

Prevalence of anemia and associated factors among “apparently healthy” urban and rural residents in Gilgel Gibe Field Research Center, Jimma

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Abstract

Introduction: Anemia is the common form of micronutrient deficiency, globally affecting more than 2 billion people. In Ethiopia, anemia affects 17% of women and 11% of men aged 15 to 49 years. Different studies indicated prevalence of anemia varied in all age group in rural and urban areas.

Objective: The aim of this study was to determine prevalence and associated factors of anemia among “apparently healthy” urban and rural residents of Gilgel Gibe Field Research Center.

Methods and Materials: A comparative cross-sectional study was carried out using secondary data of Gilgel Gibe Field Research Center. For the main study, a total of 5500 individuals were taken as a study population using the WHO-STEP wise surveillance manual to estimate prevalence and risk factors of chronic non communicable diseases. Data of 1602 (1258 rural and 344 urban) apparently healthy adults who had information on hemoglobin level were included in the analysis. Data were analyzed by SPSS 20 and separate logistic regression models. Statistical significant was set at P-value < 0.05 with 95 % CI.

Results: The overall prevalence of anemia was 40.9%. Anemia was higher among rural residents (46.6%) than urban residents (20.1%). In urban residents, being male [AOR = 2.15, 95% CI: (1.03, 4.50)], and illiterate [AOR = 5.76, 95% CI: (1.27, 26.07)] were significantly associated with anemia. In rural residents, being female [AOR = 1.78, 95% CI: (1.27, 2.52)], presence of heart disease [AOR = 2.63, 95% CI: (1.09, 6.33)], central obesity [AOR = 1.83, 95% CI: (1.31, 2.57)], and being illiterate [AOR = 3.62, 95% CI: (1.57, 8.35)], and having only a primary school education [AOR = 2.69, 95% CI: (1.08, 6.73)] were significantly associated with anemia.

Conclusions: The overall prevalence of anemia was a severe public health problem according to WHO. There is marked urban - rural variation in anemia prevalence, indicating the need for targeting specific areas for intervention. Strengthening strategies aimed at educational empowerment, nutrition education and nutrition service will have a contribution in combating anemia especially in the rural kebeles of the study area.

Key words: Anemia, apparently healthy

Introduction

Anemia is defined as a low blood hemoglobin concentration (below 130 g/L for men, 120 g/L for non-pregnant women and below 110 g/L in pregnant women (WHO 2011). However, reference range for normal blood hemoglobin levels may vary in individuals depending on the age, gender, race, food habits and geographical location. Pregnant and lactating women, children and elderly people with some underlying disease causing blood loss are at higher risk as compared to other groups of population (Jilani and Iqbal 2010).

Functional consequences of anemia are diverse; it follows the life cycle approach where each stage of life is affected. Inside the mother's womb it decreases fetus' physical growth and may cause mental growth retardation; during childhood it affects cognitive growth and development; during adult hood it decreases physical work capacity, and finally in elderly it affects the quality of life. Moreover, in severe cases it is associated with an increased risk of maternal and infant mortality (AlQuaiz et al. 2013). Anemia is affecting the lives of more than two billion people

(30% of the world's population), which is the most common public health problem particularly in developing countries at all stages of life. An estimated 43% population in developing, and 9% in developed countries are anemic (WHO 2011).

In Ethiopia, anemia affects 17% women and 11% men aged 15 to 49 years (CSA 2012). Institution/hospital-based studies are available regarding prevalence and risk factors of anemia and most of the studies have been conducted on pregnant women, children and adolescents (Gebremedhin et al. 2014; Kassebaum et al. 2014). However, assessing anemia among apparently healthy adults through community-based approach is a crucial component of public health research. Therefore, the aim of this study is to assess the prevalence of anemia and its associated factors among apparently healthy urban and rural adult residents' of Gilgel Gibe Field Research Center, Jimma, Southwest Ethiopia.

Materials and Methods

The data for this comparative cross sectional study were taken from Gilgel Gibe Field Research Center. A

cross sectional study was conducted to assess the prevalence of anemia among “apparently healthy” urban and rural residents in Gilgel Gibe Field Research Center of Jimma University, from late September 2008 to end of January 2009 at which is located around Gilgel Gibe Hydroelectric Dam, 55 kilometers Northeast of Jimma town on the way to Addis Ababa. The center serves as health and demographic surveillance site for Jimma University and comprises of 8 rural and 2 urban kebeles. The study areas were comprised of residents of the 10 kebeles of the center which had about 11,000 households with a total population of 50,000 in the center, where almost entire population was within age range of 15 to 49 years of both sexes. Based on this, a total of 4371, 2653 and 1861 adults in the age group of 15-64 years were included for step I, II and III, respectively. The sample size was allotted to urban and rural strata proportional to their size in a ratio of 25% to 75%, respectively. Furthermore, equal sample was allotted into each sex and age strata. Individual study subjects were then selected using simple random sampling technique.

