ORIGINAL ARTICLE

A cross sectional study to assess anemia & its determinants among pregnant women in a rural area of Maharashtra

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ABSTRACT

Background: In India, anaemia prevalence is more than 40% so it is a severe public health problem. National Family Health Survey V indicates that prevalence of anaemia in pregnant women in Maharashtra's rural areas is 46.5%. As the pregnant women have high prevalence of anaemia, it highlights the need to conduct research to find out the determinants and its preventive measures. **Aim**: To determine prevalence of anaemia and to assess its determinants amongst pregnant women in a rural area **Methods**: Three eighty-four pregnant women in a rural area of Thane district were selected for a community based descriptive cross-sectional study. Association between anaemia and variables in the study was established using Pearson's Chi- square test. For studying association between anaemia as dependent variable and various determinants as independent variables, binary logistic regression analysis was used. **Results**: Prevalence of anaemia was found to be 62.5%. 29.2% participants were mildly anaemic, 33.0% were moderately anaemic, 0.3% were severely anaemic and 37.5% were non-anaemic. Occurrence of anaemia was significantly associated with age, religion, gravida status, trimester, gestational age at first ANC visit, no consumption of IFA tablets, no consumption of dark green leafy vegetables and dietary habits. **Conclusions**: High prevalence of anaemia amongst pregnant women reflects poor utilization of health care services, lack of awareness about adequate dietary patterns and poor nutritional status. Anaemia is still a severe public health issue amongst pregnant women of rural areas.

KEYWORDS

ANC Visits; Anaemia; Dietary habits; Gravida status; Pregnant women

INTRODUCTION

Anaemia is one of the important factors driving pregnancy outcome. Anaemia during pregnancy is defined as haemoglobin concentration below 11 g/dl (1) by World Health Organization and Centers of Disease Control and Prevention.

Anaemia is responsible for many maternal deaths in India (2). National Family Health Survey Five data shows anaemia prevalence among urban, rural, and total pregnant women was 44.2%, 46.5% and 45.7% respectively for Maharashtra (3).

In India, nutritional interventions are well established and operational through various programmes. Despite various national health programme interventions related to pregnant woman, prevalence of anaemia among them is high in our country.

As per National Family Health Survey Four, anaemia among pregnant woman was 49.3% in Maharashtra. Though anaemia prevalence has reduced slightly, the problem persists in wider scale (4). The present study aimed for assessing anaemia amongst pregnant women in rural Maharashtra, hence this study was planned amongst pregnant women in rural field practice area belonging to Community Medicine department of a medical college.

MATERIAL & METHODS

The study was a descriptive cross - sectional study conducted in rural area of PHC Khadavli & PHC Padgha in Thane district of Maharashtra. The duration of the present study was 18 months. The study participants were pregnant women in field practice area. Inclusion criteria of the study was to include pregnant women second trimester onwards. Pregnant women taking treatment for diseases like haemoglobinopathies, leukaemia, lymphoma and pregnant women who didn't give consent were excluded. Following Helsinki Declaration participants were given an option to be part of the study or not.

The present study calculated sample size using $n = \frac{Z^2PQ}{E^2}$ formula.

Where, Z is =1.96, P is prevalence of anemia amongst pregnant women as per National Family Health Survey Four i.e. P = 50.4% Hence Q was taken as (1- P) i.e. 49.6%

Allowable error was taken as 5%. Hence, with 5% allowable error and 95% confidence interval, 384 sample size was obtained.

