occupation, 153 (53.9%) were housewives. In terms of education, only 53 (18.7%) had completed secondary above education. The pregnancy and health related characteristics are presented in Table 2. Of the 294 study women, 83 (29.2%) were primigravida. The overall prevalence of anaemia and the ways to collect the data. Besides, the supervisors and the investigators closely observed the day-to-day data collection process during the pre-test and the actual data collection. Moreover, the filled questionnaire was collected and signed by the supervisor once it was checked for any omitted items and completeness. The EpiData version 3.1 software was used for data entry, and the SPSS version 20.0 was used for data analysis. Descriptive statistics, frequency, and proportions were computed to summarise the data. Both bivariate and multivariable logistic regression analysis were conducted to see the association between the outcome and explanatory variables. Variables that have a p-value 0.25 in bivariate analysis were entered into multivariable logistic regression to identify the independent effect of each explanatory variable on the outcome variable. At the end, p value 0.05 was considered statistically significant in the multivariable model with 95% CI. Hosmer and Lemeshow’s goodness of fit test was used to assess whether the necessary assumptions were fulfilled. The Ethical letter was obtained from the Research Review Committee of Hossana Health Science College. Similarly, a permission letter was acquired from Hossana Town health office and respective administrative officials of each health facility. Informed written consent was sought from each study participant. The participants were told about the objective, procedures, possible risks, and benefits of the study. Moreover, the participants were ensured that rejection to consent or withdrawal from the study would not alter or put at risk their access to care.
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was found to be 75 (26.4%), among which 45 (60%), 28 (37.3%) and 2 (2.7%) were mild, moderate, and severe anaemia respectively. The mean (± SD) haemoglobin was 12.4 g/dl (± 3.21) (Table 3).

As shown in table 4, the lack of information, a history of heavy menstrual bleeding and the lack of animal-origin food at least once a week, a meal frequency of times per day, short birth interval, and maternal education (unable to read and write) were found to be significantly associated with anaemia during pregnancy. Women uninformed about anaemia were two or more times more likely to have experienced anaemia compared to informed women (AOR = 2.3; 95% CI - 1.2, 7.0). Moreover, women with history of heavy menstrual bleeding were 4.3 times more likely to have anaemia than

| Characteristics                                      | Anaemia | COR (95 % CI) | AOR (95% CI) |
|------------------------------------------------------|---------|---------------|--------------|
|                                                      | No      | Yes           |              |
| Educational level                                    |         |               |              |
| Able to read and write                               | 26      | 18            | 4.2 (1.7, 10.7) | 5.1 (1.3, 20.6)* |
| Primary level                                        | 128     | 48            | 2.3 (1.1, 5.0)  | 2.6 (0.8, 8.4)  |
| Secondary and above (ref.)                           | 55      | 9             | 1             | 1              |
| Monthly income of family                             |         |               |              |
| < 2000                                               | 63      | 26            | 2.7 (1.1, 6.4)  | 1.6 (0.5, 5.3)  |
| 2000 - 4500                                          | 94      | 41            | 2.8 (1.2, 2.1, 6.5) | 1.6 (0.5, 4.9)  |
| > 4500(ref.)                                         | 52      | 8             | 1             | 1              |
| Birth interval                                       |         |               |              |
| Short birth interval                                 | 92      | 44            | 2.3 (1.1, 4.9)  | 2.6 (1.1, 6.5)* |
| Optimum birth interval (ref.)                        | 54      | 11            | 1             | 1              |
| Trimester during interview                           |         |               |              |
| First trimester (ref.)                               | 77      | 21            | 1             | 1              |
| Second trimester                                     | 70      | 26            | 0.6 (0.3, 1.2)  | 1.1 (0.4, 2.9)  |
| Third trimester                                      | 62      | 28            | 0.8 (0.4, 1.6)  | 1.7 (0.7, 4.2)  |
| History of heavy menstrual bleeding                  |         |               |              |
| No (ref.)                                            | 197     | 58            | 4.8 (2.2, 10.7) | 4.3 (1.3, 14.0)** |
| Yes                                                  | 12      | 17            | 1             | 1              |
| Heard about anaemia before pregnancy                 |         |               |              |
| Informed (ref.)                                      | 184     | 47            | 1             | 1              |
| Uninformed                                           | 24      | 28            | 4.6 (2.4, 8.6)  | 2.3 (1.2, 7.0)** |
| Had intestinal parasites                              |         |               |              |
| Yes                                                  | 22      | 12            | 1.6 (0.8, 3.5)  | 1.1 (0.3, 3.3)  |
| No (ref.)                                            | 187     | 63            | 1             | 1              |
| Malaria attack in last one year                       |         |               |              |
| Yes                                                  | 15      | 3             | 1.9 (0.5, 6.6)  | 1.1 (0.2, 6.4)  |
| No (ref.)                                            | 194     | 72            | 1             | 1              |
| Taking animal origin food within a week              |         |               |              |
| Yes (ref.)                                           | 20      | 27            | 1             | 1              |
| No                                                   | 189     | 48            | 5.3 (2.7, 10.3) | 3.2 (1.2, 8.9)** |
| Meal frequency per day                               |         |               |              |
| 3 times                                              | 27      | 25            | 3.4 (1.8, 6.3)  | 2.9 (1.2, 6.8)** |
| 3 times (ref.)                                       | 182     | 50            | 1             | 1              |