This study was based on secondary data of Gilgel Gibe Field Research Center of Jimma University. Secondary data were extracted for 1602 individuals whose hemoglobin level was determined and had complete data records. Data on a wide-range of potential independent variables (socio-demographic, economic, dietary intake, nutritional status, and health status, etc.) were extracted from the database using template prepared for this study. Data were cleaned and analyzed using SPSS version 20. Hemoglobin level was adjusted for altitude of respective kebeles and individual smoking status using WHO recommendation. WHO hemoglobin levels were used as cut-off values to classify anemia. Descriptive analysis such as frequency, percentage, mean and standard deviation were performed.

All variables with a P-value < 0.25 at bivariate logistic regression were considered as candidates for multivariable logistic regression models and statistical significance was set at P-value < 0.05. Separate models were fitted; for urban, and rural participants. Variables were entered into the model using the “Enter logistic regression” method. Adjusted odds ratio (AOR) and its 95% confidence interval (CI) were used to measure strength and significance of the association. Ethical approval was obtained from Ethical Review Board of Institute of Health, Jimma University. Additionally, secondary data was accessed and extracted from Gilgel Gibe Field Research Center through legal and official means. The original data were collected from participants in line with national ethical guideline.

Results

Socio-demographic characteristics: Data of 1602 study participants were included in the analysis. Around 1258 (78.5%) of participants were from rural and 344 (21.5%) were from urban. Nearly 207 (60.2%) of urban and 638 (50.7%) of rural participants were females. Larger proportion of study subjects both in urban 94 (27.3%) and rural 290 (23%) were in age group of 55-64 years. More than one third 131 (38.5%) of urban residents were housewives and more than half 729 (58.1%) of rural residents were farmers. Regarding educational status, majorities of the participants were illiterate both in urban 190 (56.7%) and rural 1044 (84.9%) areas (Table 1).

Table 1: Socio demographic characteristics of urban and rural residents, Gilgel Gibe Field Research Center, September 2008-January 2009.

Variables	Urban n = 344 Number (%)	Rural n = 1258 Number (%)
Sex		
Female	207(60.2)	638(50.7)
Male	137(39.8)	620(49.3)
Age group		
15-24	39(11.3)	195(15.5)
25-34	56(16.3)	265(21.1)
35-44	69(20.1)	271(21.5)
45-54	86(25)	237(18.8)
55-64	94(27.3)	290(23.0)
Occupation		
Farmer	39(11.5)	729(58.1)
Housewife	131(38.5)	407(32.5)
Student	12(3.5)	49(3.9)
Employed	109(32.1)	41(3.3)
Unemployed	49(14.4)	28(2.2)
Educational level		
Illiterate	190(56.7)	1044(84.9)
Primary	81(24.2)	137(11.1)
Secondary and above	64(19.1)	48(3.9)
Income		
≤ 500	41(53.2)	508(56.4)
500-1000	18(23.4)	251(27.8)
≥ 1000	18(23.4)	142(15.8)

Prevalence of anemia: After adjusting the hemoglobin value for altitude and smoking, the mean hemoglobin concentration of the study participants was 130 g/L. Overall, 40.9 % were anemic. The prevalence was 20.1 % among urban residents and 46.6 % among rural residents. Regarding degree of anemia, majority of participants 392, (59.8%), urban residents 55, (79.7%) and rural residents 337, (57.5%) had mild anemia (Figure 1).

Factors associated with anemia: In urban residents, in the bivariate analyses sex, age group, educational level, current smoking status, smoking history, and hypertension became candidate variables for multivariable analyses.

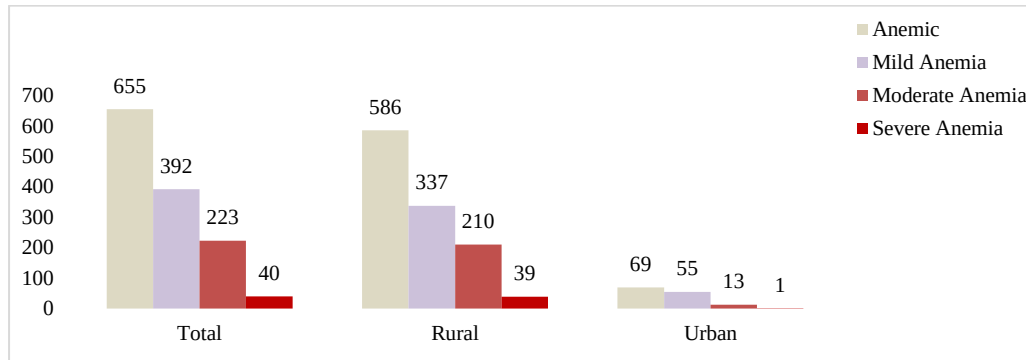


Figure 1: Anemia severity among urban and rural residents, Gilgel Gibe Field Research Center, September 2008- January 2009

In multivariable logistic regression analysis, odds of anemia was found two times higher in males than females [AOR = 2.15, 95% CI: (1.03, 4.50)] and almost six times higher among illiterates than those

who had secondary and above educational level [AOR = 5.76, 95% CI: (1.27, 26.07)] in urban residents (Table 2).

