

Magnitude of Anemia and Socio Demographic Factors Associated with it among Adults Age 15-49 Years in Ethiopia: A Population Based Study Using the 2016 Demographic and Health Survey Data

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ABSTRACT

Background: According to World Health Organization (WHO); anemia considered as a major public threat when prevalence was greater than 40%, a moderate public threat from 20%-40%, and as a mild threat from 5%-20%. This study aims to assess the prevalence of anemia and its associated socio demographic factors among adults age 15-49 years in Ethiopia

Methods: Demographic and Health Surveys in 2016, in Ethiopia were analyzed in SPSS, using multivariate logistic regression. Socio demographic variables were selected based on their availability in the dataset.

Results: Of the total sample of 27289 of men and women 15-49 years at the time of survey, 19.8% (n=5078) anemia. Men and women 15-49 years living in rural areas 0.029 (AOR 0.029; 95% CI:0.018-0.048), men and women age living in afar region 0.821 (AOR 0.821; 95% CI: 0.725-0.929), men and women who are in lowest wealth quintile 1.255 (AOR 1.255; 95% CI: 1.091-1.445) and an increase in one-year in age 9.952 (95% CI 6.2 to 16.1) were found significant predictors of anemia.

Conclusions: The magnitude of anemia in the current study was found to be a mild public health problem. Rural residence, low wealth quartile and old age were predictors of anemia among adults age 15-49 years. There is significant urban-rural difference in anemia prevalence, indicating the need for targeting specific areas for intervention.

Keywords: Anemia; EDHS; Socio demographic; Ethiopia

Abbreviations and Acronyms: AOR: Adjusted Odds Ratios; COR: Crude Odds Ratios; EDHS: Ethiopian Demographic and Health Survey; ICF: Inner City Fund; SNNPR: Southern Nations Nationalities and Peoples' Region; SPSS: Statistical Software; UNICEF: United Nations International Children's Emergency Fund; WHO: World Health Organization

INTRODUCTION

Anemia is defined as a condition in which there is less than the normal hemoglobin level in the body, which decreases oxygen-carrying capacity of red blood cells to tissues. Anemia is more common in developing countries because of poor nutritional status and high prevalence of parasitic infestation [1].

According to World Health Organization (WHO) anemia considered as a major public threat when prevalence was greater than 40%, as a moderate public threat when prevalence was from 20%-40%, and as a mild threat when prevalence was from 5%-20% [2]. Globally, anemia affects over a quarter of the world population [3,4].

The highest prevalence of anemia exists in the developing world

its causes are multi-factorial. Anemia is responsible for significant morbidity and mortality [5,6]. A study in Uganda reported a prevalence of 16.8 to 33.8% anemia in adult men and women [7]. Another study also reported anemia, 12.5% in males and 13.2% in females in South Africa [8] and 23% prevalence in Zimbabwe [9]. A study from Ghana reported a 53.2% prevalence of anemia in non-pregnant women [10]. Similar studies have been reported in Ethiopia, 17% to 52.3% prevalence of anemia [11-13]. In addition, data from WHO indicated that prevalence of anemia among non-pregnant women in Ethiopia was 23.3% as of 2016. Its highest value over the past 26 years was 47.50% in 1990, while its lowest value was 21.40% in 2012 [14]. Prevention and control of anemia is important to reduce its consequences [15,16].

The magnitude of the different types of anemia and its severity

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have not yet well documented in Ethiopia [13,17]. Therefore, additional studies on anemia are required to produce national data. The majority of researches regarding anemia has been focused on children, adolescents and pregnant women and almost all of them are Institution based studies [18]. However, assessing anemia among apparently healthy adults through community-based studies is essential. Therefore, the aim of this study was to assess the prevalence of anemia and its associated factors among adults age 15-49 years in Ethiopia.