Statistically significant at *** P < 0.01 and * P < 0.05
their counterparts (AOR = 4.3; 95% CI - 1.3, 14.0).
In addition to this, the probability of developing
anaemia for pregnant women who had a meal
frequency of 3 times per day was nearly triple or
less (AOR = 2.9; 95% CI - 3.1, 22.2). Furthermore,
anaemia was three or more times more likely to
occur in women who didn’t eat any animal-origin
food at least once a week compared to their
counterparts (AOR = 3.2; 95% CI - 1.2, 8.9).
Anaemia during pregnancy was 2.6 times more
likely to occur in women who had short birth
interval in comparison to their counterparts (AOR =
2.6; 95% CI - 1.1, 6.5). Women who were unable to
read or write were five or more times more likely
to develop anaemia during pregnancy respect to
their counterpart (AOR = 5.1; 95% CI - 1.3, 20.6).

DISCUSSION
Our study shows that the prevalence rate of
anaemia is 26.4%. This prevalence is lower, as
compared to the values reported in Arba Minch
Town, and Butajira, of Ethiopia, which was 32.8%,
and 27.6% respectively.15,21 However, a higher
prevalence of anaemia was found in the present
study, compared to those of other studies in
Adigrat, Bench Maji, Debre Berhan Town, Tigray
and Addis Ababa, Ethiopia, which were 7.9%, 19%,
10.6%, and 11.6%, respectively.16,17,20,22 According
to the results of the present study, the rate of
anaemia was lower compared to those in other
countries, such as Ghana,23 and Kenya24 reported as
51% and 57% respectively. In contrast, this study
found a higher prevalence of anaemia compared to
other studies in Iran25 and Turkey26 which were
16.6% and 20% respectively. The above-mentioned
differences might be due to various geographical
variations, socioeconomic status and dietary habits
and might be attributed various prevalence of
hemoparasites like hookworm and malaria in the
one study area compared to another area. The
history of heavy menstrual bleeding was a factor to
birth anaemia, like that reported in Ethiopia16,21
and Kenya.24 The possible justification could be that
heavy menstrual bleeding reduces the mothers’
body stores of iron leading to additional need of
iron.

The present study showed that being not heard
about anaemia before pregnancy has a significant
association with anaemia, which is in line with the

The finding of this study also revealed that women
who did not eat food of an animal origin within a
week suffered from anaemia. This finding is
consistent to the studies done in Mekele, Ethiopia29
and Turkey.30 This could be due to the fact that
consumption of animal-based food is an essential
source for improving iron intensity of the women.
Recall and / or social desirability bias might be
hosted on dietary information. Moreover, since the
study was cross-sectional it may not show the cause
and effect relationship of anaemia. Despite these
limitations, we are hopeful that our research would
help more insight into this vast topic of anaemia
during pregnancy.
CONCLUSIONS
The findings of this study conclude that anaemia is an unresolved public health problem in the study area. The overall prevalence of anaemia was found to be 26.4%. The factors associated with anaemia included maternal lack of education, not being heard about it, short birth interval, having history of heavy menstrual bleeding before the current pregnancy, not taking meat within a week and meal frequency of less than three times per day. Pre-pregnancy counselling, dietary advice, and iron supplementation are recommended to avert anaemia during pregnancy.

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