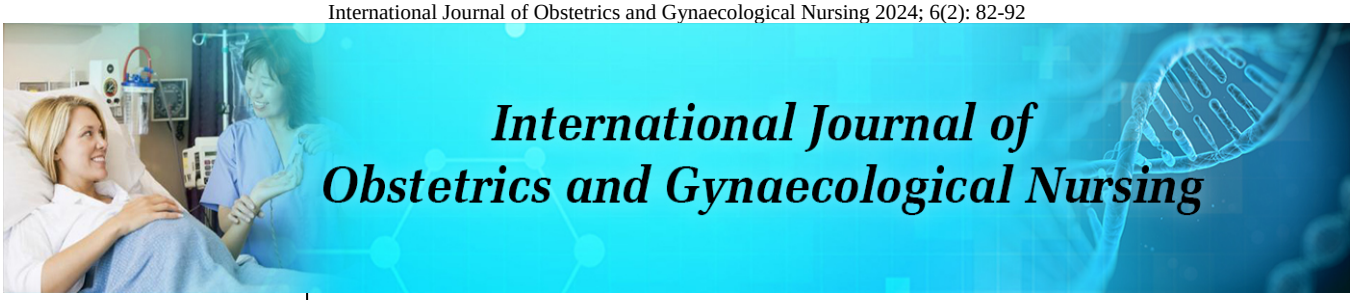

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Study to assess the magnitude of anemia and to identify its contributing factors among antenatal women in selected rural community, Murshidabad, West Bengal

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Abstract
Aim: To assess the magnitude and the contributing factors of anemia among antenatal women; find out the association between anemia with selected demographic variables and contributing factors among antenatal women.
Design: Descriptive cross-sectional research design.
Methods: Kaoru Ishikawa fishbone diagram was used to assess the magnitude of anemia and to identify contributing factors among antenatal women. Cluster sampling technique was used to select 312 antenatal women of 24-40 weeks of gestation from selected rural community. Instruments used for data collection were a validated semi-structured and structured interview schedule and bio-physiological measures of hemoglobin estimation.
Results: Majority of antenatal women belonged to age group of 19-25 years. Most of the antenatal women had completed secondary education. Majority of antenatal women got married below the age of 18 years and multigravida women. Study findings revealed that 68.91% antenatal women had anemia; amidst 36.22% had moderate anemia, 32.05% had mild anemia and 0.64% had severe anemia. Identified contributing factors related to pregnancy were teenage pregnancy and not taking iron folic acid supplementation (IFA). Contributing factors related to pre-existing anemia was menorrhagia. Dietary pattern related contributing factors was faulty dietary intake. Contributing factors related to disease related factors were history of worm infestation and piles/ hemorrhoids. Statistical significant association existed between level of anemia with education, per capita income, age of marriage, gravida, parity and inter pregnancy interval, teenage pregnancy, IFA supplementation, IFA before food, menorrhagia, meals <3 times/ day and additional diet, vegetables, fruits, milk/milk products, worm infestation, deworming during pregnancy and piles/ hemorrhoids. No association found between level of anemia with religion, gestation, regular antenatal checkup, blood loss in last delivery, history of fatigue, shortness of breath, uses of mosquito net, drink tea/coffee after meals, history of malaria, urinary tract infection and chronic disease.
Conclusions: Magnitude of anemia in the present study was 68.91%.

Keywords: Anemia, antenatal women, hemoglobin estimation, rural community, contributing factors

1. Introduction

Anemia is a serious global public health problem affecting approximately two billion people of the world-wide. It strikingly attacks young children and antenatal women. Incidence of anemia in pregnancy in tropical countries ranges from 40- 80%, whereas in developed countries it is 10-20% [1]. Anemia affects almost two- thirds of pregnant women in developing countries and contributes to maternal mortality and low birth weight. 20% of maternal death in the third world countries are due to anemia. According to World Health Organization (WHO), the cut-off points of hemoglobin for anemia during pregnancy is <11.0 g/dl, 10.0-10.9 g/dl (mild anemia), 7-9.9 g/dl (moderate anemia) and <7 g/dl (severe anemia) [2, 3].

