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# Anemia and Associated Factors Among Under Five Children at Asella Teaching and Referral Hospital, Ethiopia

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**Abstract:** Anemia is a condition which results from a reduction in hemoglobin concentration or reduction in red blood cell number or both which resulting in lower ability of oxygen delivery to support the body's activities. It is a wide spread public health problem and has a significant cause of childhood mortality and (WHO) considers anemia prevalence over 40% as a major public health problem, between 20 and 40% as a moderate public health problem, and between 5 and 20% as a mild public health problem. The high prevalence of anemia has its negative consequences for children's health, especially for their growth and development of their mental, physical and social development. It also causes negative behavioral and cognitive effects which resulting in poor school performance and work capacity in later years as different studies indicated. The Objectives of the study is to assess the prevalence of anemia and associated factor among under five children attending pediatrics outpatient department in Asella teaching and referral Hospital June 2018 to September 30 2018. Institutional based cross sectional study was conducted by non- probability convenience sampling technique, 338 children was selected. The results of the study showed that, the overall prevalence of anemia among under five children were 36.3%, around 21 (6.2%) of them were found to be severely anemic, whereas 37 (10.9%) were moderately anemic. Factors like child's age [AOR=2.00, 95%CI (1.15, 2.61)], birth intervals [AOR=2.25, 95%CI (1.91, 6.94)], sex of the children, being stunting [AOR=2.50, 95%CI (2.00, 3.10)] and wasting [AOR=1.52, 95%CI (1.40, 3.66)], infected with malaria parasites [AOR=1.12, 95%CI (1.00, 1.40)], were associated with anemia. Anemia remains a common health problem in the study area among under five children and further studies are needed to focus on etiologies and interventions.

**Keywords:** Anemia, Under Five Children, Asella Teaching, Referral Hospital

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## 1. Introduction

Anemia is a decrease in the total amount of red blood cells (RBCs) or hemoglobin in the blood [1, 2] or both which result a lowered ability of the blood to carry oxygen [3]. Anemia is major public health problem in developing country among preschool children.

Blood is a body fluid in humans that delivers necessary substances such as nutrients and oxygen to the cells and transports metabolic waste products away from those same cells [4]. It is composed of blood cells suspended in blood plasma. Plasma, which constitutes 55% of blood fluid, is mostly water (92% by volume). The blood cells are mainly

red blood cells (also called RBCs or erythrocytes), white blood cells and platelets [5].

When concentration hemoglobin or red blood cells in the body reduced to below normal anemia developed the most common symptom of all type anemia are include feeling tired, weakness, shortness of breath or a poor ability to exercise. Anemia that comes on quickly often has greater symptoms, which may include confusion, feeling like one is going to pass out, loss of consciousness, or increased thirst. Anemia must be significant before a person becomes noticeably pale. Additional symptoms may occur depending on the underlying cause. [6]

The three main types of anemia are: *blood loss, decreased red blood cell production, and increased red blood cell*

*breakdown*. Causes of blood loss include trauma and gastrointestinal bleeding, among others. Causes of decreased production include iron deficiency, a lack of vitamin B12, thalassemia, and a number of neoplasms of the bone marrow. Causes of increased breakdown include a number of genetic conditions such as sickle cell anemia, infections like malaria, and certain autoimmune diseases [6].

A complete blood count is one of the most frequently requested blood tests to investigation of anemia. There are many potential causes of anemia; the most common in developing country is iron deficiency due to blood loss and anemia of chronic disease. It can be classified into three based on the size of red blood cells and amount of hemoglobin in each cell. If the cells are small, it is *microcytic anemia*. If they are large, it is *macrocytic anemia* while if they are normal sized, it is *normocytic anemia*. Iron deficiency anemia in young children is recognized as a major public health issue and the most prevalent form of micronutrient deficiency worldwide [7-10].

Anemia can be prevented by treating the underlying cause for example; *Iron deficiency anemia* is treated with oral iron supplements. Patients with uncomplicated iron deficiency can be given a trial treatment with oral iron supplementation to correct anemia and replenish physiological stores [4].

