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Original Research Article

Prevalence and predictors of anaemia in pregnancy: the role of birth spacing, educational status and awareness levels in Meerut City

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ABSTRACT

Background: Anaemia during pregnancy remains a major public health challenge in India and is a leading contributor to maternal and neonatal morbidity. Understanding its determinants is essential for designing targeted interventions. Evidence from urban areas such as Meerut City is limited, despite rapid urbanisation and shifting socioeconomic patterns. To assess the prevalence and predictors of anaemia among pregnant women in Meerut City, with specific focus on birth spacing, educational status and awareness related to anaemia.
Methods: A cross-sectional study was conducted among 904 pregnant women attending antenatal clinics in Meerut City. Data were collected using a structured, interviewer-administered questionnaire along with haemoglobin estimation based on WHO criteria. Logistic regression analysis was performed to identify significant predictors of anaemia.
Results: Anaemia prevalence was 59.6%, comprising 22.9% mild, 34.5% moderate and 2.2% severe cases. Short interpregnancy interval (<24 months) showed a strong association with anaemia ($p<0.05$). Women with lower educational attainment and poor awareness of anaemia were significantly more likely to be anaemic, indicating a prominent role of reproductive, educational and informational factors.
Conclusions: Anaemia among pregnant women in Meerut City remains alarmingly high. Short birth spacing, low maternal education and inadequate awareness emerged as key predictors. Strengthening ANC counselling, enhancing women's health literacy and promoting optimal birth spacing are critical strategies to reduce the burden of anaemia in similar urban populations.

Keywords: Anaemia, Awareness, Birth spacing, Educational status, Maternal health, Meerut city, Pregnancy

INTRODUCTION

Anaemia in pregnancy continues to be a major public health concern in many low-and middle-income countries, including India, where its prevalence remains high despite ongoing national interventions. Evidence from recent studies highlights that maternal anaemia is strongly influenced by reproductive patterns, nutritional practices and socioeconomic disparities rather than biological factors alone.[1-3] National surveys such as NFHS-5 have consistently shown that large segments of antenatal women remain anaemic, underscoring persistent gaps in health services, awareness and dietary intake.[4] Research from various Indian and international settings indicates that maternal nutritional depletion is significantly associated with repeated and closely spaced pregnancies. Short interpregnancy intervals reduce the time available for women to restore iron stores, thereby increasing their vulnerability to anaemia.[5-14] Systematic reviews also confirm that inadequate spacing poses risks not only for maternal anaemia but also for overall

maternal and child health.[15-18] Similar associations have been reported across African and Asian populations, demonstrating that this pattern persists across socioeconomic contexts.[19-21]

Awareness and educational status have emerged as major determinants of maternal nutritional outcomes. Studies conducted in different regions of India suggest that limited knowledge about anaemia, poor understanding of iron-rich diets and inconsistent use of iron and folic acid supplements significantly elevate anaemia risk.[22-26] Awareness gaps are often compounded by low educational attainment, which restricts women's access to health information and reduces their likelihood of adopting preventive behaviours.[27-29]

The influence of socioeconomic conditions is also well documented. Research shows that women with low income, inadequate household facilities or limited access to health services face a greater risk of nutritional deficiencies, including anaemia.[30-32] This is particularly relevant in urban settings experiencing rapid demographic transitions, where lifestyle changes, dietary shifts and uneven utilisation of antenatal care contribute to varying anaemia levels.[33]

Government initiatives such as Anaemia Mukt Bharat aim to strengthen supplementation, dietary counselling and community engagement; however, the effectiveness of these programmes depends heavily on maternal awareness, birth spacing practices and ANC participation.[34,35] Identifying predictors such as educational status, interpregnancy interval and anaemia awareness is therefore essential for improving focused interventions, especially in urban areas like Meerut where socioeconomic variation is considerable.

