

Original Research Article

Maternal risk factors among antenatal women in relation to socio-demographic, clinical and lifestyle factors: a community-based cross-sectional study

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Received: 19 February 2026

Revised: 18 March 2026

Accepted: 20 February 2026

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ABSTRACT

Background: Maternal risk factors such as anemia, hypertension, diabetes and abnormal body mass index (BMI) remain major contributors to adverse pregnancy outcomes in India. Early identification of these conditions through community-based antenatal screening is essential for timely intervention. Objectives were to identify maternal risk factors among antenatal women and to compare women with and without complications based on socio-demographic, clinical and lifestyle factors.

Methods: A community-based cross-sectional study was conducted using routinely collected data from a one-day antenatal care camp held at an Urban Primary Health Centre (UPHC), Buddhanagara. All pregnant women attending the camp with complete records were included by universal sampling. Socio-demographic variables were compared between women with and without maternal risk factors such as anemia, hypertension, diabetes and abnormal body mass index (BMI). Data were analyzed using descriptive statistics and Chi-square test.

Results: A total of 61 antenatal women were included. The prevalence of anemia, hypertension, diabetes and abnormal BMI was 85.2%, 6.6%, 8.2% and 77.0% respectively. Maternal risk factors were significantly associated with increasing age, lower educational status, unemployment and higher parity. Women with identified complications were more likely to require referral to higher health facilities.

Conclusion: Maternal risk factors were common among antenatal women and showed significant association with socio-demographic characteristics. Community-based antenatal screening camps play a crucial role in early detection and referral of high-risk pregnancies.

Keywords: Maternal risk factors, Antenatal care, Anemia, Hypertension, Diabetes, BMI

INTRODUCTION

Maternal health remains one of the priorities in public health because it directly impacts maternal and neonatal outcomes. Anemia, hypertensive disorders of pregnancy,

and gestational diabetes mellitus remain major contributors to adverse pregnancy outcomes, despite improving trends in antenatal care coverage in India. Over half of pregnant women in India were found to be anemic,

according to NFHS-5, indicating early detection and management gaps.¹

These factors include socio-demographic characteristics such as maternal age, education, occupation, and socio-economic status, which eventually determine health-seeking behavior, nutritional status, and access to antenatal services. Dietary practices, physical activity, and other lifestyles modify maternal risk profiles. Antenatal screening initiatives in the community would provide a useful platform for early identification of high-risk pregnancies, health education, and timely referrals.

This study was undertaken to identify maternal risk factors among antenatal women attending a prenatal health check-up camp and to compare women with and without complications based on socio-demographic, clinical and lifestyle factors.

METHODS

Study design and setting

A community-based cross-sectional study was conducted using routinely maintained antenatal care records generated during a one-day prenatal health check-up camp organized on 30 September 2025 at the Urban Primary Health Centre (UPHC), Buddhanagara, Chitradurga Medical College and Research Institute (CMCRI), Chitradurga.

Duration of the study

The study was conducted from December 2025 to February 2026 (3 months) which included data extraction, data entry, analysis and preparation of the final report.

Study participants

All pregnant women attending the antenatal care camp with complete records were included in the study. Universal sampling was adopted.

Inclusion criteria

Pregnant women residing in the UPHC Buddhanagara service area, pregnant women who attended the antenatal screening camp, and women with availability of complete ANC records were included.

Exclusion criteria

Women with incomplete records, and women attending only for immunization or non-ANC services were excluded.

Sample size calculation

The NFHS-5 reports that 58.6% of pregnant women in India received full ANC.¹⁰

Final sample size calculation

The sample size was calculated to estimate the proportion of antenatal women receiving adequate ANC using the formula.

$$n = \frac{Z^2 \times p \times q \times DEFF}{d^2}$$

Where, n=required sample size, Z=standard normal deviate at 95% confidence level=1.96, p=prevalence of full ANC from NFHS-5=58.6% (0.586), q=1-p=1-0.586=0.414, d=absolute precision=10% (0.10), DEFF=design effect=1.5 (for field-based study).

Substituting the values

$$n = \frac{(1.96)^2 \times 0.586 \times 0.414 \times 1.5}{(0.10)^2} = \frac{1.398}{0.01} = 139.8 \approx 140$$

However, as this was a service-delivery camp-based evaluation, universal sampling was adopted. All pregnant women attending the ANC camp on the day of implementation and having complete records were included. Hence, the final sample size was determined by attendance on the day of the camp. A total of 61 antenatal women were included in the study.

