

## Original Research Article

# Prevalence of anaemia and its associated factors among the pregnant women receiving antenatal care in a maternity hospital, Bengaluru

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**Received:** 16 October 2019

**Revised:** 19 November 2019

**Accepted:** 20 November 2019

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## ABSTRACT

**Background:** Anaemia affects 1.62 billion people globally which corresponds to 24.8% of the population and the prevalence of anaemia in pregnant women is 56 million. In India 16% of maternal deaths are attributed to anaemia with prevalence of 50.3%. Hence, this study was done to assess the prevalence of anemia and its associated factors among the pregnant women attending the maternity hospital.

**Methods:** A hospital based cross section study was done among pregnant women receiving antenatal care over a period of 2 months. Based on the prevalence rate of anaemia; 39.6%, the estimated sample size was 368. Haemoglobin was estimated by cyanmethaemoglobin method. All pregnant women who voluntarily agreed to participate were selected by systematic sampling method.

**Results:** Majority of subjects were in the age group of 15 to 24 years, 60.6%. Nearly 90% were Hindus, 83.2% were homemakers and 62% belonged to nuclear family. The prevalence of anaemia was 56% in which 46.6% had mild anaemia, 51.9% had moderate and 1.5% were severely anaemic. Univariate analysis showed religion, occupation, gestational age and history of abortion being associated with anaemia. In multivariate analysis women in first trimester of pregnancy and history of abortion were significant factors for anaemia.

**Conclusions:** In developing nations like India anaemia is a major public health problem contributing to maternal and infant mortality and morbidities; henceforth there is a need for an effective intervention in the form of health education modules to the community and nutritional counseling for women in the reproductive age group about the importance of Iron supplementation during antenatal period.

**Keywords:** Anaemia, Prevalence, Pregnant women

## INTRODUCTION

Anaemia characterised by decreased concentration of haemoglobin, is one of the most common nutritional deficiency diseases observed globally as it affects more than a quarter of world's population. It is a major public health problem affecting all ages of the population with its highest prevalence among children under five years of age and pregnant women.<sup>1</sup> Globally anaemia affects 1.62 billion people which corresponds to 24.8% of the

population and the prevalence of anaemia in pregnant women according to WHO is 56 million.<sup>2</sup> In India 16% of maternal deaths are attributed to anaemia and as per the NFHS 4 report the prevalence of anaemia during pregnancy is 50.3%.<sup>3</sup>

World Health Organization (WHO) as categorized and emphasized on the significant health consequences based on the prevalence of anemia. If the prevalence of anemia is 4.9% or less, it is considered as no public health

problem for that country. The prevalence of anemia between 5.0% and 19.9% indicates a mild public health problem, considered moderate when the prevalence is between 20.0% and 39.9% and if the prevalence is 40.0% or more, it is considered as severe public health problem.<sup>4</sup>

Anaemia associated with iron deficiency may adversely affect the cognitive and motor development and may impair cellular immune response and increased susceptibility to infections. Anaemia in pregnancy can lead to Low birth weight along with increased risk of Perinatal and maternal mortality.<sup>5</sup> Mild anemia may not have any effect on pregnancy and labour except that the mother will have low iron stores and may become moderately to-severely anemic in subsequent pregnancies. Moderate anemia may cause increased weakness, lack of energy, fatigue and poor work performance. Severe anemia, however, is associated with poor outcome. The woman may have palpitations, tachycardia, breathlessness and increased cardiac output leading on to cardiac stress which can cause de-compensation and cardiac failure which may be fatal.<sup>6</sup> The relative contribution of each of these factors to anemia during pregnancy depends greatly on geographical location, season, and dietary practices.<sup>7</sup>

The high rates of anemia among Indian women reflect their social and biological vulnerability both within the society and household. Common customs and cultural taboos often aggravate the anemic status of these women. Some of these like eating last in the family, open air defecation, walking barefoot outside, early age at marriage, teenage pregnancy are still rampant in rural areas of our country. Coupled with this, poverty, illiteracy and unemployment take a heavy toll on the anemic pregnant women.<sup>8</sup>

Anaemia during pregnancy remains one of the India's major public health problems. In developing countries like India with prevalence rate of 50.3%, anaemia causes increased morbidity and mortality during pregnancy leading to maternal and fetal consequences like Low birth weight, infant mortality rates and maternal mortality rates. Hence this study was done to assess the prevalence of anaemia and its determinants among pregnant women who were receiving antenatal care in the maternity hospital of Bengaluru.