Against this background, the present study titled "Prevalence and Predictors of Anaemia in Pregnancy: The Role of Birth Spacing, Educational Status and Awareness Levels in Meerut City" examines the magnitude of anaemia and explores key determinants affecting haemoglobin status among pregnant women. The findings from this study aim to support more effective maternal health strategies, better ANC counselling and locally relevant policy improvements.

Objective

Anaemia in pregnancy remains a major public health challenge in urban India, where socioeconomic differences, limited awareness and suboptimal reproductive practices continue to influence maternal nutritional outcomes. In Meerut City, these factors vary widely across populations, making it important to generate local evidence that can guide targeted interventions. Birth spacing, educational status and awareness of anaemia prevention have been repeatedly identified as key determinants affecting haemoglobin levels during pregnancy. Despite national programmes such as Anaemia Mukt Bharat, gaps persist in understanding how these factors interact in urban settings. Therefore, the present study was designed to examine the prevalence and predictors of anaemia with a specific focus on these determinants.

The study was conducted with the following specific objectives.

To determine the prevalence of anaemia among pregnant women in Meerut City. To assess the influence of maternal educational status on anaemia in pregnancy. To examine the role of birth spacing (interpregnancy interval) as a determinant of anaemia. To evaluate the association between awareness levels related to anaemia. To identify the major predictors of anaemia using logistic regression analysis.

METHODS

This study employed a cross-sectional descriptive research design to determine the prevalence of anaemia among pregnant women in Meerut City and to identify key predictors associated with it. The study specifically focused on examining the influence of birth spacing (interpregnancy interval), maternal educational status and awareness levels related to anaemia, diet and supplementation. A total of 904 pregnant women attending antenatal clinics in Meerut City were selected using a structured questionnaire and haemoglobin assessment following WHO criteria. The design enabled the assessment of current anaemia status and its relationship with selected sociodemographic and reproductive determinants within the study population.

Study design

This study adopted a cross-sectional descriptive research design to determine the prevalence of anaemia among pregnant women in Meerut City and to examine the association of key predictors including birth spacing, educational status and anaemia awareness with anaemia status.

Study area and population

The research was conducted across 28 Government Urban Primary Health Centres (UPHCs) in Meerut City, Uttar Pradesh, India. The study population comprised pregnant women attending antenatal clinics at these UPHCs during the data collection period.

Sample size and sampling technique

A total of 904 pregnant women were selected using a stratified random sampling technique to ensure proportional representation from all 28 UPHCs. Women were eligible for inclusion if they were currently pregnant, aged 18–45 years, permanent residents of Meerut City and willing to provide informed consent.

Data collection (tools and techniques)

Data collection was carried out from April 2025 to July 2025 across all 28 UPHCs in Meerut City. A structured, pre-validated questionnaire was used for data collection, administered digitally via Google Forms to ensure standardization and minimize data-entry errors. Ethical approval for the study was obtained from the Institutional Ethical Committee of Swami Vivekanand Subharti University, Meerut, Uttar Pradesh. Informed consent was obtained from all participants prior to data collection.

The questionnaire captured socio-demographic information (age, household income, occupation, education), reproductive characteristics including parity and interpregnancy interval and awareness-related variables concerning anaemia, dietary practices and supplementation. Educational attainment was categorized as: no formal education, primary, secondary, higher secondary and graduate or above.

Assessment of anaemia awareness

Anaemia awareness was assessed using a structured 10-item questionnaire covering causes, symptoms, iron-rich food sources, iron and folic acid (IFA) supplementation, prevention strategies and complications related to anaemia. Each correct response was awarded one point, resulting in a total awareness score ranging from 0 to 10. Based on a Modified Kuppuswamy–style additive scoring approach, participants were categorised as having low awareness (0–3), moderate awareness (4–6) or high awareness (7–10). The same scoring technique was also applied for categorising the availability of basic amenities and participation in entertainment activities. This scoring framework enabled meaningful comparison of awareness levels with the prevalence and severity of anaemia, as well as with selected socio-demographic characteristics.