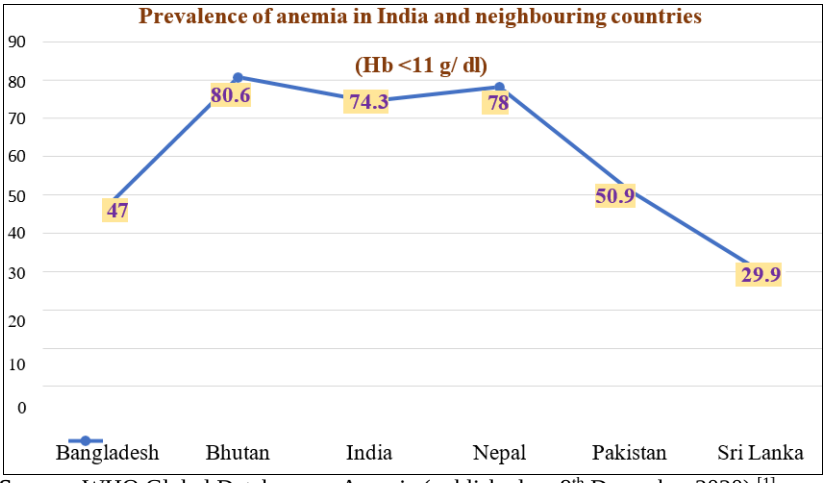
During pregnancy there are increase in maternal plasma volume by 40-50% and RBC volume increases by 20% which contribute physiological anemia in women. This is normal and usually requires no treatment. But if women have any pre- existing anemia, it usually aggravated physiological anemia during pregnancy [4].

There is relative fall in hemoglobin level and hematocrit value during pregnancy. Extra iron is required during pregnancy, especially in second half by the growing fetus. Even an adequate diet cannot provide the extra demand of iron. As a result, there is not only fall a hemoglobin concentration and hematocrit value but also associated with low serum iron. Increased rate of iron absorption and increased iron binding capacity. Due to combined effect of hemodilution and negative iron balance, there are fall in the hemoglobin concentration during pregnancy. Variety of hematological disorders may affect a woman during pregnancy, majority (75%-90%) are classified as iron deficiency anemia [1, 2].

2. Background

2.1 Global overview

As per WHO Global Database on Anemia for 1993–2005 (published on 9th December 2020), the prevalence of anemia worldwide is 25 per cent. Although the prevalence of anemia is estimated at 9 per cent in countries with high development, in countries with low development prevalence is 43 per cent. Children and women of reproductive age are most at risk, with global anemia prevalence estimates of 47 per cent in children younger than 5 years, 42 per cent in pregnant women, and 30 per cent in non-pregnant women aged 15–49 years. Africa and Asia account for more than 85 per cent of the absolute anemia burden in high-risk groups and India is the worst hit [1].



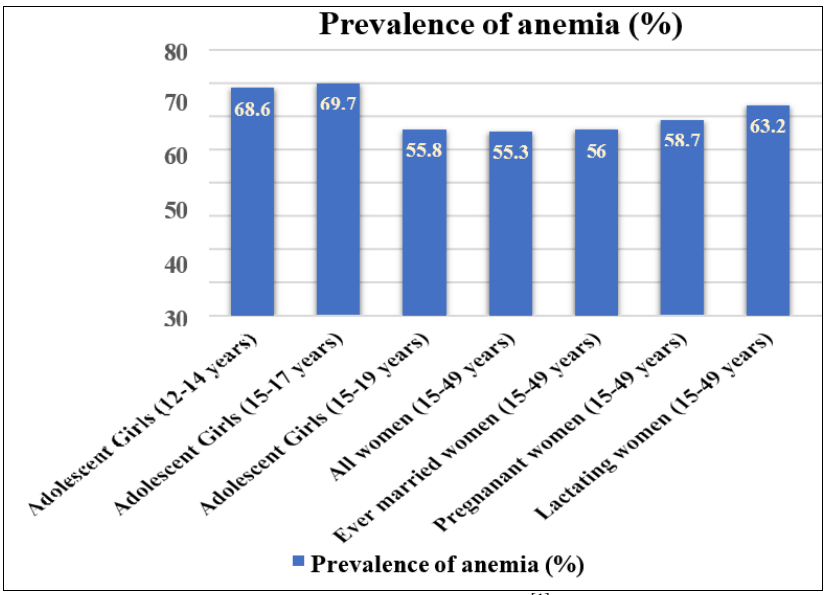
Source: WHO Global Database on Anemia (published on 9th December 2020) [1]

Fig 1: Line graph on prevalence of anemia in India and neighboring countries

2.2 Indian Scenario

India is one of the countries with unreasonable prevalence of anemia in the world. Nearly 58% of pregnant women in India are anemic. Anemia is the root cause for 20-40% of maternal deaths in India. In South Asia, India contributes 80 per cent of the maternal deaths due to anemia.

The National Family Health Survey-3 (NFHS-3) data recommend that anemia is largely widespread among all age groups, and is explicitly high among the most vulnerable group- 58% among pregnant women, 50% among non-pregnant non-lactating women, 56%among adolescent girls (15–19 years), 30% among adolescent boys and all over 80% among children below 3 years of age [1].



