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A Study to Assess the Incidence and Level of Knowledge about Anemia among Pregnant Women Selected Hospitals of Bagalkot Karnataka

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Abstract: ***Background and Objective: Anemia in pregnancy is a public health problem in developing countries. This study aimed to determine the prevalence, risk factors, and adverse perinatal outcomes of anemia among pregnant women in selected hospitals of Bagalkot. Methods: This was a follow - up study conducted from 2021 to 2022. A total 220 pregnant women were enrolled in this study. Interviews were conducted followed by determination of hemoglobin level. Women were followed up at delivery and at 7 days and 28 days after delivery. Results: A total of 220 women were included in this analysis. Their mean age was 25.8 (SD5.73). The prevalence of anaemia was 18.0% and 2% had severe anemia during pregnancy. At delivery, there were 10 stillbirths, 16 low birth weight (LBW) newborn, and 2 preterm birth cases. No association was found between anemia and LBW, preterm birth, or stillbirths. Conclusion: Anemia in pregnancy was a mild public health problem in the study setting of selected hospitals of Bagalkot Karnataka.***

Keywords: Anemia, Pregnant Women, Pregnancy

1. Introduction

Anemia during pregnancy is a public health problem especially in developing countries and is associated with adverse outcomes in pregnancy [1]. World Health Organization (WHO) has defined anemia in pregnancy (Hb) concentration of less than 11 g/dl [2]. According to (WHO), anemia is considered to be of a public health significance or problem if population studies find the anemia prevalence of 5.0% or higher. Prevalence of anemia of > - 40% in a population is classified as a severe public health problem [3].

Global data shows that 56% of pregnant women [1]. The chronic infections like TB and HIV [7 - 11]. Contributions of each of the factors that cause anemia during pregnancy vary due to geographical location, dietary practice, and season. But in Karnataka inadequate intake of diets rich in iron is reported as the leading cause of anemia among pregnant women [10, 11].

Anemia during pregnancy is reported to have negative maternal and child health effect and increase the risk of maternal and perinatal mortality [12, 13]. The negative health effects for the mother include fatigue, poor work capacity, impaired immune function, increased risk of cardiac diseases, and mortality [1, 13, 14]. Some studies have shown that anemia during pregnancy contributes to 23% of indirect causes of maternal deaths in developing countries [1].

Anemia in pregnancy is associated with increased risk of preterm birth and low birth weight babies [1, 6]. Preterm and LBW are still the leading causes of neonatal deaths in developing countries like India contributing to 30% of the deaths [16]. It has also been associated with increased risk of intrauterine growth restriction (IUGR) which is a risk for stunting among children of less than two years [6, 7].

India as a country has strengthened different interventions to reduce the burden of anemia during pregnancy. The interventions during pregnancy include anemia screening during pregnancy and treatment, giving a combination of folic acid (FeFo) and iron supplements for three months, intermittent prophylaxis treatment for malaria with sulfadoxine pyrimethamine (SP) from 14 weeks, free provision of mosquito treated nets, and health education during the antenatal visits [18]. Few studies have evaluated the burden of anemia and its effect in pregnant outcomes in India after scaling of preventive interventions. Data for studies by some of the researcher of 2018 - 19 were collected. Between 2015 - 2018, before strengthening interventions targeting anemia in pregnancy and interventions improving overall maternal and neonatal health. There is a need of having current information on burden and effects of anemia during pregnancy after these multiple interventions. Therefore, this study aims to determine prevalence, risk factors, and associated perinatal adverse perinatal outcomes of anemia during pregnancy.

2. Methods

2.1 Study Design and study setting

The study was part of larger cohort study that aimed to describe the effects of sexually transmitted infections/Reproductive tract infections and anemia on pregnancy outcomes and child growth in selected area Bagalkot, Karnataka [19]. The study was conducted between October 2021 and June in selected area of Bagalkot.