METHODS

Data source, sampling and data collection

The data for this study was extracted from the 2016 EDHS. The 2016 EDHS is the fourth and most recent in the Demographic and Health Survey series in Ethiopia. The survey was conducted in nine regional states and two city administrations of Ethiopia. Further details on sampling strategy can be found in the DHS manual [19].

A total of 16,583 eligible women and 11,606 eligible men between 15 and 49 years were approached to be interviewed. A response rate of 95% was observed with 15,683 women completing the interviews and response rate 86% among 11,606 men interviewed. The interviews included several standard questionnaires recording information ranging from basic socio-demographic information to detailed bio-medical information. Our analysis included all men and women age 15-49 years which resulted in a total weighted sample of 27,289.

Outcome variable

We used any Anemia as the outcome variable using the recommended definition as Anemia status by hemoglobin level for women 15-49 years age Not pregnant <12.0 g/dl, Pregnant <11.0 g/dl and for men 15-49 years age <13.0 g/dl (1 if the people have anemia 0 otherwise).

Co-variables

The basic socio-demographic variables were selected based on their availability in the dataset. The included basic socio-demographic factors are highest education level (categorized as “no education”, “primary”, “secondary”, “more than secondary”) and working status in the past 12 months (“not working” or “working and occupation status (“not working”, “non-agriculture” and “agriculture”), marital status (“never married”, “currently married”, “Living together”, “Divorced/separated” and “Widowed”) age (“15-19 years”, “20-24 years”, “25-29 years” 30-34 years” “35-39 years” “40-45 years” and “45-49 years”) and mothers exposure to mass media (“no” or “yes”). Number of living children (“1”, “1-2”, “3-4” and “5+”), Literacy (“Cannot read at all”, “Can read part/whole sentence” and “Other”). Household factors included household wealth index (categorized as “poorest”, “poorer”, “middle”, “richer” and “richest”).

The household wealth index was calculated using scores based on household assets with analyses conducted by the National Population Commission and Inner City Fund (ICF) International based on a methodology developed from previous DHSs [20,21] and using methods recommended by the World Bank Poverty Network and United Nations International Children’s Emergency Fund (UNICEF) [22].

Community level factors recorded were the place of residence (“rural” or “urban”) and geographical region.

The geographical regions were grouped into nine regional states of Ethiopia; namely Afar, Amhara, Benishangul-Gumuz, Gambella, Harari, Oromia, Somali, Southern Nations Nationalities and Peoples’ Region (SNNP), and Tigray, and two city administrations named Addis Ababa and Dire Dawa [19].

Statistical analysis

Sampling weights provided with the EDHS dataset were used during analysis. Further details on sample weights can be found in the EDHS report [19]. Descriptive statistics were employed to show the distribution of background characteristics. We used logistic regression model to determine the true association between anemia and basic socio-demographic factors. Both unadjusted and adjusted odds/ratios (ORs) were reported with 95% confidence intervals (95% CI). Besides, diagnostic tests were done, particularly goodness of fit of the model by the Hosmer and Lemeshow test; (where p-value of 1.00 was found), The Cronbach’s alpha result of the variables is 0.889. The Nagelkerke R Square shows that about 70.6% of the variation in the outcome variable (Anemia) is explained by this logistic model. The overall accuracy of this model to predict subjects having Anemia (with a predicted probability of 0.5 or greater) is 88.4%. All analyses were performed using statistical software SPSS (Version 16.0).

RESULTS

Baseline characteristics

Of the total sample of 27289 of men and women 15-49 years at the time of survey, 19.8% (n=5078) have anemia (Table 1).

As summarized in Table 2, majority (57.5%) of the respondents were female and a predominant percentage of the men and women 15-49 years lived in rural areas (78.8%), respondents in the regions of Oromiya were (37.1%) and Amhara (24.3%). 32.1% of men and women 15-49 years reported not working in the past 12 months at the time of survey, and 39.2% did not have any formal education. In addition to education status, around 45.9% of men and women 15-49 years reported having poor literacy skills and could not read at all (Table 2).