Source: National Nutrition Monitoring Bureau Survey [1]

Fig 2: Bar diagram on Prevalence of anemia among different age group

3. Aims of the study

This study aims to

- Assess the magnitude of anemia among antenatal women.
- Identify the contributing factors of anemia among antenatal women.
- Find out the association between anemia and contributing factors among antenatal women.
- Find out the association between anemia with selected demographic variables among antenatal women.

4. Methods

4.1 Research design

Descriptive cross-sectional research design was chosen for the study was conducted between March 2023 to April 2023. There were 27 blocks in Murshidabad, amidst 02 blocks were selected for each pilot and final study. After random selection of sub-division, final study was conducted in selected subcentres under Gokarna Block Primary Health Centre (BPHC) of Kandi sub-division which covered 2,46,959 population and Nabagram Block Primary Health Centre of Lalbagh sub-division which covered 2,48,536 population. Amidst 31 subcentres under Gokarna Block Primary Health Centre and Nabagram Block Primary Health Centre 13 subcentres were selected randomly from each block for final study. Cluster sampling technique was used to select 312 antenatal women of 24-40 weeks of gestation from rural community, Murshidabad.

5. Results

The collected data were coded, tabulated, analyzed and interpreted in accordance with the objectives of the study.

5.1 Findings related to demographic variables

Table 1: Frequency and percentage distribution on demographic variables of antenatal women n=312

Demographic variables	Frequency (f)	Percentage (%)
Age in years		
≤ 18 years	57	18.27
19-25 years	181	58.01
26-32 years	68	21.80
> 32 years	6	1.92
Religion		
Hindu	86	27.56
Muslim	226	72.44
Educational qualification		
No formal education	3	0.96
Primary	87	27.88
Secondary	127	40.71
Higher secondary	80	25.64
Graduate	15	4.81
Socio-economic status		
Upper class	18	5.77
Upper middle class	55	17.63
Middle class	154	49.36
Lower middle class	84	26.92
Lower class	1	0.32
Age of marriage		
< 18 years	169	54.17
≥18 years	143	45.83
Gestational age		
24-28 weeks	113	36.22
29-40 weeks	199	63.78
Gravida		
Primigravida	137	43.91
Multigravida	175	56.09
Parity		
Nullipara	149	47.76
Parous	163	52.24
Inter pregnancy interval		
Primigravida	137	43.91
<2 years	103	33.01
≥2 years	72	23.08

Data in table 1 represented that majority (58.01%) of the antenatal women belonged to 19- 25 years of age group. Religion of majority (72.44%) of antenatal women were from Muslim community. Most (40.71%) of the antenatal women had completed secondary education, 27.88% antenatal women had primary education, 25.64% women had higher secondary education, 4.81% had completed graduation and only 0.96% antenatal women had no formal education. Data also depicted that 49.36% antenatal women belonged to middle class family, 26.92% were from lower middle- class family, 17.63% were from upper middle- class family and only 5.77% belonged to upper class family. Majority (54.17%) antenatal women got married below 18 years of age and rest (45.83%) got married at and above 18 years of age. Gestational age of majority (63.78%) of antenatal women were within 29-40 weeks and rest

(36.22%) were within 24- 28 weeks of gestation. Majority (56.09%) of the antenatal women were multigravida women and 43.91% were primigravida women; 52.24% antenatal women were parous and 47.76% antenatal women were nulliparous. Data also presented that most of the (43.91) antenatal women were primigravida, inter pregnancy interval of 33.01% antenatal women were <2 year and 23.08% were >2 years and rest of all were primigravida antenatal women.