The larger study enrolled women in their third trimester of pregnancy and followed them at birth, at 7 days post delivery, monthly up to 9 months and every post delivery. Enrollment of pregnant women was conducted in October 2018 and follow up mothers and their infants up to 9 months was completed in June 2021. This paper used that was collected from enrollment up to seven days post delivery.

In that selected area we have selected 4 areas total population 5056 and 657 women of reproductive age. The total deliveries in PHC 342 deliveries 256 health workers the health care centers are provide services to approximately 243 pregnant women.

2.2 Sample Size Calculations

Sample size was estimated by using the following formula. The minimum sample that was required for this study was 243 pregnant women.

$$N=z^2*p\ (1 - p)$$

Where N is estimated minimum sample size; Z is confidence level at 95% (standard value is 1.96); p is proportion (prevalence of anemia during pregnancy 53% 2018); is precision at 95% CI=0.05.

$$N= (1.96)^2 x0.53\ (1 - 0.53)$$

2.3. Study population and procedures.

The study population included all pregnant women who were in their third trimester and attending for routine care at the two primary health care clinics between October 2013 and April 2014. The study excluded women who reported they will relocate/move after delivery and those who did not consent.

Women were informed about the study aims and follow up schedule and those agreeing to participate gave a signed consent. Face –to - face interviews using questionnaire were conducted trained research assistants who were nurses/doctors and underwent one - week training. The interviews were conducted in kannada and English language. The information collected included social demographic characteristics, economic characteristics, reproductive health history, feeding practices, and intended place of delivery. After the interviews, clinical examinations were conducted and blood sample was collected for diagnosis of HIV, STIs, and hemoglobin levels [19].

A Total of 243 pregnant women were enrolled, but analysis was done on 220 women who had complete information of hemoglobin levels; see figure 1.

2.4 Data processing, Categorization, and Analysis

The data were entered, cleaned, and analyzed by using SPSS version 20. Descriptive statistics was used to summarize data. Proportion was used for categorical variables and mean or median with respective measures of dispersion for numerical variables. The Odds Ratio (OR) with 95% Confidence Interval (CI) was used to measure the strength of association between anemia and exposure variables (socio demographic, economic, nutrition, and reproductive health characteristics) as well as association between anemia and adverse pregnancy outcomes (LBW, preterm, and stillbirth), logistic regression analysis was performed to control for the confounders. The *p* value of less than 0.05 was considered as a statistically significant result.

Categorization of Variables

A pregnant women was considered anemic if hemoglobin was <11g/dl [2]. Severity of anemia was measured as follows: mild if Hb was 9/0 - 10.9g/dl; moderate if Hb was 7.0 - 8.9g/dl; and severe if Hb was, 7.0g/dl [2]. Age of participants which was collected as numerical variable was categorized (14 - 24, 25 - 34, and 35 - 49), as well as income per month, <60, 000 and >20, 000) partners age (15 - 24, 25 - 34, and 35+), being gravid (first, second, third, or more pregnancies), parity (1, 2, 3, and 5+) frequency of antenatal care visits (1, 2, 3, and 4+), pregnancy interval (<37 and > - 37), and number of meals per day (1, 2 or 3 or more meals per day). Preterm delivery was categorized as <37 weeks of gestation age, low birth weight was categorized <2500 grams and early neonatal death is the death during the first 7 days of life [22].

2.5. Ethical Consideration

The permission to conduct this study was sought from Shri. BVVVS Institute of nursing Sciences Bagalkot committee. The study was granted ethical clearance certificate, participants who were enrolled gave a signed consent. Participants who were found to have anemia received free treatment and counseling according to National treatment guidelines. Numbers instead of names were used in all the questionnaire and laboratory forms.

3. Results

3.1. Demographic and reproductive health Characteristics of the Women

The age of the 220 participants ranged from 15 to 46 years with mean age of 25.8 (SD 5.73) years. Majority of the participants were married / cohabiting, 135 (89%) and unemployed, 102 (61.1%), and 76 (67.9%) this was their second or third antenatal visit, and 88% reported they have received iron supplementation during current an pregnancy, Table 1. Most of the women (89%d) reported an interpregnancy.