Majorities (39.8%) of the respondent’s occupation were agriculture, 28.1% were non agriculture employee in addition, and 43.8% of the respondents were orthodox religion followers. In terms of men and women 15-49 years age, overall 21.8% of men and women were between 15 and 19 years of age.

Most men and women 15-49 years (58.9%) reported as currently married at the time of the survey. Of the total, only 16.4% were in lowest wealth quintile and 26.0% were in the highest wealth quintile. In terms of the number of living children, about 39.7% of men and women 15-49 years reported to have one living children and 20.7% had more than 5 number of living children during survey. Regarding exposure to mass media, 6.2% read newsletter, 18.1% watch to TV and 21.7% listen to radio.

Multivariable analysis

As expected, men and women 15-49 years who are in lowest wealth quintile had 25% (AOR 1.255; 95% CI: 1.091-1.445) higher odds of having anemia. In addition, residence they live had significant association with men and women 15-49 years living in rural areas having 97% reduced odds of anemia (AOR 0.029; 95% CI:0.018-0.048) compared to men and women 15-49 years who had live in urban areas.

Table 1: Socio demographic characteristics of men and women age 15-49 years according to Anemia, Ethiopia 2016.

Characteristics	Overall (n=25653)	Anemia	
	N (%)	Yes (n=5078)	No (n=20575)
Age			
15-19	5953 (23.2%)	3381 (66.6%)	2572 (12.5%)
20-24	4645 (18.1%)	1697 (33.4%)	2948 (14.3%)
Residence			
Urban	5779 (22.5%)	3476 (68.5%)	2303 (11.2%)
Rural	19874 (77.5%)	1602 (31.5%)	18272 (88.8%)
Region			
Tigray	1837 (7.2%)	1129 (22.2%)	708 (3.4%)
Affar	210 (8%)	128 (2.5%)	82 (4%)
Amhara	628 (25.8%)	3714 (73.1%)	2914 (14.2%)
Oromiya	10110 (39.4%)	107 (2.1%)	10003 (48.6%)
Wealth quintile			
Lowest	4472 (17.4%)	2633(51.9%)	1839 (8.9%)
Second	4927 (19.2%)	2445 (48.1%)	2482(12.1%)
Marital status			
Never married	8918 (34.8%)	4036 (79.5%)	4882 (23.7%)
Married	15103 (58.9%)	1042 (20.5%)	14061 (68.3%)

Table 2: Individual, household and community level characteristics of men and women 15-49 years, Ethiopia 2016.

Socio-demographic factors	N (%)
	SEX
Male	11606 (42.5%)
Female	15683 (57.5%)
Wealth index	
Lowest	4472 (16.4%)
Second	4927 (18.1%)
Middle	5224 (19.1%)
Fourth	5566 (20.4%)
Highest	7098 (26.0%)
Residence	
Urban	5779 (21.2%)
Rural	21509 (78.8%)
Age category	
15-19	5953 (21.8%)
20-24	4645 (17.0%)
25-29	4934 (18.1%)
30-34	3980 (14.6%)
35-39	3318 (12.2%)
40-44	2496 (9.1%)
45-49	1961 (7.2%)
Religion	
Orthodox	11946 (43.8%)
working status (past 12 months)	
Working	18518 (67.9%)
Marital status	
Married	16059 (58.9%)
Literacy	
Cannot read at all	12530 (45.9%)