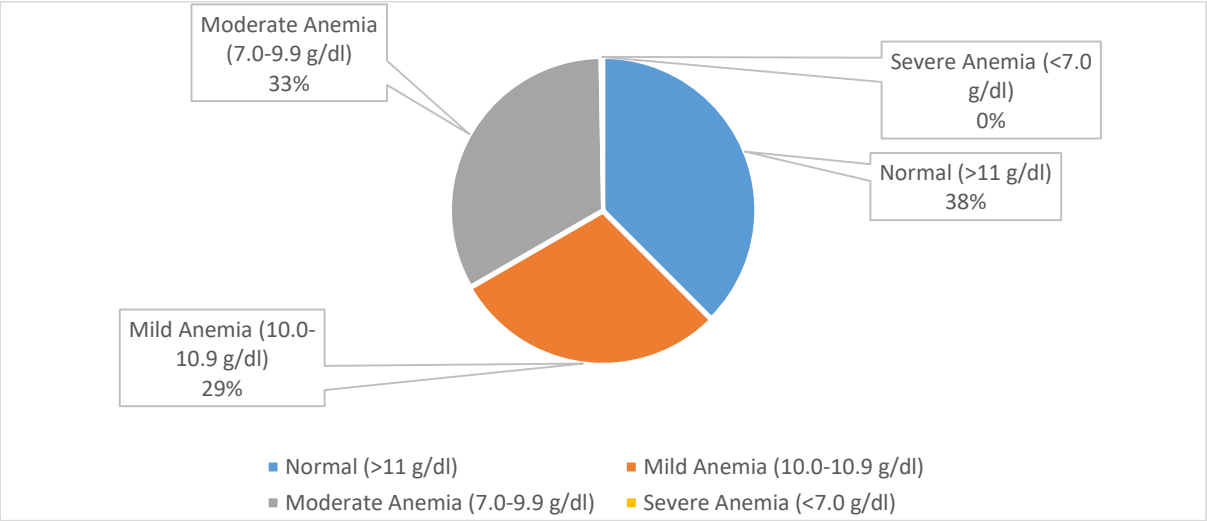
In this study multi-stage sampling was done. There are four PHCs - Khadavli, Bhatane, Padgha and Durvesh under the rural field practice area. Out of these, two PHCs i.e., Khadavli and Padgha PHCs were selected by simple random sampling using lottery method. Both PHCs had six sub-centres each. Subsequently, four sub-centres from each PHC were chosen using simple random sampling using lottery method. The list of all pregnant women was obtained from ANC registers kept at these sub-centres. Among these sub-centres 848 pregnant women were registered during study period. Three eighty-four pregnant women willing to participate in the study were included after applying exclusion criteria. Among these 384 pregnant women, 48 from each sub-centre were selected using random number table to maintain uniformity. Their addresses and contact numbers were taken from the ANC register maintained by the ANM of all eight selected sub-centres. The selected pregnant women were visited at their houses and face-to-face interviews were taken using a semi-structured, pretested interview schedule. Privacy was maintained by conducting it in a separate room. Participants provided their written informed consents prior study. Interview schedule included details of the participants about Socio-demographic characteristics, Obstetric history, ANC clinic visits and consumption of Iron & Folic Acid tablets and Diet history. Study participants were classified according to Modified B G Prasad Scale updated – 2020 (5). Ethics approval was obtained by institutional ethics committee. Participants were classified for anaemia based on the Haemoglobin concentration at the time of their last ANC visit.

Data collection processing and analysis was done using SPSS Windows software version 22.0. Descriptive statistics using proportions were used for sociodemographic variables. Cross tabulation using Pearson's Chi square test was conducted to establish the association between anaemia in pregnant women with covariates. Binary logistic regression analysis was performed for studying association between anaemia as dependent variable and various determinants as independent variables.