Data analysis

Collected data were compiled, coded and analyzed using both descriptive and inferential statistical techniques. The prevalence and severity of anaemia were assessed through frequency and percentage distributions. Associations between anaemia status and key predictors including birth spacing, educational level and anaemia awareness were examined using the chi-square test. Variables showing significant associations were further analyzed using logistic regression to identify independent predictors of anaemia. A p value of <0.05 was considered statistically significant for all analyses.

RESULTS

Anaemia was more common among pregnant women aged 21–30 years, those from low-income households (60.3%) and women with lower educational attainment, particularly those educated up to primary level (51.9%). Limited access to basic amenities (60.1%), low engagement in information or entertainment activities (66.6%) and larger family size (>5 members: 81.3%) were also associated with higher anaemia prevalence. Consumption of iron-rich foods was low, with 58.7% reporting rare intake and IFA tablet compliance was inconsistent, as only 8.9% of anaemic women took supplements daily. Awareness levels showed a strong gradient, where 62.5% of anaemic women had low awareness compared to non-anaemic women who demonstrated higher knowledge levels.

The analysis shows that most pregnant women were between 21–30 years of age (71.7%) and anaemia was highest in the same age group, particularly among women aged 21–25 years (42.1%) and 26–30 years (36.5%). Income appeared to be an important determinant, where 60.3% of anaemic women belonged to low-income households, while only 9.6% in this income category were non-anaemic.

Educational status also showed a strong pattern: 51.9% of anaemic women had only primary or middle-level schooling and only 6.9% of those with higher education (UG/PG) were anaemic. Access to basic amenities showed a similar association, as 60.1% of women with low amenities were anaemic, compared to 18% among those with normal facilities. Engagement in entertainment and informational activities also varied, with 66.6% of anaemic women reporting low engagement, while only 12.8% from the high-engagement group were anaemic.

Household structure further influenced anaemia levels. A large proportion of anaemic women (81.3%) belonged to families with more than five members, whereas only 18.7% came from smaller families. Type of housing showed minimal variation as 94.8% of anaemic women lived in owned houses, indicating that housing type may not be a major distinguishing factor in this sample. Awareness and supplementation behaviour indicated gaps: although 95% of participants were aware of the importance of iron supplementation, actual consumption was inconsistent. Only 8.9% of anaemic women took IFA tablets daily, while the majority (55.5%) reported taking them sometimes.

The frequency of IFA tablet intake also showed differences, where 64.2% of anaemic women were taking only one tablet per day, while 67.4% of non-anaemic women were taking two tablets daily, indicating better compliance among non-anaemic women. Dietary practices reflected similar patterns, as 58.7% of anaemic women rarely consumed iron-rich foods, while only 1.5% consumed them daily. Finally, overall awareness levels of anaemia showed a strong relationship with haemoglobin status, as 62.5% of anaemic women had low awareness, compared to 50.1% of non-anaemic women with high awareness, indicating a clear link between awareness and anaemia outcomes. A majority of pregnant women-initiated ANC late, with 57.5% reporting first contact during the third trimester, among whom 64.2% were

anaemic. Women attending ANC between 12–20 weeks also showed a high anaemia prevalence (59.1%). Anaemia increased progressively with gravida and parity, with the highest levels among women with three or more previous pregnancies (68–72%). Inter-pregnancy spacing shorter than two years showed the strongest association, where 73.0% of women in this category were anaemic. Overall, late ANC initiation, higher maternal reproductive load and short birth spacing appear strongly linked to anaemia.

The gestational profile and ANC patterns indicate that most pregnant women began antenatal care (ANC) in the later stages of pregnancy. A majority (57.5%) initiated ANC in the third trimester, where anaemia was also highest (64.2%) in this group. Only 2.0% of women started ANC in the first trimester and among them, 33.3% were anaemic. Similarly, when analysed by gestational age reporting rather than ANC start stage, most women (89.3%) sought ANC between 12–20 weeks, with 59.1% of them anaemic. Very few women (0.7%) accessed ANC between 21–28 weeks. Gravida status showed that anaemia increased with repeated pregnancies. Among women pregnant for the third time (28.0% of total cases), 68.0% were anaemic, followed by those in their fourth pregnancy (72.1% anaemic), while first-time mothers showed a lower rate (58.8%).