The other prevention mechanism of anemia in child can be *restoration of the hemoglobin concentration to normal level* by blood transfusion which for patients with iron deficiency anemia are generally only required where there is a risk of cardiovascular instability due to severe anemia, or if patients have symptomatic anemia despite iron treatment. The goal of a transfusion is to restore hemoglobin to a safe, but not necessarily normal, level. [11]

Anemia is a major public health problem in several countries, particularly common among preschool-aged children and women [15]. According to the 2011 World Health Organization (WHO) report, anemia resulting from iron deficiency was one of the most important factors contributing to the global burden of diseases, and it increases morbidity and mortality in preschool-aged children and pregnant women [16].

Anemia is a wide spread public health problem, and it has a significant cause of childhood mortality and (WHO) considers anemia prevalence over 40% as a major public health problem, between 20 and 40% as a moderate public health problem, and between 5 and 20% as a mild public health problem [7].

In sub-Saharan Africa, it is a severe public health problem among preschool-age children. In this region, much of the national prevalence is estimated to be above 40% among this group [10]. The national level prevalence of anemia in Ethiopia also considered that it is moderate with the prevalence of (5–44%); but in some regions of the country high prevalence of anemia was reported. According to the 2016 EDHS report of national level, even if there is intervention the prevalence increased significantly to 72.3%. It means that prevalence of anemia is still at the highest public health problem in Ethiopia. [12]

The high prevalence of anemia has its negative consequences for children's health, especially for their growth and development of their mental, physical and social development [13]. It also causes negative behavioral and cognitive effects which resulting in poor school performance and work capacity in later years as different studies indicated [14].

Hence this study was conducted to assess anemia and associated factor among pre-school age children and the information obtained from the study might be contribute to design effective intervention strategies on study area by concerned body.

## 2. Objective

### 2.1. General Objective

To assess the prevalence of anemia and associated factor among under five children attended pediatrics outpatient department in Asella teaching and referral Hospital from June 2018 to September 2018.

### 2.2. Specific Objective

To assess the prevalence of anemia among under five children in Asella teaching and referral Hospital.

To assess the associated factor of anemia among under five children in Asella teaching and referral Hospital.

## 3. Methods and Materials

### 3.1. Study Area

The study was conducted at Asella teaching and referral hospital. Asella is Located in the Arsi Zone of the Oromia Region about 175 kilometers from Addis Ababa. The town has a latitude and longitude of 7°57'N 39°7'E/ 7.950°N 39.117°E, with an elevation of 2,430 meters from sea level. The 2007 national census reported indicate a total population for Asella of 67,269, of whom 33,826 were men and 33,443 were women [15].

Arsi University teaching and referral Hospital currently serves for around 3.5 million populations in Arsi and the nearby zones.

### 3.2. Study Design and Period

Institutional based cross sectional study design was used to assess the magnitude of anemia and associated factor among under-five children in Asella teaching and referral hospital at Asella town, South East Ethiopia from June 2018 to October 2018.

### 3.3. Source and Study Population

The source population was all under five children attending pediatrics outpatient department in Asella teaching and referral hospital during the data collection period.

### 3.4. Study Population

All under five children attending Asella teaching and

referral hospital pediatrics outpatient department and sent to laboratory for any investigation.

### 3.5. Sample Size and Sampling Procedures

#### 3.5.1. Sample Size Determination

The total sample size was determined by using the formula to estimate a single population proportion with the following assumptions: population proportion ( $P$ ), that is, 72.3% taken from Ethiopian Demographic Health Survey 2016 report as prevalence of anemia among children aged 6–59 months, 95% confidence level, and 5% margin of error. Then, the final sample size 338 was obtained by adding 10% contingency.

#### 3.5.2. Sampling Procedure

Convenient sampling technique was used to recruit a total of 338 children within study time until sample size fulfilled.

Eligible criteria

Inclusion Criteria: - all under five children attended pediatrics outpatient department clinic during study period.

Exclusion Criteria: - under five children who have severely ill.

Variables of the study

Dependent variables

Anemia.

Independent variables

Socio demographic and socio economic of parents like educational level, occupation, place of residence and also age of child's, height of child's, sex of child, weight of child's and MUAC of child, intestinal parasite and hemo-parasites

Operational Definitions

Anemia- is identified by measuring the hemoglobin level  $<11$  (g/dl) in blood.