RESULTS

Anaemia prevalence amongst pregnant women in the present study was 62.5%. In the study 112 (29.2%) participants were mild anaemic, 127 (33.1%) were moderate anaemic & one (0.3%) was severe anaemic. (Figure 1)

Figure 1: Study participants distribution as per Anaemia grading of WHO



Out of 384 study participants majority 293 (76.3%) participants belong to the age group 21-30 years, followed by 58 (15.1%) who were of less than 20 years. Mean age of participant was 24.51 ± 3.8 years. Majority i.e., 194 (50.5%) participants were educated till secondary, 87 (22.7%) were educated till higher secondary, 38 (9.9%) were graduate, 34 (8.9%) were educated till primary and only 31 (8.0%) were illiterate. 304 (79.2%) participants were Hindu and only 80 (20.8%) were Muslim. 357 (93.0%) participants were unemployed (housewives), 10 (2.6%) were involved in semi-professional occupation, 11 (2.9%) were involved in clerical, farmer, shopkeeper occupation. Four (1%) and two (0.5%) were involved in semi-skilled and unskilled occupation respectively. According to Modified B G Prasad scale, 133 (34.6%) participants were from the social class II, followed by 105 (27.3%) from social class III, 75 (19.6%) were from social class IV, 51 (13.3%) were from social class I while 20 (5.2%) were from social class V. Association of anaemia with age (p value <0.001) and religion (p value 0.038) was found statistically significant. (Table 1)

Table 1 Association between anaemia and Socio-demographic variables

Variables	Anaemia		Total	Chi-square	P value
	Absent (n=144) (%)	Present (n=240) (%)	(n=384)		
Age					
≤ 20	38 (65.5)	20 (34.5)	58	33.845	<0.001
21-30	104 (35.5)	189 (64.5)	293		
>30	2 (6.1)	31 (93.9)	33		
Education					
≤ primary	18 (27.7)	47 (72.3)	65	4.413	0.110
Secondary	72 (37.1)	122 (62.9)	194		
≥ Higher secondary	54 (43.2)	71 (56.8)	125		
Religion					
Hindu	106 (34.9)	198 (65.1)	304	4.312	0.038
Muslim	38 (47.5)	42 (52.5)	80		
Occupation					
Non-working	133 (37.3)	224 (62.7)	357	0.130	0.718
Working	11 (40.7)	16 (59.3)	27		

Variables	Anaemia		Total	Chi-square	P value
	Absent (n=144) (%)	Present (n=240) (%)	(n=384)		
Socio-economic class					
≤ II	76 (41.3)	108 (58.7)	184	2.182	0.140
> II	68 (34.0)	132 (66.0)	200		

Among 384 pregnant women, 40 participants had gravida status more than or equal to four. Among these, 26 were gravida four, eight were gravida five, four were gravida six and two were gravida seven. While 148 (38.5%) were nulliparous pregnant women. Among these women, 122 were primi gravida and 26 pregnant women had history of abortion before period of viability. Out of 384 participants, 89 (23.2%) had history of abortion. 150 (39.1%) participants had completed two ANC visits. It was found that 324 (84.4%) pregnant women started IFA tablet consumption between 13-24 weeks of gestational age. 238 (62.0%) participants were consuming vitamin C rich foods such as lemon, amla, guava, etc. One twenty-five (32.55%) pregnant women were eating dark green leafy vegetables less than three times in a week, 47 (12.24%) were eating more than three times in a week and 181 (47.14%) were eating daily. Out of 232 participants who were having mixed diet, 194 (50.52%) were eating meat and animal products like chicken, meat, fish, and eggs, etc. less than three times in a week, 29 (7.55%) were eating more than three times in a week and nine (2.34) were eating daily. None of the participants were taking coffee/ tea immediately after the meal. Deworming of 376 (97.9%) participants was done. On analysis, association of anaemia with gravida status (p value <0.001), trimester at the time of interview (p value = 0.0042), gestational age at first ANC visit (p value <0.001) & veg diet (p value <0.001) was found statistically significant. (Table 2).