Parity distribution showed a similar trend, where women with three or more previous births had the highest anaemia prevalence (68.9%) compared to primiparous women (57.9%). Inter-pregnancy interval (IPI) analysis revealed that the majority belonged to the category of less than two years spacing (46.5%) and among these women, 73.0% were anaemic, reflecting the highest proportion in this category. In comparison, women with an interval of more than two years showed a significantly lower proportion of anaemia (32.5%). Overall, the data suggests that delayed ANC initiation, higher gravida and parity levels and shorter birth spacing are associated with higher anaemia prevalence among pregnant women in the study population.

The findings indicate that among 904 pregnant women, 59.6% were anaemic, highlighting a notable public health concern. Moderate anaemia was the most prevalent category (34.5%), followed by mild anaemia (22.9%), while severe anaemia accounted for only 2.2% of cases. In contrast, 40.4% of women had normal haemoglobin levels, reflecting a substantial proportion still requiring nutritional or clinical intervention.

The analysis revealed strong associations between anaemia and key predictors including inter-pregnancy interval, awareness levels, education and parity. Women with a shorter birth spacing (<2 years) showed a significantly higher anaemia prevalence (73.8%) compared to those with longer spacing (>2 years), with an odds ratio of 1.63, indicating increased risk. A clear gradient was observed with awareness, where women with low awareness demonstrated the highest anaemia burden (62.5%) and logistic regression indicated they were 3.47 times more likely to be anaemic.

Education also emerged as a protective factor: women with primary and middle schooling had higher anaemia (51.9%) compared to those with graduate education, supported by a statistically significant association ($p<0.001$; OR=1.44). Parity patterns further highlighted risk concentration among multiparous women, with anaemia highest among women with 2 or more children (73.0%), whereas primigravidas had comparatively lower levels. All associations were statistically significant ($p<0.001$), confirming the role of birth spacing, awareness, educational status and parity as major determinants of anaemia among pregnant women in Meerut.

The results clearly indicate that anaemia among pregnant women in Meerut, is strongly influenced by reproductive, educational and awareness-related factors. Women with shorter birth spacing (<2 years) were more likely to be anaemic, which may be attributed to inadequate nutritional recovery between pregnancies. Similarly, low awareness regarding anaemia and its prevention strongly correlated with higher anaemia levels, emphasizing the importance of information access and health literacy.

Education emerged as a significant protective factor, where women with higher levels of schooling showed lower anaemia rates, due to better nutritional understanding, healthcare access and decision-making ability.

Parity also played a key role, with higher anaemia prevalence among women with two or more children, suggesting increased physiological demand and limited nutritional reserves. Overall, the pattern demonstrates that modifiable factors such as improving awareness, extending birth spacing, enhancing female education and limiting high-parity pregnancies could reduce the burden of anaemia in this population.

Table 1: Baseline socio-demographic and maternal health characteristics of pregnant women (n=904).

Variables	Anaemic PW – 539 (%)	Non-anaemic PW 365 (%)	Total-904 (%)
Women's age group who are pregnant (in years)			
≤20	41 (7.6)	22 (6.0)	63 (7.0)
21-25	227 (42.1)	132 (36.2)	359 (39.7)
26-30	197 (36.5)	147 (40.3)	344 (38.1)
31-35	64 (11.9)	53 (14.5)	117 (12.9)

Continued.