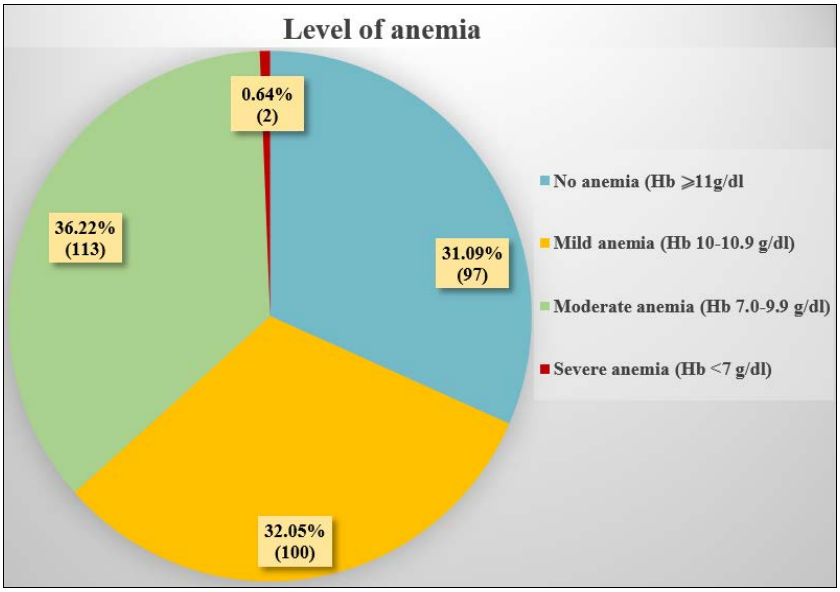


Fig 3: Pie diagram of frequency and percentage distribution on level of Anemia

Data depicted in figure 3 revealed that out of 312 antenatal women, 36.22% had moderate anemia, 32.05% had mild anemia, 0.64% had severe anemia. From the above figure it can be concluded that 31.09% antenatal women had no anemia and majority (68.91%) of antenatal women had anemia.

5.2 Findings related to percentage distribution of contributing factors of anemia among antenatal women

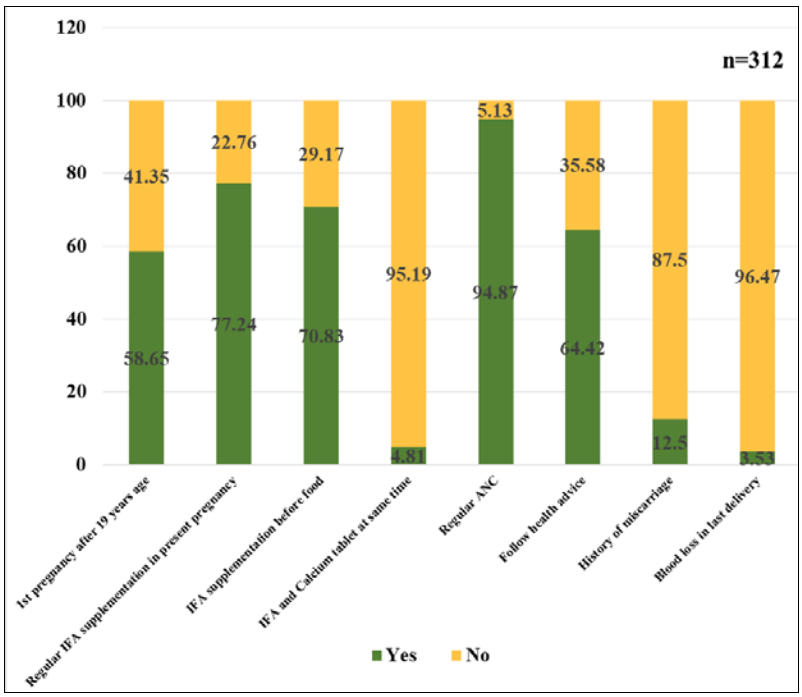


Fig 4: Compound bar diagram showing percentage distribution on pregnancy related contributing factors of anemia among antenatal women.

Data represented in figure 4 shows that 58.65% antenatal women had 1st pregnancy after 19 years of age and 41.35% antenatal women had before 19 years of age. 77.24% antenatal women had taken iron folic acid supplementation (IFA) regularly in their present pregnancy and only 22.76% antenatal women did not take. Majority (70.83%) of the antenatal women were taking it before food and 29.17% antenatal women were taking it after food. Majority (95.19%) of antenatal women were taking IFA and calcium tablets at different time and only 4.81% antenatal women were taking at the same time. Data also revealed that majority (94.87%) of antenatal women came for regular

antenatal check-up and only 5.13% antenatal women were not under regular antenatal check-up. Majority (64.42%) of antenatal women followed health advices given by health worker and 35.58% antenatal women did not follow it. 12.50% antenatal women had previous history of miscarriage and 3.53% had history of blood loss in last delivery.

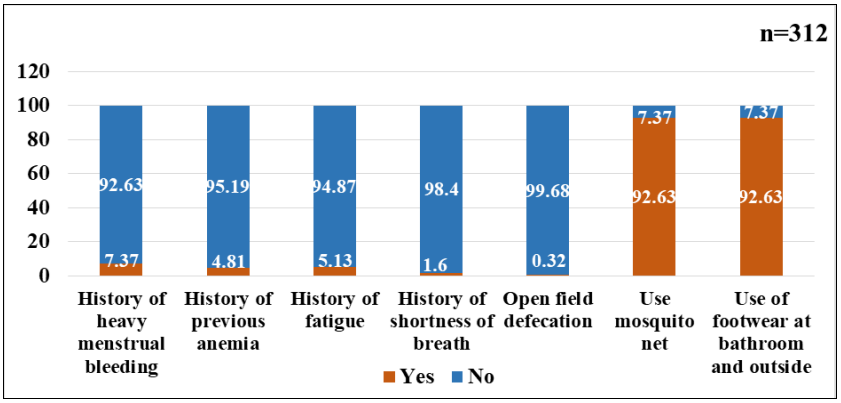


Fig 5: Compound bar diagram showing percentage distribution on pre-existing anemia related contributing factors among antenatal women.