Table 2: Factors associated with anemia in urban residents, Gilgel Gibe Field Research Center, September 2008- January 2009.

Variables	Normal	Anemic	COR (95%)	AOR (95%)
Sex				
Male	99	38	2.17 (1.22 - 3.72)	2.15 (1.03 - 4.50)***
Female	176	31	1	1
Age group				
15-24	32	7	1.04 (0.37 - 2.90)	1.98 (0.12 - 2.20)
25-34	45	11	1.16 (0.47 - 2.87)	2.04 (0.15 - 1.57)
35-44	57	12	1	1
45-54	72	14	0.92 (0.39 - 2.15)	1.98 (0.17 - 1.48)
55-64	69	25	1.72 (0.79 - 3.73)	1.70 (0.21 - 1.62)
Educational level				
Illiterate	151	39	1.58 (0.72 - 0.340)	5.74 (1.26 - 26.00)***
Primary	64	17	1.62 (0.67 - 3.93)	4.67 (0.95 - 22.99)
Secondary and above	55	9	1	1
Current smoking status				
No	259	60	1	1
Yes	16	9	2.43 (1.02 - 5.76)	0.58 (0.16 - 2.10)
History of smoking				
No	257	61	1	1
Yes	17	8	1.98 (0.82 - 4.81)	1.21 (0.28 - 5.06)
Hypertension				
No	257	61	1	1
Yes	17	8	1.98 (0.82 - 4.81)	1.21 (0.29 - 5.06)

*** Significant association at $P < 0.05$, AOR: Adjusted Odds Ratio, COR: Crude Odds Ratio

In rural residents, on the bivariate analyses sex, age group, occupation, educational level, history of smoking, current chat chewing status, presence of heart disease, presence of diabetes, serving of fruit and vegetable, central obesity and body mass index (BMI) became candidate variables for multivariable analyses. In multivariable logistic regression analysis, odds of anemia was 1.78 times higher in females than males [AOR = 1.78, 95% CI: (1.27, 2.52)], 2.63 times higher

in those with heart disease [AOR = 2.63, 95% CI: (1.09, 6.33)], almost twice higher in participants with central obesity [AOR = 1.83, 95% CI: (1.31, 2.57)], 3.6 times higher in illiterates [AOR = 3.62, 95% CI: (1.57, 8.35)] and 2.69 times higher in those who had primary school [AOR = 2.69, 95% CI: (1.08, 6.73)] as compared to those who had secondary and above educational level (Table 3).

Table 3: Factors associated with anemia in rural residents, Gilgel Gibe Field Research Center, September 2008- January 2009.

Variables	Normal	Anemic	COR (95%)	AOR (95%)
Sex				
Male	333	287	1	1
Female	339	299	1.02 (0.82 - 1.28)	1.79 (1.27 - 2.52)***
Age group				
15-24	122	73	0.82 (0.56 - 1.19)	0.65 (0.40 - 1.04)
25-34	153	112	1.15 (0.82 - 1.62)	0.68 (0.46 - 1.01)
35-44	147	124	1	1
45- 54	119	118	1.36 (0.95 - 1.93)	0.67 (0.45 - 0.98)
55-64	131	159	1.66 (1.19 - 2.32)	0.78 (0.52 - 1.17)
Occupation				
Farmer	395	334	2.62 (1.27 - 5.43)	0.72 (0.24 - 2.18)
Housewife	197	210	3.31 (1.58 - 6.92)	0.97 (0.31 - 2.99)
Student	32	17	1.65 (0.65 - 4.15)	1.62 (0.41 - 6.35)
Employed	31	10	1	1
Unemployed	15	13	2.69 (0.96 - 7.52)	2.35 (0.10 - 1.74)
Educational level				
Illiterate	533	511	4.79 (2.22 - 10.34)	3.62 (1.57 - 8.35)***
Primary	86	51	2.97 (1.29 - 6.83)	2.69 (1.08 - 6.73)***
Secondary and above	40	8	1	1
Ever smoke daily				
No	628	536	1.48 (0.95 - 2.30)	0.83 (0.49 - 1.39)
Yes	38	48	1	1
Current chat chewing status				
No	13	23	2.20 (1.09 - 4.44)	1.15 (0.59 - 3.39)
Yes	299	240	1	1
Heart disease				
No	659	564	1	1
Yes	9	18	2.34 (1.04 - 5.24)	2.63 (1.09 - 6.33)***
Diabetes				
Normal	652	559	1	1
Diabetes	20	27	1.56 (0.87 - 2.84)	1.24 (0.39 - 1.66)
Serving of fruit and vegetable				
High	84	61	1	1
Low	556	495	1.23 (0.86 - 1.74)	0.85 (0.57 - 1.27)
Central obesity				
No	426	319	1	1
Yes	169	198	1.57 (1.22 - 2.01)	1.83 (1.31 - 2.57)***
BMI				
Underweight	280	266	3.48 (0.96 - 12.62)	1.65 (0.29 - 9.10)
Normal	304	247	2.98 (0.82 - 10.79)	1.95 (0.37 - 10.21)
Overweight	11	3	1	1