## **METHODS**

A hospital based cross sectional study was conducted in the maternity hospital attached to the department of Community Medicine of a medical college, Bengaluru over a period of 2 months from July 2018 to September 2018. Pregnant women (15-45 yrs) age group receiving antenatal care at a maternity hospital in Bengaluru were included and those with reported bleeding disorders like thrombocytopenia, haemophilias, thrombotic micro-angiopathies and Von Willebrand disease were excluded from the study. Based on the prevalence rate of anemia of

39.6% as per the NFHS-4 report, Karnataka and at 5% of precision the estimated sample size was found to be 368.<sup>3</sup> Data was collected through an interview method by systematic random sampling method. As per the ANC register reviewed till June 2018 in the maternity hospital, a minimum of 20 pregnant women visit daily for antenatal care. Data was collected over a period of 2 months, where around 1000 pregnant women were expected to visit for antenatal care. An estimated pregnant women (of 1000) divided by a minimum sample size of 368 gave an average sampling interval of 3 ( $K^{th}=3^{rd}$ ). First pregnant women were selected randomly and from there every 3rd women was interviewed till the sample size was achieved.

Initially a pilot study was done among 30 antenatal mothers attending the maternity hospital to check for the feasibility of study tool. The study tool contained details of socio demographic profile and factors associated with anaemia. The study participants were interviewed using a pretested semi structured questionnaire after obtaining a written informed consent. Haemoglobin estimation was done during their visits by Cyanmethaemoglobin method by using blood collected by finger prick under aseptic precautions. Anonymity of the study participants was maintained.

Principle of Cyanmethaemoglobin method is where blood is diluted in a solution containing potassium cyanide and potassium ferricyanide. Potassium ferricyanide converts Haemoglobin to Methaemoglobin which is in turn converted to Cyanmethaemoglobin by potassium cyanide. The absorbance of the solution is then measured in a spectrophotometer at a wavelength of 540 nm or in a colorimeter using a yellow green filter.<sup>9,10</sup>

## **Operational definition**

Anaemia is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by age, sex, altitude, smoking and pregnancy status.

Pregnant women are said to be anemic when hemoglobin levels are below 11 g/dl in first trimester, 10.5 g/dl in the second trimester and 11 g/dl in the third trimester. According to the ICMR classification of anemia, the severity of anaemia is graded as mild (10-10.9 g/dl), moderate (9.9-7 g/dl), severe (6.9-4) and very severe as hemoglobin of <4 g/dl.<sup>11</sup>

## **Statistical analysis**

The data was initially coded and then entered in Microsoft excel and after initial data cleaning the data was analysed using SPSS version 20.0. The collected information was presented using descriptive statistics such as frequency, mean, percentages. The inferential statistics used was chi-square test. Multivariate analysis

was done to see the association of independent risk factors with anemia. A p value of <0.05 was considered to be as significant. The study was approved by Institutional Ethics committee.

## RESULTS

Out of 368 study subjects enrolled in the study, majority of them were in the age group of 15 to 24 years (60.6%)

with minimum age of 18 years and maximum age of 38 years and the mean age of the subjects was 23.87±3.63 years. Majority were Hindus 329 (89.4%), 40.2% studied upto higher secondary, 83.2% were homemakers, 48.9% were from class II socioeconomic status, 62% belonged to nuclear family and 89% had mixed dietary habits. Table 1 describes the socio demographic details of study subjects.

**Table 1: Socio-demographic profile of study participants (n=368).**

Socio-demographic variables	Frequency	Percentage (%)
<b>Age group (years)</b>		
15-24	223	<b>60.6</b>
25-34	139	37.8
>34	6	1.6
<b>Mean age±SD (years)</b>	23.87±3.63	
<b>Religion</b>		
Hindu	329	<b>89.4</b>
Muslims	31	8.4
Christians	7	1.9
Others	1	0.3
<b>Type of family</b>		
Nuclear	228	<b>62</b>
Joint	92	25
Extended	48	13
<b>Educational status</b>		
Illiterate	12	3.3
Primary to middle school	44	12
High school	131	35.6
Higher secondary (PUC)	148	<b>40.2</b>
Graduate	33	9
<b>Occupation</b>		
Skilled	9	2.4
Semi-skilled	32	8.7
Laborer	21	5.7
Homemaker	306	<b>83.2</b>
<b>Socio economic status (Modified B.G Prasad Classification)</b>		
Class I	88	23.9
Class II	180	<b>48.9</b>
Class III	75	20.4
Class IV	23	6.2
Class V	2	0.5
<b>Dietary habits</b>		
Vegetarian	42	11.4
Mixed diet	326	88.6

Significant values are in bold.

**Table 2: Prevalence of anaemia in study population (n=368).**

	Frequency	Percentage (%)
<b>Prevalence of anaemia</b>		
Anaemic	<b>206</b>	<b>56</b>
Non anaemic	162	44
<b>Severity of anaemia</b>		
Mild	96	46.6

Continued.