Under five children: - children aged 6–59 months

Mild anemic-Hemoglobin level 10.0–10.9 g/dL

Moderate anemic – hemoglobin level 7–9.9 g/dL whereas and  $<7$  g/dL as severely anemic

Data collection procedures

A structured and standardized questionnaire was used to collect the data. The questioners were prepared in English language by principal investigator and then translated to local language.

One day training was given for data collectors before the actual data collection, furthermore a pre-test of the instrument and the procedure was conducted and corrective measures were taken.

Hemoglobin (Hgb) concentration was determined by Sysmex fully automated CBC analyzer from blood sample. Venous blood was used, sample was collected from arm after rubbing the site with sterile cotton (immersed in 70% alcohol), and collected around 3ml of blood in EDTA tube. Blood films was prepared and stained with Giemsa stain for the assessment of hemo-parasites.

In addition to the laboratory investigation to determine anemia, the height, MUAC and weight of children were measured by Nurses and BMI calculated to determine malnutrition status of child and also stunting and wasting of

child was calculated by using WHO anthroplus application

Data quality assurance

The quality of data was controlled starting from the time of questionnaires preparations. The questionnaires were developed by reviewing relevant literatures on the subject to ensure reliability.

Quality of laboratory test result also checked by running high, medium and low quality control material daily and blood film quality also checked starting from smear preparation and reagent quality check up to have quality smear. Standard operating procedure (SOPs) was followed during laboratory analysis

After the completion of the data collection, the questionnaire was checked for its completeness, unrecorded values and unlikely responses were manually clean up on such indication. The test result was written on the laboratory data collection format sheet

Data analysis method

Data entry and analyses was done by SPSS version 21 programs to calculate frequencies and percentile of each variable that describes participant characteristics. Significance level and association of variables was tested by using 95% confidence interval (C. I) and odd ratio. P-value less than 0.05 were taken as statistically significant.

Ethical considerations

Ethical clearance was obtained from department of medical laboratory Sciences and ethical review and research committee. Official letters were taken from the Arsi University College of health science to Asella teaching and referral Hospital and pediatrics Department.

Oral consents were taken from parents/care giver after creating awareness about objective, benefit of the study, individual's right.

Any participants who are not volunteers were not enforced to include as study subject and they can stop or refuse to study participant any moment they want. At the end they are informed the result of them. Participant who is anemic were communicated with principal investigator and help them on getting necessary treatment.

## 4. Result

### 4.1. Socioeconomic and Demographic Characteristics of a Family

A total of 338 children aged 6–59 months with their mothers/care giver were included in the study with the response rate of 100%. Thirty seven percents 126 (37.3%) of mothers/care giver attended their education only up to elementary school and around 83 (26.3%) mothers of participant attended higher education (diploma and above). Regarding paternal education, 46.7% were attended their education diploma and above.

Twenty two percents of participants' family had lowest monthly income which was less than 1000 Ethiopian Birr, whereas the majorities were around 56.5% had more than 3000.00 Birr income per month (table 1).

**Table 1.** Sociodemographic of participants' family in Asella teaching and referral Hospital Asella, Oromia, Ethiopia, October 2018 (n=338).

| Variable                   | Frequency | Percent (%) |
|----------------------------|-----------|-------------|
| Resident of child family   |           |             |
| Urban                      | 171       | 50.6        |
| Rural                      | 167       | 49.4        |
| Education status of Father |           |             |
| Illiterate                 | 9         | 2.7         |
| Elementary                 | 76        | 22.5        |
| Secondary                  | 96        | 28.4        |
| Diploma and above          | 157       | 46.4        |
| Education status of Mother |           |             |
| Illiterate                 | 25        | 7.4         |
| Elementary                 | 126       | 37.3        |
| Secondary                  | 104       | 30.8        |
| Diploma and above          | 83        | 24.6        |
| Occupation of Father       |           |             |
| Merchant                   | 52        | 15.4        |
| Farmer                     | 136       | 40.2        |
| Civil servant              | 150       | 44.4        |
| Occupation of Mother       |           |             |
| Housewife                  | 201       | 59.5        |
| Merchant                   | 71        | 21          |
| Civil servant              | 66        | 19.5        |
| Monthly income of family   |           |             |
| <1000                      | 11        | 3.3         |
| 1000-2000                  | 60        | 17.8        |
| 2000-3000                  | 71        | 21          |
| 3000-4000                  | 61        | 18          |
| 4000-5000                  | 59        | 17.5        |
| >5000                      |           |             |
| Birth interval of mother   |           |             |
| < 2 year                   | 73        | 21.6        |
| > 2 year                   | 265       | 78.4        |