Table 1: Socio demographic and reproductive health characteristics of the pregnant women (N=220)

Variable name	Number %
Mothers characteristics	
Age (years)	
14 - 24	20.10%
25 - 34	19.30%
35 - 49	4.40%
Level of education	
None	1.10%
Primary	25.40%
Secondary or higher	14.50%
Maritalstatus	
Married	34%
Single/widow/divorced	5.60%
Occupation	
Unemployed	47.50%
Employed	4.50%
Businessman	48%
Income category for women	
<60, 000 Tsh	67.90%
60, 000 - 200, 000Tsh	27.30%
>20, 000Tsh	4.80%
Alcohol intake	
No	86.40%
Yes	13.60%
Gravida	
First pregnancy	35.20%
Second pregnancy	32.10%
Third pregnancy and above	32.70%
Inter pregnancy interval	
<24 months	10.60%
>_ 24 moths	89.40%
Antenatal care visit current	
1 visit	3.30%
2 - 3 visits	65.60%
4+ visits	31.10%
Have received irons supplementation at current pregnancy	
No	12.40%
Yes	87.60%
Pica habits during this pregnancy	
No	38.00%
Yes	62.00%
HIV status at current pregnancy	
Negative	93.80%
Positive	6.10%

*Variables with missing information.

Interval of> - 24 months. Other demographic and reproductive health characteristics at shown in Table1.

3.2 Prevalence of anemia among pregnant women

The prevalence of anemia was 18.0% (n=95). Forty women had mild, 43 moderate, and 12 severe anemia, Figure 2.

3.3. factors associated with anemia in pregnancy. Table 2 shows association between anemia and several predictor variables. Women who were recruited from private clinic had two times higher odds being anemic (OR; 2.1; 95% CI 1.3 - 3.3) compared to women with secondary education Anemia.

Table 2: Sociodemographic, nutrition, and reproductive characteristics factors associated with anemia in pregnancy (N=220)

Variable	Anemia (Hb<11gm/dl) n%	unadjusted	P value
Name of clinic enrolled			
Private clinic	29 (12.3)	1	0.003
Govt hospital	66 (22.4)	21 (1.28 - 3.31)	
Age (years)			
14 - 24	48 (18.5)	1	
25 - 34	43 (19.2)	1.04 (0.66 - 1.65)	0.852
35 - 49	4 (8.7)	0.42 (0.14 - 1.22)	0.112
Level of education			

None	5 (41.7)	1	
Primary	61 (19.1)	0.33 (0.10 - 1.07)	0.66
Secondary or higher	29 (14.7)	0.24 (0.07 - 0.81)	0.022
Marital status			
Married	84 (17.8)	1	0.991
Single/widow/divorced	10 (17.9)	1.0 (0.5 - 2.1)	
Income categoryfor women			
<60, 000Tsh	65 (18.3)	1	
60, 000 - 200, 000Tsh	23 (16.1)	0.7 (0.5 - 1.4)	0.556
>20, 000Tsh	5 (20.0)	1.1 (0.4 - 3.1)	0.833
Gravida			
1st pregnancy	34 (18.2)	1	
2ndpregnancy	33 (19.5)	1.2 (0.7 - 2.0)	0.600
> - 3rd pregnancy	28 (16.2)	1.3 (0.7 - 2.2)	0.435
Have received iron Supplementation at current pregnancy			
No	8 (25.0)	1	
Yes	49 (18.2)	0.7 (0.3 - 1.6)	0.357
HIV status at current pregnancy			
Negative	13 (29.5)	1	
Positive	63 (20.2)	0.6 (0.3 - 1.2)	0.160
Number of meals taken per day			
1 meal per day	90 (18.1)	1	
2meals per day	5 (15.6)	0.2 (0.2 - 1.0)	0.719
3+ meals pre day	68 (21.6)	0.4 (0.10 - 1.7)	0.550
History of food insecurity within past 12 months			
No	74 (21.6)	1	
Yes	2 (15.4)	0.7 (0.1 - 3.0)	0.592
Pica habits			
No	29 (21.5)	1	
Yes	47 (21.3)	1.0 (0.6 - 1.7)	0.962