	Frequency	Percentage (%)
Moderate	<b>107</b>	<b>51.9</b>
Severe	3	1.5
<b>Prevalence based on gestational age</b>		
First trimester	44	21.4
Second trimester	80	<b>38.8</b>
Third trimester	82	<b>39.8</b>

Significant values are in bold.

**Table 3: Determinants of factors associated with anaemia.**

Risk factors	Disease status		Total N (%)	Chi square P value
	Anaemic (n=206) N (%)	Non anaemic (n=162) N (%)		
<b>Religion</b>				
Hindu	189 (91.7)	140 (86.4)	329 (89.4)	0.014
Muslim	11 (5.3)	20 (12.3)	31 (8.4)	
Christian	6 (2.9)	1 (0.6)	7 (1.9)	
Others	0	1 (0.6)	1 (0.3)	
<b>Occupation</b>				
Skilled	8 (3.9)	1 (0.6)	9 (2.4)	<b>0.042</b>
Semi-skilled	22 (10.7)	10 (6.2)	32 (8.7)	
Laborer	14 (6.8)	7 (4.3)	21 (5.7)	
Homemaker	162 (78.6)	144 (88.9)	306 (83.2)	
<b>Any particular food withhold during pregnancy</b>				
No	165 (55.6)	132 (44.4)	297 (100)	0.73
Yes	41 (57.7)	30 (42.3)	71 (100)	
<b>Craving for non-food items</b>				
No	199 (55.4)	160 (44.6)	395 (100)	0.182
Yes	7 (77.8)	2 (22.2)	9 (100)	
<b>History of abortion</b>				
Nil	172 (54.6)	143 (45.4)	315 (100)	0.007
One	33 (71.7)	13 (28.3)	46 (100)	
More than two	1 (14.3)	6 (85.7)	7 (100)	
<b>Gestational age</b>				
First trimester	44 (68.8)	20 (31.2)	64 (100)	0.05
Second trimester	80 (55.6)	64 (44.4)	144 (100)	
Third trimester	82 (51.2)	78 (48.8)	160 (100)	
<b>Spacing between pregnancy and anaemia</b>				
Less than or equal to 2 years	47 (65.3)	25 (34.7)	72 (100)	0.255
More than 2 years	59 (56.7)	45 (43.3)	104 (100)	

Significant values are in bold.

**Table 4: Multiple binary logistic regression to see the association of independent factors with anaemia.**

Covariates/ Independent factors	B	S.E.	Wald	P value	Adjusted Odds ratio	95 % C.I. for OR	
						Lower	Upper
<b>Religion</b>							
			5.608	0.132			
Hindu	21.851	4.02	0.000	1.000	3.09	0.000	-
Muslim	21.102	4.02	0.000	1.000	1.46	0.000	-
Christian	23.394	4.02	0.000	1.000	1.44	0.000	-
<b>Occupation</b>							
			5.064	0.167			
Skilled worker	1.699	1.080	2.475	0.116	5.470	0.658	45.440
Semi-skilled worker	0.479	0.419	1.307	0.253	1.614	0.710	3.667
Laborer	0.648	0.496	1.706	0.192	1.911	0.723	5.051

Continued.

Covariates/ Independent factors	B	S.E.	Wald	P value	Adjusted Odds ratio	95 % C.I. for OR	
						Lower	Upper
<b>Gestational age</b>			4.977	0.083			
First trimester	0.738	0.333	4.914	<b>0.027</b>	<b>2.091</b>	1.089	4.015
Second trimester	0.241	0.240	1.012	0.314	1.273	0.796	2.036
<b>H/O abortion</b>			8.280	<b>0.016</b>			
Nil	2.017	1.097	3.379	0.066	7.519	0.875	64.616
More than or equal to 1	2.787	1.142	5.950	<b>0.015</b>	<b>16.229</b>	1.729	152.325

The overall prevalence of anaemia was found to be 56% where 46.6% of them had mild anaemia, 51.9% had moderate and 1.5% being severely anaemic. Majority of the subjects who were anaemic were found to be in their third and second trimester (39.8% and 38.8%) of pregnancy respectively (Table 2). Univariate analysis showed a significant association of anaemia with religion, occupation, gestational age and history of abortion ( $p < 0.05$ ). Table 3 determines the factors associated with anaemia using inferential statistics. After adjusting for other variables multivariate analysis was done, which showed women in first trimester of pregnancy having 2.09 times increased risk and those with history of more than 1 abortion with 16 times more risk of developing anaemia ( $p < 0.05$ ). Table 4 determines the association of independent risk factors with anaemia using logistic regression analysis.