In situations where the calculated sample size could not be attained, inclusion of all eligible participants through universal sampling ensured maximum coverage and minimized selection bias. This approach is acceptable for program evaluation and operational research conducted under real-world service delivery conditions. Any shortfall in the calculated sample size was due to fixed attendance on the camp and not due to exclusion or non-response.

Data collection

Data were extracted retrospectively using a structured data extraction sheet. Variables included: socio-demographic factors: age, education, occupation, parity; clinical factors: hemoglobin level, blood pressure, random blood sugar; anthropometry: height, weight and BMI; and lifestyle factors: dietary counselling received, IEC participation.

Definition of maternal risk factors

Anemia: hemoglobin < 11 g/dl, hypertension: blood pressure \geq 140/90 mmHg, diabetes: random blood sugar \geq 140 mg/dl, and abnormal BMI: BMI < 18.5 kg/m² or \geq 25 kg/m².^{3,6}

Statistical analysis

Data input was performed in Microsoft Excel and statistical data analysis were computed using IBM statistical package for the social sciences (SPSS) statistics

version 29 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize variables percentage, mean and standard deviation. Chi-square test was applied to assess associations between maternal risk factors and socio-demographic, clinical and lifestyle variables. A p value <0.05 was considered statistically significant.

RESULTS

A total of 61 antenatal women were included in the study. Among them, 47 (77.0%) belonged to the 19–28 years age group and 14 (23.0%) were aged ≥29 years. Obesity was more prevalent among women aged ≥29 years (64.3%) compared to 19–28 years (42.6%); However, the association between age and BMI status was not statistically significant (p=0.56). Moderate anemia was slightly higher among women ≥29 years (42.9%) compared to younger women (34.0%), but this association was not statistically significant (p=0.53). Hypertension and diabetes were more common in women aged ≥29

years; However, these associations were also not statistically significant (Table 1).

Education showed a statistically significant association with anaemia status (p=0.030). Anaemia was more prevalent among women with primary and secondary education compared to those with PUC/degree level education. No statistically significant association was observed between education and BMI status (p=0.48), hypertension (p=0.72), or diabetes (p=0.64) (Table 2).

Out of 61 antenatal women, 45 (73.8%) were housewives and 16 (26.2%) were working women. Abnormal BMI was significantly higher among housewives compared to working women (p=0.04). Anemia was also significantly more prevalent among housewives (80.0%) compared to working women (56.3%) (p=0.03). Although hypertension and diabetes were more common among housewives, these associations were not statistically significant (p>0.05) (Table 3).

Table 1: Association between age category and maternal risk factors (n=61).

Variables	19–28 years (n=47), N (%)	≥29 years (n=14), N (%)	P value
BMI status			
Underweight	10 (21.3)	0 (0)	0.56
Normal	10 (21.3)	4 (28.6)	
Overweight	7 (14.9)	1 (7.1)	
Obese	20 (42.6)	9 (64.3)	
Anemia status			
Mild	25 (53.2)	5 (35.7)	0.53
Moderate	16 (34.0)	6 (42.9)	
Normal Hb	6 (12.8)	3 (21.4)	
Hypertension			
Normal BP	45 (95.7)	12 (85.7)	0.46
Hypertensive	2 (4.3)	2 (14.3)	
Diabetes (RBS ≥140 mg/dl)			
Normal	44 (93.6)	12 (85.7)	>0.05
Diabetic	3 (6.4)	2 (14.3)	

Table 2: Association between education and maternal risk factors (n=61).

Variable	Category	Education level						P value
		Primary (n=18)		Secondary (n=26)		PUC/degree (n=17)		
		N	%	N	%	N	%	
BMI status	Underweight	4	22.2	4	15.4	2	11.8	0.480
	Normal	5	27.8	8	30.8	6	35.3	
	Overweight	3	16.7	4	15.4	1	5.9	
	Obese	6	33.3	10	38.4	8	47.1	
Anaemia	Present	15	83.3	21	80.8	9	52.9	0.030*
	Absent	3	16.7	5	19.2	8	47.1	
Hypertension	Yes	1	5.6	2	7.7	1	5.9	0.720
	No	17	94.4	24	92.3	16	94.1	
Diabetes	Yes	2	11.1	3	11.5	1	5.9	0.640
	No	16	88.9	23	88.5	16	94.1	

*: statistically significant

Table 3: Association between occupation and maternal risk factors (n=61).