Table 3.1: Logistic regression analysis of factors influencing anemia in pregnancy

Variable	Adjusted OR (95%CI)	P value
Age group (years)		
15 - 24	1	
25 - 34	0.96 (0.59 - 1.53)	0.85
35 - 49	0.42 (0.14 - 1.24)	0, 114
Education of the women		
None	1	
Primary	0.28 (0.08 - 0.94)	0.04
Secondary or higher	0.21 (0.06 - 0.74)	
Name of the clinic enrolled		
Private clinics	1	0.015
Govt hospital	2.06 (1.26 - 3.36)	0.004

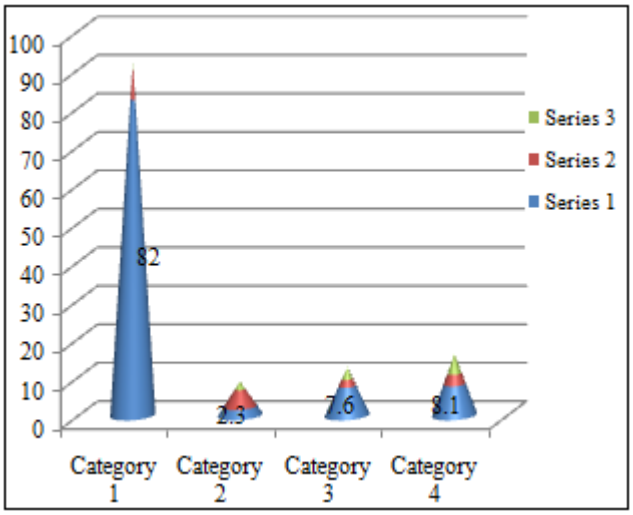

Figure 2: Severity of anemia in pregnancy among women in private hospital

Or higher had 76% less odds of having anemia compared to others. Other factors like age, marital status, occupation, income, and alcohol intake were assessed but were not associated with anemia during pregnancy.

Women who attended ANC or more times had lower prevalence of anemia (17.4%) than those who attended only once (35.3%): women who reported having received iron difference was not statistically significant. . other factors that were analyzed but were not associated with anemia during pregnancy include gravida, parity, history of miscarriage, pica habits, HIV status, and gestational age.

Food security or household characteristics (water source for sanitation, owning toilet facility, household ownership, land ownership, history of food insecurity, number of meals taken per day, and intake of meat or fish) were assessed but none was associated with anemia in pregnancy.

Table 3 shows the results of logistic regression analysis. Education and clinic of enrolment remained significantly associated with anemia in pregnancy. women enrolled at public health 'center had twice the odds of being anemic compared to women with primary and secondary education or more had 72% and 79% significantly less odds of having anemia compared to women with no formal education.

3.4. Birth Out comes among women in private clinic.

Among 220 pregnant women who had complete information on Hb, 83.6% (n=212) had delivery information, Figure 1. There were no difference in anemic status between those women who had information at delivery and those who did

not have information at delivery and those who did not have information at delivery (p=0.849).

At delivery, there were 10 stillbirths (2.3%), 16 low birth weight newborns (3.6%), and 2 (0.45%) preterm birth cases. Two out of 56 infants died within the first 7 days (0.5%).
No association was found between anemia and low birth weight, preterm birth, or stillbirths in private clinics, Table 4.

4. Discussion

The study findings showed that prevalence of anemia during pregnancy from the two selected health centers in private clinics was 18.0%. the clinic of recruitment and secondary or higher education among women were factors that were associated with anemia in pregnancy. Anemia in pregnancy was not associated with adverse pregnancy outcomes in these settings.