Table 2: Association between anaemia and Obstetrics variables & dietary habits

Variables	Anaemia		Total	Chi-square	P value
	Absent (n=144) (%)	Present (n=240) (%)	(n=384)		
Gravida status					
1	62 (50.8)	60 (49.2)	122	19.355	<0.001
2	54 (35.8)	97 (64.2)	151		
3	22 (31.0)	49 (69.0)	71		
≥ 4	6 (15.0)	34 (85.0)	40		
Parity					
≤ 2	66 (31.3)	145 (68.7)	211	2.501	0.114
≥ 3	4 (16.0)	21 (84.0)	25		
Number of ANC visits					
< 4	115 (37.5)	192 (62.5)	307	0.001	0.974
≥ 4	29 (37.7)	48 (62.3)	77		
Gestational age at first ANC visit (in weeks)					
< 12	101 (46.1)	118 (53.9)	219	16.153	<0.001
≥ 12	43 (26.1)	122 (73.9)	165		
Trimester (at the time of interview)					
2nd	99 (41.4)	140 (58.6)	239	4.155	0.042
3rd	45 (31.0)	100 (69.0)	145		
Birth spacing (in years)					
< 3	47 (29.2)	114 (70.8)	161	0.861	0.354
≥ 3	35 (34.6)	66 (65.4)	101		
IFA tablet consumption					
Yes	134 (39.5)	205 (60.5)	339	5.076	0.024
No	10 (22.2)	35 (77.8)	45		

Variables	Anaemia Absent (n=144) (%)	Present (n=240) (%)	Total (n=384)	Chi-square	P value
Dark green leafy vegetables consumption					
Yes	138 (39.1)	215 (60.9)	353	4.737	0.030
No	6 (19.4)	25 (80.6)	31		
Dietary habit					
Mixed	104 (44.8)	128 (55.2)	232	13.427	<0.001
Veg.	40 (26.3)	112 (73.7)	152		

For multivariate analysis, variables which had p value < 0.05 in univariate analysis were considered. Analysis was carried out by using forward conditional method. Variables which had statistically significant p value were entered step wise. Anaemia in pregnant women was significantly associated with age (age <20 years, p = 0.000; age 21-30 years, p =0.004), trimester (p = 0.011), gestational at first ANC visit (p = 0.000) and mixed diet (p = 0.000) in binary logistic regression analysis (Table 3).

Table 3: Binary Logistic Regression Analysis for identifying determinants of anaemia

Variables	B	S.E.	p value	Odds ratio	CI (95%)	
					Lower	Upper
Age			.000			
Age ≤ 20 years	-3.507	.802	.000	.030	.006	.144
Age 21- 30 years	-2.196	.756	.004	.111	.025	.489
Age > 30 years	Reference case					
Trimester- 2nd	-.635	.249	.011	.530	.326	.864
Trimester- 3rd	Reference case					
Gestational age at first ANC visit ≥ 12 weeks	1.045	.243	.000	2.868	1.782	4.616
Gestational age at first ANC visit < 12 weeks	Reference case					
Mixed diet	-1.017	.255	.000	.362	.219	.596
Veg diet	Reference case					
Constant	3.429	.791	.000	30.858		

DISCUSSION

In the present study, anaemia prevalence was 62.5%. This finding matched with the study conducted by Ravishankar Suryanarayana et al (64%) (6) and Hugara Siddalingappa et al (62.4%) (7). This finding was different from studies conducted by Bhargavi Vemulapalli et al (100%) (1), Virender et al (96.5%) (2), Ritesh P Kundap et al (66.7%) (8), Nadeem Ahmad et al (74.8%) (9), Vinod Kumar et al (81.8%) (10) and Seema Kumari et al (81%) (11).

In the present study, it was found that moderate anaemia prevalence was more than mild and severe anaemia. This finding matched to the study conducted by Nadeem Ahmad et al (9). The prevalence of severe anaemia among pregnant women is same as that of a study conducted by Ritsuko Aikawa et al (0.5%) (12) and Anuja Baruah et al (1.4%) (13).

Present study found statistically significant association between anaemia and age. This could be due to lack of awareness about adequate diet during pregnancy in participants less than 20 years of age. Vinod Kumar et al (10) study also found a similar result.