Data in figure 5 revealed that only 7.37% antenatal women had history of heavy menstrual bleeding and 4.81% antenatal women had previous history of anemia. Only 5.13% antenatal women had history of fatigue and 1.60% antenatal women had shortness of breath. Data also presented that 0.32% antenatal women had habits of open field defecation; majority (92.63%) of the antenatal women were using mosquito net and using footwear at bathroom and outside.

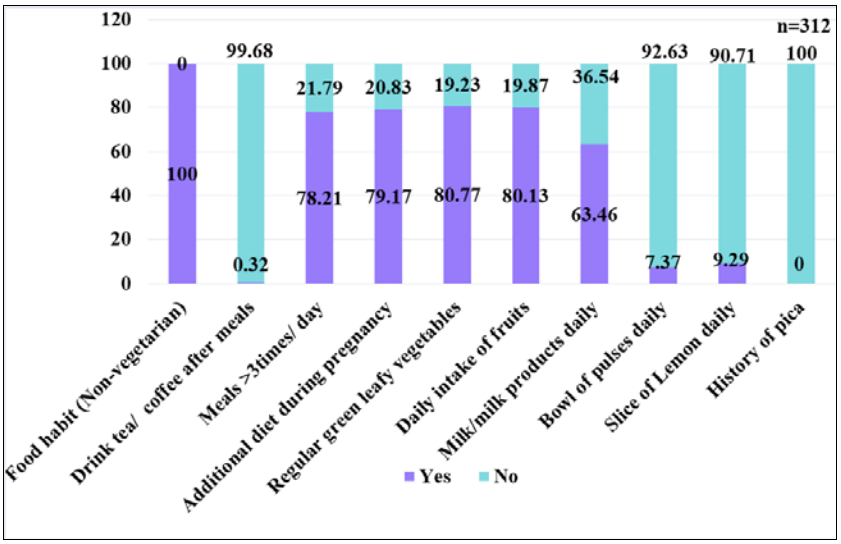


Fig 6: Compound bar diagram showing percentage distribution on dietary related contributing factors among antenatal women

Data in figure 6 revealed that all antenatal women were non vegetarian. Majority (99.68%) of antenatal women did not take tea/coffee after meals. Majority (78.2%) of antenatal women had taken meals>3 times/day and 79.2% antenatal women had taken additional diet during pregnancy, but 20.83% did not take any additional diet. 80.8% antenatal women were taken green leafy vegetables daily and rest of the antenatal women were not taken. Majority (80.1%) of antenatal women were taking fruits daily and only 19.9% antenatal women were not taken. Data also revealed that only 63.5% antenatal women were taken milk/milk products daily and rest of the antenatal women were not taken. Majority (92.6%) of antenatal women were not taken bowl of pulses daily during pregnancy. Only 9.29% antenatal women were taken slice of lemon daily and but majority (90.71%) were not taken it daily. No women were found with the history of pica during pregnancy.

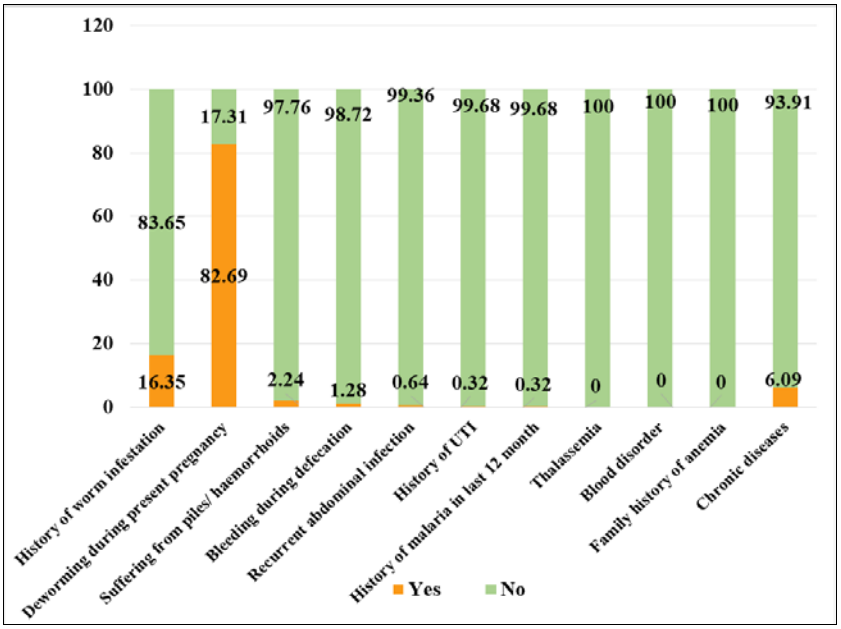


Fig 7: Compound bar diagram showing percentage distribution on disease related contributing factors among antenatal women.