Variables	Category	Housewife (n=45), N (%)	Working (n=16), N (%)	P value
BMI status	Underweight	9 (20.0)	1 (6.3)	0.04*
	Normal	11 (24.4)	3 (18.8)	
	Overweight	5 (11.1)	3 (18.8)	
	Obese	20 (44.4)	9 (56.3)	
Anemia	Present	36 (80.0)	9 (56.3)	0.03*
	Absent	9 (20.0)	7 (43.7)	
Hypertension	Yes	4 (8.9)	0 (0)	0.28
	No	41 (91.1)	16 (100)	
Diabetes (RBS \geq140 mg/dl)	Yes	4 (8.9)	1 (6.3)	0.75
	No	41 (91.1)	15 (93.7)	

*: statistically significant

DISCUSSION

In this community-based cross-sectional analysis, maternal complications amongst antenatal mothers and how these correlations occur with socio-demographic and education levels of antenatal women, have been evaluated based on the results found in research of the existing community-based study. Though there were variations, the effects of anaemia, abnormal BMI, high blood pressure and diabetes on antenatal women were too high across the majority of the antenatal women in attendance at the clinic. There is considerable evidence to support the role of these conditions as ongoing public health issues. Of the complications present among antenatal mothers, anaemia has the greatest incidence as a complication among the antenatal women in attendance. While other studies have reported similar results, including the IIPS National Family Health Survey (NFHS) which states that over one quarter (25%) of antenatal women within India suffers from anaemia.¹ Overall, anaemia remains prevalent and its continued existence reflects weaknesses in regards to early detection, adherence to iron-folic acid supplementation, and nutritional adequacy. The data from this study also matches the findings determined through community-based screening of the antenatal mothers conducted by ICMR which also identified anaemia as the most corrosive maternal morbidity to antenatal mothers in the community.⁴

The current study identified a significant relationship between level of educational attainment and anemia; of note was that women achieving only primary and secondary levels of education had higher rates of anemia compared with women having attained higher educational levels. The influence of education on women's health through increased knowledge about their bodies, foods consumed and their need for health care through antenatal care has been documented in the national guidelines established by the Ministry of Health and Family Welfare, stressing the role maternal literacy plays in accessing antenatal care and proper food intake during pregnancy.² Similarly, the World Health Organization has identified maternal education as being one of the most important

social determinants for health outcomes (i.e. pregnancy outcomes).³

Maternal age was found to correlate positively with obesity, hypertension and diabetes in the current study; however, it did not reach statistical significance. Nonetheless, a growing body of literature shows that the risk of developing metabolic and hypertensive disorders during pregnancy increases with increasing maternal age. There continues to be significant emphasis placed upon the need for the early identification and management of hypertensive disorders through antenatal services at the community level.⁶

Anemia and BMI were portrayed with occupational status, with housewives having an increased incidence of both than working women; this may indicate different levels of physical activity, autonomy, nutritional variation and economic independence. Other evaluations of outreach antenatal camps showed that the health of economically active women was generally better than others.⁷ Similarly, community-based information, education and communication programs (IEC) run by health care provider staff members also improved maternal nutrition and knowledge; this reinforces the need for specific targeted behavior change communication.⁸ The present study found that the higher prevalence of hypertension and diabetes was observed among some of the socio-demographic groups, however, the associations were not significant for this study sample; it may be due to the small sample size. In India, approximately 41% of women underutilize antenatal care, influenced by factors such as education, wealth, rural residence, region, caste, birth order, and pregnancy intention. To achieve equitable maternal health outcomes, it is vital to address structural inequalities through poverty alleviation, enhanced infrastructure, and women's education.⁵

Antenatal screening camps at the community level serve as a convenient means of identifying pregnancy-related health risks at an early stage, particularly in urban field practice areas. This is consistent with the guidelines set forth nationally and internationally (United Nations), which encourage complete maternal health care through

routine screening, risk/benefit analysis, and referral to an appropriate physician.^{2,3} Detecting maternal health risks at the earliest possible point should reduce complications and increase the health outcomes for both mothers and babies.