Variables	Anaemic PW – 539 (%)	Non-anaemic PW 365 (%)	Total-904 (%)
>35	10 (1.9)	11 (3.0)	21 (2.3)
Monthly household income			
Low	325 (60.3)	35 (9.6)	360 (39.8)
Medium	145 (26.9)	194 (53.2)	339 (37.5)
High	69 (12.8)	136 (37.3)	205 (22.7)
Pregnant women's educational attainment			
No formal education	91 (16.9)	47 (12.9)	138 (15.3)
Primary & middle (1-8)	280 (51.9)	153 (41.9)	433 (47.9)
Secondary & higher secondary (9-12)	131 (24.3)	111 (30.4)	242 (26.8)
UG & PG	37 (6.9)	54 (14.8)	91 (10.1)
Religion of pregnant women			
Hindu & other	279 (51.8)	223 (61.1)	502 (55.5)
Muslim	260 (48.2)	142 (38.9)	402 (44.5)
Category of religion			
General	199 (36.9)	152 (41.6)	351 (38.8)
OBC	274 (50.8)	153 (41.9)	427 (47.2)
SC	66 (12.2)	60 (16.4)	126 (13.9)
Basic amenities are available (electricity, clean drinking water, sanitary amenities, television, air conditioning, laptop or computer and automobile transportation)			
Low	324 (60.1)	79 (21.6)	403 (44.6)
Medium	118 (21.9)	86 (23.6)	204 (22.6)
Normal	97 (18.0)	200 (54.8)	297 (32.9)
Entertainment activities (Watch TV, go to the Movies and Read the News)			
Low	359 (66.6)	89 (24.4)	448 (49.6)
Moderate	111 (20.6)	125 (34.2)	236 (26.1)
High	69 (12.8)	151 (41.4)	220 (24.3)
Size of the family			
<5 Member	101 (18.7)	84 (23.0)	185 (20.5)
>5 Member	438 (81.3)	281 (77.0)	719 (79.5)
Type of house			
Owned house	511 (94.8)	343 (94.0)	854 (94.5)
Rented house	28 (5.2)	22 (6.0)	50 (5.5)
Specify frequency in a day of taken IFA Tablets			
Advice from family/friends	172 (54.3)	145 (45.7)	317 (35.1)
Awareness of ANC benefits	286 (63.3)	166 (36.7)	452 (50.0)
None of above	81 (60.0)	54 (40.0)	135 (14.9)
Include iron-rich foods (e.g., green leafy vegetables, meat, beans) in your diet			
Daily	8 (1.5)	119 (32.6)	127 (14.0)
2-3 times/week	86 (16.0)	160 (43.8)	246 (27.2)
Rarely	445 (82.6)	86 (23.6)	531 (58.7)
Are you aware of the importance of iron supplementation during pregnancy?			
Yes	512 (95.0)	356 (97.5)	868 (96.0)
No	27 (5.0)	9 (2.5)	36 (4.0)
How are you taking Iron /FA?			
Daily	48 (8.9)	208 (57.0)	256 (28.3)
2-3 times/week	192 (35.6)	113 (31.0)	305 (33.7)
Sometimes	299 (55.5)	44 (12.1)	343 (37.9)
Specify frequency in a day of taken IFA tablets			
One tablet per day	346 (64.2)	119 (32.6)	465 (51.4)
Two tablets in a day	193 (35.8)	246 (67.4)	439 (48.6)
Awareness of anaemia and knowledge its sources			
High	75 (13.9)	183 (50.1)	258 (28.5)
Moderate	127 (23.6)	113 (31.0)	240 (26.5)
Low	337 (62.5)	69 (18.9)	406 (44.9)

Table 2: Gestational profile and ANC patterns (n=904).