Data in figure 7 represented that 16.35% antenatal women had previous history of worm infestation and 83.65% antenatal women were never been affected. Majority (82.69%) of antenatal women had taken deworming tablets during present pregnancy and rest of the antenatal women have not taken. Only 2.24% antenatal women were suffered from piles and among them 1.28% antenatal women were suffered from bleeding during defecation. No antenatal women were found with history of blood disorder, family history of anemia and only 6.09% antenatal women were suffered from chronic diseases (Thyroid, Hypertension). Antenatal women suffered from recurrent abdominal infection were 0.64%, history of UTI and malarial attack within last 12 month were 0.32% both. No antenatal women were found with thalassemia.

5.3 Association between level of anemia with selected demographic variables

Table 2: Association between level of anemia with selected demographic variables of antenatal women n=312

Demographic variables	Anemia		Chi-square (χ^2)
	Present	Not present	
Religion			
Hindu	57	29	0.38
Muslim	158	68	
Education			
Secondary	169	48	25.83*
Above secondary	46	49	
Per capita monthly income			
Rs. < 3000	122	24	28.57*
Rs. ≥3000	93	73	
Age of marriage			
<18 years	134	35	18.64*
≥18 years	81	62	
Gestational age			
24-28 weeks	79	34	0.08
29-40 weeks	136	63	
Gravida			
Primigravida	72	65	30.70*
Multigravida	143	32	
Parity			
Nulliparous	84	65	21.18*
Parous	131	32	
#Interpregnancy interval			
Primigravida	72	65	31.65*
<2years	85	16	
≥2years	58	16	

Chi-square (χ2) df (1)= 3.841, p<0.05 significant,
#Interpregnancy interval df (2)= 5.99, p<0.05 significant
*= Significant

Data in table 2 represented that calculated chi square value of education (25.83), per capita monthly income (25.57), age of marriage (18.64), gravida (30.70), parity (21.18) found significant with the level of anemia as the table value (3.841) was lower than the calculated chi square value at 0.05 level of significance. There was also statistically significant association found between the level of anemia with the interpregnancy interval as the table value (5.99) is lower than calculated chi-square value (31.65) at df (2) of 0.05 level of significance.

Table 3: Association between level of anemia with pregnancy related Contributing factors of anemia among antenatal women. n=312

Contributing factors	Anemia		Chi-square ($\mathcal{X}^2$)
	Present	Not present	
1st pregnancy after 19 years of age			
Yes	106	77	26.40*
No	109	20	
Regular IFA supplementation			
Yes	149	92	30.11*
No	66	5	
IFA tablet before food			
Yes	138	83	16.09*
No	77	14	
IFA and calcium tablet at same time			
Yes	14	1	5.62*
No	201	96	
Regular ANC			
Yes	202	94	1.31
No	13	3	
Following health advice			
Yes	121	80	21.49*
No	94	17	
History of miscarriage			
Yes	34	5	7.99*
No	181	92	
Blood loss in last delivery			
Yes	9	2	0.97
No	206	95	

Chi-square ($\mathcal{X}2$) df (1)= 3.841, p<0.05 significant
*= Significant,

Table 4: Association between level of anemia with pre-existing anemia related contributing factors of anemia among antenatal women n=312

Contributing factors	Anemia		Chi-square ($\mathcal{X}^2$)
	Present	Not present	
History of heavy menstrual bleeding			
Yes	21	2	7.14*
No	194	95	
History of previous anemia			
Yes	14	1	5.62*
No	201	96	
History of fatigue			
Yes	14	2	3.18
No	201	95	
History of shortness of breath			
Yes	5	0	3.76
No	210	97	
Open field defection			
Yes	1	0	0.74
No	214	97	
Use of mosquito net			
Yes	196	93	2.40
No	19	4	
Use of footwear at outside and bathroom			
Yes	195	94	4.37*
No	20	3	

Chi-square ($\mathcal{X}2$) df (1) = 3.841, p<0.05 significant*= Significant

Data in table 3 represented that there was significant association found between the level of anemia and 1st pregnancy ≥19 years of age (26.40), regular IFA supplementation in present pregnancy (30.107), IFA tablet

before food (42.33) and IFA & calcium at same time (5.62), followed health advice (39.83) and history of miscarriage (7.99); as the table value was lower than calculated chi-square value at df 1 of 0.05 level of significance.