*** Significant association at P value < 0.05 , AOR: Adjusted Odds Ratio, COR: Crude Odds Ratio

Discussion

This study has determined prevalence of anemia among rural and urban residents. The overall magnitude of anemia (40.9%) was of severe public health significance (WHO 2011). This prevalence (40.9%) was comparable with study done in Egypt (39%) (Afaf et al. 2015). However, the finding was much higher than the findings from China 3.4% (Li et al. 2015), Serbia 7.7% (Jovanka et al. 2014), and Korea 8.4% (Lee et al. 2014). This discrepancy might attribute to the difference in socio-economic and educational status, and dietary intake.

In this study, anemia prevalence was 20.1% among urban and 46.6% among rural residents. This observed higher prevalence of anemia among rural residents was similar with the finding from Ethiopian demographic and health survey 2011, 31% for rural and 16% for urban (CSA 2012).

Regarding factors associated with anemia among urban residents', males' were twice more likely to develop anemia [95% CI: (1.03, 4.50)] than females. This finding contradicts with the finding from Serbia (Jovanka et al. 2014), Korea (Lee et al. 2014) and, Central and Eastern Asia (Li et al. 2015). The possible discrepancy might be due to high substance use in males, which might have contributed for the observed higher prevalence. Unlike urban population, in rural residents, females were almost two times more likely to develop anemia than males [95% CI: (1.27, 2.52)], Similar finding was observed from West Bengal India (Amitava et al. 2014). The higher prevalence of anemia among rural women is likely related to lack of adequate nutrition education during pregnancy, inadequate dietary intake, inaccessibility of health care service and high blood loss during delivery (Kefiyalew et al. 2014; Wojtyła et al. 2011).

In this study, education remained one of the factors associated with anemia, illiterate urban residents were six times more likely to develop anemia as compared to those who had secondary and above educational level [95% CI: (1.27, 26.07)]. A similar finding was observed in rural residents, illiterates were almost four times more likely to develop anemia as compared to respondents who had secondary and above educational level [95% CI: (1.57, 8.35)], and those who had primary education, were 2.69 times more likely to develop anemia than those who had secondary and above educational level [95% CI: (1.08, 6.73)]. This finding was supported by reports of studies from Gondar (Alem et al. 2013) and a study based on secondary data of EDHS 2005 (Gebremedhin et al. 2014).

Rural residents, who had heart disease, were 2.63 times more likely to develop anemia than their counterparts [95% CI: (1.09, 6.33)]. This finding was in line with the findings from meta-analysis of 34 CHF studies (Pereira et al. 2013) and study done in Canada (Ezekowitz et al. 2017). Rural residents who had central obesity were almost twice more likely to develop anemia [95% CI: (1.31 - 2.57)]. This finding was similar with findings of cross-sectional studies done in USA and Saudi Arabia, where waist to hip ratio had statically significant association, with anemia. However, a study done in china indicated that women with central obesity were less likely to have anemia (Qin et al. 2013). This discrepancy might be due to increased iron requirement and reduced absorption in obese individuals which might lead to higher prevalence of anaemia in obese individuals.

The major strength of this study was its large sample size. However, this study also had some limitations. So the findings of this study should be interpreted with caution. First, time of data collection to secondary analysis and presence of missing data were potential limitations. Second, anemia was determined by hemoglobin value, biochemical tests like serum ferritin was not employed. Helminthic infections burden hadn't been determined.

Conclusions

The overall prevalence of anemia in the study area is high that it is classified as severe public health problem according to WHO (2011). There is marked urban - rural variation in anemia prevalence, indicating the need for targeting specific areas for intervention. Strengthening strategies aimed at educational empowerment, nutrition education and nutrition service for non-communicable/lifestyle diseases could have positive contribution in combating anemia in the study area especially in rural 'kebeles'.

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Conflict of interests: The authors declare that they have no competing interests.

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