There was no statistically significant association between anaemia and education in the current study. Similar result was reflected in a study conducted by Vinod Kumar et al (10). This finding contrasted with other studies like the ones done by Virender Gautam et al (2), Ritsuko Aikawa et a (12) and Ravishankar Suryanarayana (6).

The current study showed statistically significant association between anaemia and religion. Similar finding was seen in study performed by Neeraj Rai et al (14) and Nadeem Ahmad et al (9). In these studies, Hindu

pregnant women were more anaemic than Muslim. The probable reason could be the non-veg dietary pattern among Muslim women.
Occupation did not show statistically significant association with anaemia in this study which contrasts with a study performed by Vinod Kumar et al (10).
Present study suggested no statistically significant association between anaemia and socio-economic status. A study performed by Vinod Kumar et al (10) found similar finding. However, this finding contrasted with a study performed by Neeraj Rai et al (14).

Gravida status showed statistically significant association with anaemia in the present study. The possible reason for this finding is inadequate dietary practices leading to depletion of iron stores in subsequent pregnancies. Similar finding was seen in studies conducted by Kumar Vinod et al (10), Ritesh Kundap et al (8), Seema Kumari et al (11) and Ravishankar Suryanarayana et al (6). However, this finding is different from a study conducted by Anuja Baruah et al (13).
The present study indicated no statistically significant association between anemia and parity. Studies conducted by Hugara Siddalingappa et al (7), Bhargavi Vemulapalli et al (1) and Ritsuko Aikawa et al (12) also found similar finding. A study performed by Rauf Ur Rashid et al (15) showed contrasted results.
A study conducted by Mangla et al (16) reflected that number of ANC visits in present pregnancy was a significant variable for determining prevalence and anaemia severity. Finding of the present study contrasted with this study.

Present study suggested those pregnant women who registered late i.e., after 12 weeks were more anaemic than those who registered during first trimester. This could be due to pregnant women who registered in first trimester received folic acid tablets and education about balanced diet during pregnancy. A study conducted by Anuja Baruah et al (13) indicated similar finding.
Pregnant women in third trimester were more anaemic than those in second trimester in this study. This finding was matched to the study performed by Neeraj Rai et al (14).
A study performed by Ravishankar Suryanarayana et al (6) also reflected that as gestational age advanced, there was a corresponding rise in the prevalence of anaemia (first trimester, 15.5% to 46.6% in third trimester) in pregnant women. However, a study performed by Bhargavi Vemulapalli et al (1) found that pregnant women in first trimester had higher prevalence of anaemia than those in second and third trimester. This is different from the present study finding.

Studies performed by Nadeem Ahmad et al (9) & Rauf Ur Rashid et al (15) did not find association between anaemia and birth spacing. This finding matched to the present study. A study performed by Anjali Kiran Bhirud et al (17)found contrasted finding.

CONCLUSION

In present study, anaemia prevalence amongst pregnant women was 62.5%. Among these 127 (33.0%) pregnant women had moderate and 112 (29.2%) had mild anaemia. Only one (0.3%) had severe anaemia. Education, occupation, socio-economic status, parity, number of ANC visits, birth spacing were not significantly associated with anaemia. Age, religion, gravida status, trimester, gestational age at first ANC visit, no consumption of IFA tablets, no consumption of dark green leafy vegetables and dietary habit showed association with anaemia in current study.

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RECOMMENDATIONS

Emphasis should be given to adopt spacing methods by couples to reduce unwanted births and repeated pregnancies should be discouraged by educating couples about importance of risk of anaemia. Pregnant Woman should be educated about importance of early registration of pregnancy which will help in early identification and correction of anaemia. Pregnant women should increase intake of iron rich food items.

LIMITATION OF THE STUDY

Present study findings cannot be generalized as present study was carried out in rural area so results may vary if it's carried out in urban area.

AUTHORS CONTRIBUTION

All authors have contributed equally

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Nil

CONFLICT OF INTEREST

The authors don't have any conflict of interest..

DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the authors have not used any AI tools or services.

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