The prevalence of anemia in the selected two clinics was lower compared to 47.4% as reported by Msuya and colleagues who collected their data about twelve years ago [7]. This may imply an improvement in maternal nutrition in this setting as well as general health and care during pregnancy. Over the years, the government has strengthened the antenatal care (ANC) services and every pregnant woman is given iron supplementation n to combat anemia, deworming, malaria prophylaxis, and mosquito nets [23]. Nowadays pregnant women have to take malaria prophylaxis and deworms in front of the health care provider. This increases the uptake

Table 4: pregnancy outcomes by anemia status (N=220)

Variable	N	Anemia (Hb<11gm/dl) n (%)	*P* value
Pre term delivery			
No	188	89 (20.2)	-
Yes	2	0 (0.0)	-
Low birth weight (<2500gms)			
No	104	89 (20.9)	-
Yes	16	0 (0.0)	-
Early neonatal death (N=56)			
No	54	79 (18.2)	-
Yes	2	0 (0.0)	-
Still birth			
No	115	79 (18.3)	
Yes	5	1 (0.0)	0.508

Of medicational and hence prevents anemia that can be caused by mosquitoes or helminthes. The prevalence of Anemia during pregnancy has been reported by other researchers to range from 32% to 62.2% [6, 7, 24].

Women who had secondary or higher education were less likely to be anemic compared to their counterparts. Education has been reported to reduce the risk of being anemic in several studies. Educated pregnant women have better income and eat nutritious food and hence do not get nutritional anemia [5]. A study in Ethiopia also reported higher prevalence of anemia among pregnant women who had no education [25]. Secondary and higher Education had been associated with several other good material and child outcomes like higher frequency of exclusive breast feeding, attending for antenatal care visits for 4 or more recommended visits, utilization of skilled attendance during delivery, and health care seeking when the children have pneumonia or malaria [5]. Women education and empowerment are not within health sectors and there is a need for multi sectorial collaboration in combating anemia and other maternal health problems.

This study was shows that women who were recruited from Pasua clinic were two times more likely to be anemic than women who were recruited from Basava clinic. Previous studies have shown that woman living in pasua have poor living standards and low income of less than 50.000 per year, compared to woman at rural [7]. Poor income leads to limited access to nutritious diets and is associated with poor eating habits that might lead to anemia. A study in Ethiopia showed that women with low income were more anemic than women with higher income [26.27].

In this study there was low occurrence of negative pregnancy outcomes: LBW (3/6%), preterm births (0.5%), and still births (2.3%). The occurrence of negative birth outcomes was low compared to national prevalence of 13% for LBW and 12.7% for preterm birth [28]. This is country to findings by other researcher's birth [28]. This is contrary to findings by other researchers in Dar es Salaam and Moshi, Karnataka conduct the study in private hospital. The author would also like to thank Beatrice Kisanga, Anna – Maria Mlingi, Adventina Mlaki, Simphorosa Mshanga, and DeoKiwali for their different roles in this study [6, 7], and researchers in Ethiopia, India, and Pakistan [15, 27].

Strength and weakness of the study
Diagnosis of anemia was based on laboratory analysis and did not depend on clinical assessment as reported by other researchers. Information on birth outcomes for women who were lost to follow - up, from enrolment to delivery might have affect the prevalence of birth outcomes. It may be that those who were lost to follow - up experienced negative pregnancy outcomes and did not see the importance of returning for follow - up, hence underestimating occurrence of pregnancy outcomes. The other causes of negative birth outcomes like diabetes and preeclampsia were not assessed.

5. Conclusion

Anemia in pregnancy was a mild public health problem in Karnataka. The main risk factors were found to be the place off residence and education level of the pregnant woman. Ongoing interventions to target anemia during pregnancy seem to be working in this setting and they should reach universal coverage. Further we recommend ongoing education about effects of anemia especially among woman with low education and population of adolescent women and women of reproductive age in general.

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