Number of living children	
0	10843 (39.7%)
1-2	5972 (21.9%)
3-4	4834 (17.7%)
>5	5640 (20.7%)
Frequency of reading newspaper	
Yes	1703 (6.2%)
No	25586 (93.8%)
Frequency of listening to the radio	
Yes	5919 (21.7%)
No	21370 (78.3%)
Frequency of watching TV	
Yes	4938 (18.1%)
No	22351 (81.9%)
Region	
Tigray	1837 (6.7%)
Afar	210 (0.8%)
Amhara	6628 (24.3%)
Oromiya	10110 (37.1%)
Somali	760 (2.8%)
Benishangul-Gumuz	278 (1.0%)
SNNPR	5659 (20.7%)
Gambela	79 (0.3%)
Harari	67 (0.2%)
Addis Ababa	1503 (5.5%)
Dire Dawa	156 (0.6%)
Occupation	
Not working	8746 (32.0%)
Non-agriculture	7669 (28.1%)
Agriculture	10874 (39.8%)
Educational Status	

No education	10701 (39.2%)
Primary	11098 (40.7%)
Secondary	3602 (13.2%)
More than secondary	1887 (6.9%)
N	27289

Table 3: Unadjusted and adjusted Odds Ratio for Anemia in Ethiopia 2016.

Charecteristics	Unadjusted		Adjusted	
	COR (95%CI)	p value	AOR (95%CI)	p value
Age	0.178 (0.169, 0.188)	0	9.952 (6.156, 16.091)	0
Residence				
Urban	1	-	-	-
Rural	0.058 (0.054-0.063)	0	0.029 (0.018-0.048)	0
Region				
Tigray	0.979 (0.730-1.312)	0.886	0.979 (0.730-1.312)	0.886
Afar	0.799 (0.719-0.888)	0	0.821(0.725-0.929)	0.002
Amhara	0.007 (0.005-0.008)	0	not Retained in model	-
Wealth quintile				
Lowest	0.688 (0.634-0.747)	0	1.255 (1.091-1.445)	0.002
Second	1	-	-	-
Marital Status				
Never married	0.090 (0.083-0.097)	0	not Retained in the model	-
Married	1	-	-	-

Backward stepwise model with dichotomous outcome of (0=no anemia; 1=anemia), CI: Confidence Intervals, 1: Reference Category

Demographically, since age is a quantitative numerical variable, an increase in one-year in age has 9.952 (95% CI 6.2 to 16.1) times decrease in odds of having Anemia. Odds of anemia among men and women age 15-49 years in afar region decreased by 18% (AOR 0.821; 95% CI: 0.725-0.929) compared to men and women age 15-49 years residing in Tigray region. Table 3 shows unadjusted and Adjusted Odds Ratios (AOR) that were calculated to determine the strength of association between the co-variates and anemia (Table 3).

DISCUSSION

The overall magnitude of anemia was found to be 19.8% (n=5078) and, this, is, lower, compared, to, previous, studies, 26.2%, 31.0% a study conducted in Gondar, North West Ethiopia (22.4%) and a study conducted in South Africa (25.8%), Arba Minch (52.3%), Dire Dawa (41.2%) and Tikur Anbessa Specialized Hospital (34.6%) [23-29].

It was also lower than the findings of studies conducted in other sub-Saharan countries: Nigeria (67%), Benin City, Nigeria (60.16%) and Tanzania (70.7%) [30-32]. Previous global estimates made by DeMaeyer in 1985 indicated that approximately 30% of the world's population was anemic [33].

Globally, anaemia affects 1.62 billion people which correspond to 24.8% of the population prevalence in men (12.7%). The prevalence of anemia was 27.4% [34-35].

A recent study by Umeta et al. also documented a comparable prevalence of 30.4%. This figure is higher than the 2002 estimate of UNICEF (17.4%) and what has been documented by Hayder et al. (18.4%) in 1999. The overall prevalence of anemia was 40.9 % study done in Egypt (39%) [36-40].