Data in table 4 represented a significant association found between the level of anemia with the heavy menstrual bleeding (7.14), history of previous anemia (5.62) and use of footwear at outside and bathroom (4.37) as the table value (3.841) was lower than calculated chi-square value at df 1 of 0.05 level of significance.

Table 5: Association between levels of anemia with dietary related Contributing factors of anemia among antenatal women. n=312

Contributing factors	Anemia		Chi-square (χ^2)
	Present	Not present	
Drink tea/ coffee after meals			
Yes	1	0	0.74
No	214	97	
Meals >3 times/ day			
Yes	151	93	32.00*
No	64	4	
Additional diet during pregnancy			
Yes	154	93	29.52*
No	61	4	
Regular green leafy vegetables			
Yes	162	90	15.05*
No	53	7	
Daily intake of fruits			
Yes	162	88	11.06*
No	53	9	
Milk/ milk products daily			
Yes	120	78	18.53*
No	95	19	
Bowl of pulses daily			
Yes	10	13	6.89*
No	205	84	
Slice of lemon daily			
Yes	11	18	13.11*
No	204	79	

Chi-square ($\chi 2$) df (1)= 3.841, $p<0.05$ significant

*= Significant

Table 6: Association between level of anemia with disease related contributing factors of anemia among antenatal women. n=312

Contributing factors	Anemia		Chi-square (χ^2)
	Present	Not present	
History of worm infestation			
Yes	50	1	33.56*
No	165	96	
Deworming during present pregnancy			
Yes	164	94	25.16*
No	51	3	
Suffering from Piles/ hemorrhoids			
Yes	7	0	5.28*
No	208	97	
Bleeding during defecation			
Yes	4	0	3.00
No	211	97	
Recurrent abdominal infection			
Yes	2	0	1.50
No	213	97	
History of malaria			
Yes	1	0	0.74
No	214	97	
History of UTI			
Yes	1	0	0.74
No	214	97	
History of Chronic disease			
Yes	16	3	2.48
No	199	94	

Chi-square ($\chi 2$) df (1)= 3.841, $p<0.05$ significant

*= Significant

Data in table 5 revealed a significant association between the level of anemia with number of meal taken more than 3times per day (32.00), additional diet during pregnancy (29.52), regular green leafy vegetables (15.05), daily intake of fruits (11.06), milk/ milk products (18.53), bowl of pulses (6.89), slice of lemon daily (13.11) as the table value (3.841) was lower than calculated chi-square value at df 1 of 0.05 level of significance.

Data in table 6 represented that there was significant association present between the level of anemia with history of worm infestation (33.56), deworming during present pregnancy (25.16) and history of piles/ hemorrhoids (5.28) as the table value (3.841) was lower than calculated chi-square value at df 1 of 0.05 level of significance.

6. Discussion

6.1 Discussion related to magnitude of anemia among antenatal women

In the present study majority (68.91%) of antenatal women were anemic. Among them 36.22% had moderate anemia, 32.05% had mild anemia and 0.64% antenatal woman had severe anemia. Mean hemoglobin concentration of all antenatal women was 10.22 gm/dl.

This findings of the present study was supported by Nationally representative cross-sectional survey was conducted by Jana A, Chattopadhyay A and Saha U R (2022) on "Identifying risk factors in explaining women's anemia in limited resource areas: evidence from West Bengal of India and Bangladesh." Study findings revealed that prevalence of anemia in West Bengal was 64% and 41% in Bangladesh [5].

A retrospective study on anemia in pregnancy was conducted by Sharma S, Kaur S P, *et al*. (2020). Out of 264 (68%) females; 191 (72.3%) had mild anemia, 65 (24.6%) had moderate anemia and 08 had severe anemia. Mean hemoglobin concentration of all participants was 10.47 gm/dl. Study findings found similar to present study findings [6].

Similar study was conducted by Kumar V, Jain M, *et al*. (2019) to determine the "prevalence of anemia among pregnant women and to determine association of anemia with socio-demographic factors." Study showed that 81.8% antenatal women were anemic with a degree of Mild anemia (35.0%), moderate anemia (45.4%) and severe anemia (1.4%) respectively [7].

6.2 Discussion related to contributing factors of Anemia among antenatal women

In the present study 68.91% antenatal women were found anemic with identified contributing factors like 1st pregnancy before 19 years of age, did not taken Iron Folic Acid supplementation in present pregnancy, history of miscarriage, heavy menstrual bleeding, did not take additional diet during pregnancy, history of worm infestation, deworming during present pregnancy. These factors were responsible for anemia among antenatal women in this study.