Variables	Anaemic PW-539 (%)	Non-anaemic PW-365 (%)	Total-904 (%)
Gestational age (in weeks) at the time of ANC start			
First trimester	6 (33.3)	12 (66.7)	18 (2.0)
Second trimester (13-26 weeks)	199 (54.4)	167 (45.6)	366 (40.5)
Third trimester (27+ weeks)	334 (64.2)	186 (35.8)	520 (57.5)
Gestational age (in weeks) at the time of ANC start			
Before 12 weeks	59 (64.8)	32 (35.2)	91 (10.1)
12–20 weeks	477 (59.1)	330 (40.9)	807 (89.3)
21–28 weeks	3 (50.0)	3 (50.0)	6 (0.7)
Women in pregnancy gravida			
1	160 (58.8)	112 (41.2)	272 (30.1)
2	158 (50.8)	153 (49.2)	311 (34.4)
3	172 (68.0)	81 (32.0)	253 (28.0)
4	49 (72.1)	19 (27.9)	68 (7.5)
The parity of pregnant women			
0	175 (57.9)	127 (42.1)	302 (33.4)
1	168 (50.8)	163 (49.2)	331 (36.6)
2	165 (73.0)	61 (27.0)	226 (25.0)
3	31 (68.9)	14 (31.1)	45 (5.0)
Inter-pregnancy interval (IPI)			
Primigravida	160 (58.8)	112 (41.2)	272 (30.1)
<2	310 (73.8)	110 (26.2)	420 (46.5)
>2	69 (32.5)	143 (67.5)	212 (23.5)

Table 3: Anaemia levels among pregnant women (n=904).

S. no.	Various level of anaemia	Frequency	%
1	<7 g/dl (Severe)	20	2.2
2	7-9.9 g/dl (Moderate)	312	34.5
3	10-10.9 g/dl (Mild)	207	22.9
4	11+g/dl (Normal)	365	40.4
Total anaemia		904	59.6

Table 4: Factors associated with prevalence of anemia among pregnant women (n=904).

Variables	Anaemic PW-539 (%)	Non-anaemic PW-365 (%)	Total-904 (%)	Chi square P value	Logistic regression P value	Odds ratio (Exp B)
Inter-pregnancy interval (IPI)						
Primigravida	160 (58.8)	112 (41.2)	272 (30.1)			
<2	310 (73.8)	110 (26.2)	420 (46.5)	<0.001	<0.001	1.63
>2	69 (32.5)	143 (67.5)	212 (23.5)			
Awareness of anaemia and knowledge its sources						
High	75 (13.9)	183 (50.1)	258 (28.5)			
Moderate	127 (23.6)	113 (31.0)	240 (26.5)	<0.001	<0.001	3.47
Low	337 (62.5)	69 (18.9)	406 (44.9)			
Pregnant women's educational attainment						
No formal Education	91 (16.9)	47 (12.9)	138 (15.3)			
Primary & Middle (1-8)	280 (51.9)	153 (41.9)	433 (47.9)			
Secondary & Higher Secondary (9-12)	131 (24.3)	111 (30.4)	242 (26.8)	<0.001	<0.001	1.44
UG & PG	37 (6.9)	54 (14.8)	91 (10.1)			
The parity of pregnant women						
0	175 (57.9)	127 (42.1)	302 (33.4)	<0.001	<0.001	0.77

Continued.

Variables	Anaemic PW-539 (%)	Non-anaemic PW-365 (%)	Total-904 (%)	Chi square P value	Logistic regression P value	Odds ratio (Exp B)
1	168 (50.8)	163 (49.2)	331 (36.6)			
2	165 (73.0)	61 (27.0)	226 (25.0)			
3	31 (68.9)	14 (31.1)	45 (5.0)			

DISCUSSION

The present study highlights a high burden of anaemia (59.6%) among pregnant women in Meerut, like recent national and regional findings across India that continue to report anaemia as a major public health challenge.[1] The age distribution showed that anaemia was highest among women aged 21–30 years, which aligns with national reproductive health trends, as this age group represents the biologically and socially active childbearing population.[2] Lower educational attainment was strongly associated with anaemia, with most anaemic women having only primary or middle schooling. Previous evidence shows that education enhances nutritional knowledge, self-care and ANC utilization, thereby reducing anaemia risk.[3-5]