## DISCUSSION

In the current study, out of 368 study participants, majority of them belonged to 15 to 24 years of age group, 223 (60.6%) and the mean age was  $23.8 \pm 3.7$  years and this reflected the findings of Okube et al where 40.3% belonged to 18 to 24 years with mean age of  $26.4 \pm 4.7$  years and 48.5% were in the age group of 15 to 24 years in a study by Gopalkrishnan et al.<sup>12,13</sup> Nearly 90% of our subjects belonged to Hindu religion, 62% belonged to nuclear family and 40.2% studied up to higher secondary and this findings were consistent with study by Dutta, Gopalkrishnan and Bisoi et al where nearly 80% and 89.9% were Hindus, 63.3% belonged to nuclear family and 49.1% completed secondary schooling.<sup>8,13,14</sup> Around 80% of our subjects were homemakers which reflected the findings of a study by Alene et al where 86.5% of the pregnant women were housewives.<sup>1</sup>

The prevalence of anaemia in the current study was found to be 56% ( $n=206$ ) and among them 46.6% had mild anaemia, 51.9% had moderate and 1.5% were found to be severely anaemic. The findings in the present study was consistent with the prevalence in India, 50.3% as per the NFHS-4 report.<sup>3</sup> Similar findings were also reflected in the study by Siddalingappa et al where the prevalence was 62.4%.<sup>15</sup> Ahmed et al also showed a similar findings where majority had moderate anaemia, 50.7% and 30.1% and 18.9% with mild and severe anaemia respectively.<sup>16</sup> Most of the anaemic subjects were found in third and second trimester (39.8% and 38.8%) of pregnancy respectively. Similarly, Lebso et al in their study conducted in Ethiopia also reported a prevalence of

47.8% and 42.7% in third and second trimester of pregnancy.<sup>17</sup> Physiological occurrence of hemodilution in second and third trimester could be one of the reason for increase in prevalence in the current study.

Among the determinants an increased prevalence was seen among the subjects who belonged to Hindu by religion and this association was statistically significant, which reflected the findings of Ahmad et al where 85.9% of anaemic pregnant women were Hindus. Dietary habits and social factors could be the reason for increased prevalence in hindus.<sup>16</sup> Majority of our study subjects, 79.9% were homemakers and this was significantly associated with anaemia and a similar results were seen in study by Obai et al where being housewives was an independent risk factor for anaemia.<sup>18</sup>

Gestational age showed a significant association with anaemia where 68.8% of women who were in the first trimester of pregnancy were anaemic and the findings were consistent with study by Gopalkrishnan and Kumar et al where nearly 51.4% and 55% of first trimester antenatal mothers were anaemic.<sup>13,19</sup> Among the study subjects with history of one abortion, 71.7% were found to be anaemic with a statistically significant association ( $p=0.007$ ) which reflected the study of Ahmad et al where abortion was found to be a significant risk factor.<sup>16</sup> Pregnant women with inter pregnancy interval of less than two years, 65.3% were found to be anaemic in our study and similar observations were made by Suryanarayana et al where 68.4% of subjects with birth interval of less than two years were anaemic.<sup>20</sup>

In view of limited sample size of 368 we observed that other determinants like parity and gravidity, frequency of antenatal visits, contraception usage, dietary habits, IFA supplementation, co-morbidities, socio-demographic determinants like socio-economic status and literacy status had not shown any association with anaemia. However, as the study subjects were homogenous in terms of their place of residence, occupation, religion, family and dietary habits, the findings can be extrapolated to rest of the pregnant women receiving antenatal care in the urban population of Bengaluru.

## CONCLUSION

The prevalence rate of anaemia among the pregnant women receiving antenatal care was 56%. Determinants like occupation, religion, previous history of abortion and gestational age showed significant association with

anaemia. In developing nations like India anaemia remains a major public health problem contributing to maternal and infant mortality and morbidities; so the need of an hour is along with the government health care services there is a need for an effective intervention in the form of health education modules to the community about the ill effects of anaemia and nutritional counseling for women in the reproductive age group about the importance of iron supplementation during the antenatal period.

## ACKNOWLEDGEMENTS

First and foremost we would like to thank all the participants for their cooperation and enthusiastic participation. We would also like to thank our interns of SIMS & RC who helped us during the data collection process. At last, we would like to acknowledge ICMR for funding this project.

*Funding: ICMR STS-2018*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee, SIMS&RC, Bengaluru.*

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**Cite this article as:** Balakrishna AM, Padmanabha URS, Maheswaran R. Prevalence of anaemia and its associated factors among the pregnant women receiving antenatal care in a maternity hospital, Bengaluru. *Int J Community Med Public Health* 2019;6:5290-5.