#### 4.2. Demographic Characteristics and Nutritional Status of Children

Out of 338 study participants, 155 (45.9%) were males and 183 (36.4%) were females. Majority of the children were 6-11 months old. Regarding durations of breast feeding, only 80 (23%) were found with history of breast feed until 2 year (table 2).

**Table 2.** Demographic Characteristics of under five children in Asella teaching and referral Hospital Asella, Oromia, Ethiopia, October 2018 (n=338).

| Variable                          | Frequency | Percent (%) |
|-----------------------------------|-----------|-------------|
| Age                               |           |             |
| 6 Month                           | 91        | 26.9        |
| 6-11 Month                        | 83        | 24.6        |
| 12-23 month                       | 63        | 18.6        |
| 24-59 month                       | 101       | 29.9        |
| Sex of child                      |           |             |
| Male                              | 155       | 45.9        |
| Female                            | 183       | 54.1        |
| Malnutrition status of child      |           |             |
| Normal                            | 141       | 41.7        |
| Mild malnutrition                 | 160       | 47.3        |
| Severe malnutrition               | 37        | 10.9        |
| Body mass index of child          |           |             |
| Normal                            | 119       | 35.2        |
| Under weight                      | 211       | 62.4        |
| Obese                             | 8         | 2.4         |
| Total time of Brest feed of child |           |             |
| 6 only month                      | 64        | 18.9        |

| Variable     | Frequency | Percent (%) |
|--------------|-----------|-------------|
| up to 1 year | 194       | 57.4        |
| up to 2 year | 80        | 23.7        |

#### 4.3. Magnitude of Anemia among Children

Anemia was measured using the hemoglobin level of the child. The over all of anemia among the children were 124 (36.7%). The mean hemoglobin level was about 11.96 (+/- 2.96) g/dl which ranged from 2 g/dl to 18.0 g/dl. Accordingly, more than two-third of the children, 214 (63.3%), were non anemic and around 21 (6.2%) of them were found to be severely anemic, whereas 37 (10.9%) were moderately anemic (table 3).

Furthermore, it also differs by child age category. A children aged 6-11 month were more anemic than the other which was 45.8% and prevalence relatively decreased in children the aged 24-59 months.

**Table 3.** The degree of anemia among children aged 6-59 months based on Hgb level in Asella referral and teaching Hospital Asella, Oromia, Ethiopia, 2018 (n=338).

| Variable                         | Frequency | Percent (%) |
|----------------------------------|-----------|-------------|
| Anemia status based on Hgb level |           |             |
| Not anemic                       | 214       | 63.3        |
| Mild anemic                      | 66        | 19.5        |
| Moderate anemic                  | 37        | 10.9        |
| Sever anemic                     | 21        | 6.2         |

## 5. Discussion

This study was assessed the prevalence of anemia and factors associated with it among children aged 6-59 months. The overall prevalence of anemia was found to be 36.7% which was relatively lower than the national prevalence of 44% Ethiopian 2011 DHS report and EDHS 2016 report (72.3%). Our study result slightly less than prevalence of anemia in sub-Saharan Africa 42% and more less than Swaziland (91%) [16]. and it was consistence to the prevalence of Tigray region (37.5%) [9]. whereas lower than Amhara Region (42%) [16]. the variation might be due to the difference in geographical locations and socio economic variations of the study area.

According to cross tabulation of age category of children with anemia status majorities were in 6-11 month age group which was 45.8% which followed with 24-59 month age group (27%). Children with previous medical illness before this study were much more anemic than those had no medical illness 72.9% from total of 48 children.