The findings over the decade did not witness tangible progress in the reduction of anemia in Ethiopia. However, the magnitude found in the current study was higher than in studies conducted at Hawassa Referral Hospital (12.0%), Jimma University Hospital (16.2%), and Ras Desta Damtew Memorial Hospital (2.85%) and in Malawi (16.2%) the findings from The People's Republic of China (13.4%), Serbia (7.7%), and Korea (8.4%) [41-47]. Variations in the methods employed, and a larger proportion of nationally representative data, are more likely to account for the differences between these estimates. The differences in the magnitude of anemia may be explained by differences in the study time, study area. Demographically, since age is a quantitative numerical variable, an increase in one-year in age has 9.952 (95% CI 6.2 to 16.1) times decrease in odds of having Anemia.

Studies in Ethiopia and Tanzania reported higher prevalence in older age groups, studies in Tanzania (50) Nigeria and India failed to witness any association [48-52].

As expected, men and women 15-49 years who are in lowest wealth quintile had 25% (AOR 1.255; 95% CI; 1.091-1.445) higher odds of having anemia.

Regarding other socio-demographic factors, being from lower economic and education category, and living in rural areas were identified as predisposing factors to anemia. Hence, empowering women in terms of education and economic status would have positive contributions to avert the problem [53].

In addition, residence they live had significant association with men and women 15-49 years living in rural areas having 97% reduced odds of anemia (AOR 0.029; 95% CI: 0.018-0.048) compared to men and women 15-49 years who had live in urban areas. Odds of anemia among men and women age 15-49 years in afar region decreased by 18% (AOR 0.821; 95% CI: 0.725-0.929) compared to men and women age 15-49 years residing in Tigray region. Anemia prevalence was 20.1% among, urban and 46.6% among rural residents [39].

This observed, high prevalence of anemia among urban residents was similar to the finding from the Ethiopian demographic and health survey 2011, 31% for rural and 16% for, urban. However, this, finding was inconsistent with a study done in central and eastern China, where the, finding was almost the same, 13.6% in urban and 13.3%, in rural areas [54-55].

The possible reasons might be due to low socioeconomic status, low serving of iron-rich, foods, lack of adequate nutrition information and, a high number of illiterates in urban areas as compared, to rural in this study.

CONCLUSION

The magnitude of anemia in the current study was found to be a mild public health problem. Rural residence, low wealth quartile and old age were predictors of anemia among adults Age 15-49 years. There is significant urban-rural difference in anemia prevalence, indicating the need for targeting specific areas for intervention. Therefore, it is recommended that educational empowerment, nutrition education and nutrition service have a

positive contribution in combating anemia in Ethiopia, especially in Urban areas.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study is a secondary data analysis of the EDHS, which is publicly available, approval was sought from MEASURE DHS/ICF International and permission was granted for this use. The original DHS data were collected in conformity with international and national ethical guidelines. Ethical clearance was provided by the Ethiopian Public Health Institute (EPHI) (formerly the Ethiopian Health and Nutrition Research Institute (EHNRI).

Review Board, the National Research Ethics Review Committee (NRERC) at the Ministry of Science and Technology, the Institutional Review Board of ICF International, and the United States Centers for Disease Control and Prevention (CDC). Written consent was obtained from respondents and data were recorded anonymously at the time of data collection during the EDHS 2016.

AVAILABILITY OF DATA AND MATERIALS

The survey datasets used in this study was based on publicly available dataset that is freely available online with no participant's identity from <http://www.dhsprogram.com/data/available-datasets.cfm>. Approval was sought from MEASURE DHS/ICF International and permission was granted for this use.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHORS CONTRIBUTIONS

Abiyu Ayalew Assefa, Kaleab Tesfaye Tegege, Eleni Tesfaye Tegege, and Mekibib Kassa Tessema were involved in formatting the research question. Kaleab Tesfaye Tegege performed the analysis with assistance from Abiyu Ayalew Assefa, Eleni Tesfaye Tegege and Mekibib Kassa Tessema. All authors prepared the initial draft of the manuscript. Eleni Tesfaye Tegege and Kaleab Tesfaye Tegege critically revised the manuscript for intellectual content. All authors approved the final version of the manuscript.

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