This study was supported by study was conducted by Kumar V, Jain M, *et al*. (2019) to "determine the prevalence of anemia among pregnant women and to determine association of anemia with socio-demographic factors." Antenatal checkup, iron and folic acid consumption and deworming were responsible for anemia among pregnant women in this study [7].

Findings of the present study was quite similar with the cross-sectional study by Alreshidi MA, Haridi HK (2021) on "prevalence of anemia and associated risk factors among pregnant women." The prevalence of anemia increased significantly with low income, bigger family size, higher parity, longer menstrual cycle > 5 days, bleeding during pregnancy, infrequent intake of meat, the habit of drinking tea just after meals, past history of anemia [8].

Similar study was conducted by Nair MS, Raphael L, *et al*. (2022) on "prevalence of anemia and associated factors among antenatal women in rural Kozhikode district, Kerala". In this study excess menstrual blood loss prior to present pregnancy, early age at first delivery, trimester, and parity were identified contributing factors [9].

6.3 Discussion related to association between anemia and contributing factors among antenatal women

Present study revealed that there was significant association existed between level of anemia with contributing factors like 1st pregnancy before 19 years of age, did not taken Iron Folic Acid supplementation in present pregnancy, history of miscarriage, heavy menstrual bleeding, did not take additional diet during pregnancy, history of worm infestation, deworming during present pregnancy.

Similar association was found in the study conducted by Sinha A, Adhikary M, *et al*. (2021) on "anemia and risk factors among pregnant women attending antenatal clinic of a rural medical college of West Bengal". Majority of pregnant women did not take minimum number of iron and folic acid tablets during their pregnancy and it was found significantly associated with the level of anemia [10].

A similar study was carried out by Abiselvi A, Gopalakrishnan S, Umadevi R, Rama R on "Socio-demographic and obstetric risk factors of anaemia". Study has been carried out in rural Tamil Nadu among pregnant women. Among the study participants, 41.5% were found anemic with the significant association between dietary habits, irregular iron folic acid tablet consumption and deworming in present pregnancy with the level of anemia [11].

Similar result was observed in the cross-sectional study by Alreshidi MA, Haridi HK (2021) on "prevalence of anemia and associated risk factors among pregnant women". The study concluded that prevalence of anemia increased significantly with low income, bigger family size, higher parity, longer menstrual cycle > 5 days, bleeding during pregnancy, the habit of drinking tea just after meals, past history of anemia [8].

6.4 Discussion related to association between anemia with selected demographic variables among antenatal women

Present study revealed that there was significant association existed between level of anemia with education, per capita monthly income, age of marriage, gravida, parity and interpregnancy interval of the antenatal women.

Similar association was found by Pandya M, Pandya J, *et al*. (2022) on "prevalence of anemia in pregnancy at tertiary care hospital, Ahmedabad". This study found significant association between anemia and higher parity, lower socioeconomic status, birth spacing <2 years, education level [12].

Similar result was observed in the study by Sarah K, Assad H on "frequency of anemia in pregnancy and association

with sociodemographic factors in women". The study concludes that there was a strong association between education, poverty and parity. They found that the anemia was most prevalent in the women with previous two (02) alive kids [13].

Dutta A conducted a "systematic review on the prevalence of anemia during pregnancy and to find common causes of increased prevalence of anemia in different regions of India from published studies (2017 to 2021)". Study concluded that more than 50% of pregnant women in India were anemic and significant association was found between anemia during pregnancy and age of the pregnant women, education level of the women and their socio-economic status [14].

7. Conclusion

Magnitude of anemia in the present study was 68.91%. Among pregnant women, iron deficiency anemia was markedly associated with adverse reproductive outcome like preterm delivery, low birth weight baby, decreased iron stores for the baby, which may impaired cognitive and motor development of infants. Anemia was an indicator of poor nutrition, which lead to poor health.

The study revealed that magnitude of anemia among antenatal women were significant health problem. Monthly income of the family, age of marriage, gravida, parity, interpregnancy interval less then 2 years were significant demographic variables contributes anemia during pregnancy. Anemia were more prevalent among less educated mother in the study. Magnitude of anemia was also higher among multigravida antenatal women with birth interval less than two years between pregnancy.

Study also revealed that antenatal women did not take regular iron folic acid tablets in right dose and time. They were neither came for regular antenatal checkup nor followed the health advice given by health worker. Most of the antenatal women did not ate additional diet during pregnancy. They also did not take green leafy vegetables, fruits, milk/milk products, pulses, lemon daily in diet. Previous history of worm infestation and deworming during pregnancy played a major role for the magnitude of anemia.

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11. Conflict of interest: Not available

12. References

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