Prevalence of anemia was higher among malnourished children than normal which 82.3%. Child with underweight (low BMI) had also anemic than the normal. Regarding anemia status among sex of the children females are higher anemic than male which was 45.9% from a total of 183 females and 25% from 155 total children respectively (table 4).

*Regarding factors Associated with Anemia:* Different parental, childhood, environmental and household variables were tested for their association with the presence of anemia

among under-five children by binary logistic regression analysis. First the association of each variable with the occurrence of anemia among under-five children was assessed by binary logistic regression, and then variables which  $P < 0.25$  were entered into the final model to control confounding. Multivariate logistic regression analysis was done to assess independent association of the factors with anemia. Accordingly, children of age 6-11 month were two times more likely hood of developing anemia than those of children 24-59 months. Sex of the children also show

statistically significant association with anemia which female children were more protective 0.39 (0.24, 0.63) than male children's (table 4).

Being stunting and wasting were more likely hood of developing anemia than normal children where 2.5 (2.00, 3.10) and 2.00 (1.90, 3.66) respectively.

Generally, children's age, birth intervals, sex of the children, being stunting and wasting, infected with malaria parasites were associated with anemia (Table 4).

**Table 4.** Associated factors anemia among children aged 6–59 months in Asella referral and teaching Hospital Asella, Oromia, Ethiopia, 2018 (n=338).

| Variables                | Anemic status |                   |                      |
|--------------------------|---------------|-------------------|----------------------|
|                          | Number (%)    | Crude OR (95% CI) | Adjusted OR (95% CI) |
| Age of child in month    |               |                   |                      |
| 6                        | 91 (26.9)     | 1.73 (0.93, 3.15) | 1.50 (1.17, 1.68)    |
| 6-11                     | 83 (24.5)     | 2.31 (1.24, 4.58) | 2.0 (1.15, 2.61)     |
| 12-23                    | 63 (18.5)     | 1.576 (1.20, 3.0) | 1.0 (1.25, 2.35)     |
| 24-59                    | 101 (29.9)    | 1                 | 1                    |
| Sex of child             |               |                   |                      |
| Female                   | 155 (45.9)    | 0.39 (0.24, 0.63) | 0.42 (0.25, 0.72)    |
| Male                     | 183 (54.1)    | 1                 | 1                    |
| MUAC of the child        |               |                   |                      |
| >11cm                    | 141 (41.7)    | 0.21 (0.13, 0.36) | 0.24 (0.14, 0.43)    |
| <12 cm                   | 197 (58.3)    | 1                 | 1                    |
| Stunting                 |               |                   |                      |
| Yes                      | 132 (39.1)    | 2.9 (2.20, 3.50)  | 2.5 (2.00, 3.10)     |
| No                       | 206 (60.9)    | 1                 | 1                    |
| Wasting                  |               |                   |                      |
| Yes                      | 184 (54.4)    | 2.05 (1.67, 2.64) | 2.00 (1.90, 3.66)    |
| No                       | 154 (45.6)    | 1                 | 1                    |
| Birth interval of family |               |                   |                      |
| < 2 year                 | 73 (21.6)     | 3.65 (1.56, 4.51) | 2.25 (1.91, 6.94)    |
| > 2 year                 | 265 (78.4)    | 1                 | 1                    |
| Malaria positive         |               |                   |                      |
| No                       | 330 (41.7)    | 1                 | 1                    |
| Yes                      | 8 (47.3)      | 1.15 (1.08, 1.31) | 1.12 (1.00, 1.40)    |

## 6. Conclusion and Recommendation

Anemia was found to be a moderate public health problem (36.7%) among children aged 6–59 months attended in Asella referral and teaching hospital. It was established that occurrence of anemia is directly correlated with parents' income and maternal literacy status. Childs' age, birth intervals, sex of the children, being stunting and wasting, infected with malaria parasites were associated with anemia.

Therefore, appropriate and tailored interventional strategies are required to reduce the prevalence of childhood anemia. These include improving providing health education on child Brest feeding practices and complementary food and also birth interval of child must be a jested until child start other complementary food other than Brest milk only.

## Conflict of Interests

The authors declare that they have no competing interests.

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