Socioeconomic status and household living conditions were major determinants in this study. Women belonging to low-income families and those with reduced access to amenities had significantly higher anaemia. Similar associations have been reported in earlier Indian and international studies, where poverty limits dietary diversity, access to iron-rich foods and compliance with supplementation.[6-9] Low engagement in entertainment and informational activities, observed among anaemic women, also reflects limited exposure to health communication, which reduces awareness and preventive behaviours.[10]

Reproductive indicators showed a particularly strong relationship with anaemia. Anaemia prevalence progressively increased with higher gravida and parity, consistent with multiple studies demonstrating that repeated pregnancies deplete maternal iron stores and increase physiological burden.[11-14] Short birth spacing (<2 years) emerged as one of the strongest predictors, with affected women showing nearly twice the risk of anaemia compared to those with ≥2 years spacing. This finding corroborates established global evidence that short inter-pregnancy intervals impair maternal nutritional recovery and elevate anaemia risk.[15-23]

The timing of ANC initiation was another critical factor. Most participants began ANC in the third trimester, where anaemia was higher. Early ANC is widely recognized as essential for timely screening, counselling and IFA supplementation; delayed initiation restricts preventive opportunities.[24-26] Although awareness of IFA importance was high, daily consumption remained low among anaemic women, highlighting a persistent gap between knowledge and practice. Previous KAP studies among antenatal women also report similar discrepancies and emphasize the need for structured behaviour-change interventions.[27-30]

Dietary behaviours in the present study further support this gap, as most anaemic women rarely consumed iron-rich foods, a finding consistent with national reports linking poor dietary diversity with anaemia.[31,32] Overall, low awareness levels showed a strong association with anaemia and logistic regression confirmed awareness as a major protective factor. Similar results have been documented in community and facility-based studies, which underscore health literacy as a key determinant of maternal anaemia.[33-35]

Collectively, the findings demonstrate that anaemia among pregnant women in Meerut is shaped by a combination of socioeconomic, educational, reproductive and behavioural factors. Modifiable determinants such as improving awareness, enhancing education, ensuring longer birth spacing, strengthening early ANC attendance and increasing dietary diversity could substantially reduce the burden. These results reinforce the need for integrated maternal nutrition programmes aligned with NFHS-5 priorities and global recommendations for maternal health.

Limitations

The present study has certain limitations. As a cross-sectional investigation conducted in selected urban areas of Meerut City, the findings may not be generalizable to all pregnant women in the district or other regions. The sample size, although adequate for analysis, was relatively modest and limited to women attending health facilities, which may introduce selection bias. Data on dietary habits, awareness levels and health practices were self-reported and could be affected by recall bias or social desirability bias. Additionally, the study relied on hemoglobin-based classification and did not include biochemical indicators such as serum ferritin or folate levels, which would have provided a more comprehensive assessment of anemia etiology. Despite these limitations, the study provides valuable insights into the prevalence of anemia and its association with educational attainment among pregnant women in this urban setting.

CONCLUSION

The study reveals that anaemia remains a significant public health concern among pregnant women in Meerut, driven by modifiable socioeconomic, educational and reproductive factors. Women with low income, limited amenities and lower educational attainment were significantly more vulnerable to anaemia, highlighting persistent inequalities in maternal nutritional health. Reproductive patterns, particularly high parity, repeated pregnancies and short inter-pregnancy intervals—further intensified the risk by limiting the mother's nutritional recovery.

Delayed initiation of antenatal care, poor compliance with iron–folic acid supplementation and low dietary intake of iron-rich foods also contributed substantially to the burden. Awareness and health literacy emerged as strong protective factors, reinforcing the need for continuous behaviour-change communication and early ANC engagement. Overall, the findings emphasize that improving maternal education, promoting adequate birth spacing, enhancing nutritional counselling and strengthening ANC services, especially in early pregnancy can significantly reduce anaemia prevalence. Targeted community-based interventions, coupled with strengthened health system response, are essential to safeguard maternal health and ensure better pregnancy outcomes in similar urban settings.

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