Among 61 antenatal women, older age showed higher obesity, anemia, and comorbidities without significance.¹¹⁻¹⁴ Education and occupation significantly influenced anemia and BMI, indicating socioeconomic factors as key maternal risk determinants in this community-based cross-sectional study.^{14,15}

In summary, the research confirms the relationship between maternal health problems and socio-demographic factors. Addressing educational disparities, improving nutrition, and implementing community-based screening can significantly decrease the number of preventable maternal morbidities.

Limitations

The study has certain limitations, including its cross-sectional design and data collection from a single community-based antenatal camp, which may limit generalizability. However, the findings provide valuable insights into maternal risk factors in a real-world primary care setting and can inform future larger-scale studies.

CONCLUSION

Results of this study show that there is a high risk for antenatal women; most notably anemia (29%) and either abnormal BMI (26%); referred to collectively as maternal risk factors. The two other significant factors were education (a statistically significant association with maternal health outcomes) and occupation (a statistically significant association with both education and maternal health outcomes). Women with lower levels of education had higher rates of anemia, whereas housewives had higher rates of both anemia and abnormal BMI than working women. The other major maternal risk factors identified were hypertension and diabetes; and were more common among older women and women who were not employed at the time. However, these associations were not found to be statistically significant. Given the findings, targeted community-based antenatal screening and health education that are specific to identifying and managing high-risk pregnancies at an early stage should be implemented.

ACKNOWLEDGEMENTS

Authors acknowledge the Dean and Director, CMCRI, Chitradurga, Department of Community Medicine and UPHC staff for all the support extended.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), 2019–21: India. Mumbai: IIPS. 2021. Available at: <https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf>. Accessed on 17 February 2026.
2. Ministry of Health and Family Welfare. Guidelines for Antenatal Care and Skilled Attendance at Birth. New Delhi: MoHFW. 2010. Available at: https://nhm.gov.in/images/pdf/programmes/maternal-health/guidelines/sba_guidelines_for_skilled_attendance_at_birth.pdf. Accessed on 17 February 2026.
3. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: WHO. 2016. Available at: <https://www.who.int/publications/i/item/WHO-RHR-18.02>. Accessed on 18 February 2026.
4. Nihal S, Shekhar C. An assessment of adequate quality antenatal care and its determinants in India. *BMC Pregnancy Childbirth.* 2024;24(1):698.
5. Thakkar N, Alam P, Saxena D. Factors associated with underutilization of antenatal care in India: Results from 2019–2021 National Family Health Survey. *PLoS One.* 2023;18(5):e0285454.
6. World Health Organization global anaemia estimates, 2025 Edition. global anaemia estimates in women 15–49 years, by pregnancy status. Available at: https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children. Accessed on 19 February 2026.
7. International Diabetes Federation. IDF Diabetes Atlas. 10th edition. Brussels: IDF. 2021. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://diabetesatlas.org/media/uploads/sites/3/2025/02/IDF_Atlas_10th_Edition_2021.pdf. Accessed on 19 February 2026.
8. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. WHO Technical Report Series 894. Geneva: WHO. 2000. Available at: <https://pubmed.ncbi.nlm.nih.gov/11234459/>. Accessed on 19 February 2026.
9. United Nations Children’s Fund (UNICEF). Improving child nutrition: The achievable imperative for global progress. New York: UNICEF. 2013. Available at: https://www.unicef.org/publications/index_68661.ht. Accessed on 19 February 2026.
10. World Health Organization. Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. Geneva: WHO. 2023. Available at: <https://www.who.int/publications/i/item/9789240068770>. Accessed on 10 February 2026.
11. Kumari S, Rani K, Baby P, Ravi RK. Prevalence of Anemia among Antenatal Women: A Cross Sectional Study from North Western India. *Iran J Nurs Midwifery Res.* 2025;30(5):676-81.

12. Lal D, Lal KK. Exploring the burden of anemia among pregnant females in rural North India. *Discover Med.* 2025;2:288.
13. Balcha WF, Eteffa T, Tesfu AA, Alemayehu BA, Chekole FA, Ayenew AA, et al. Factors associated with anemia among pregnant women attended antenatal care: a health facility-based cross-sectional study. *Ann Med Surg (Lond).* 2023;85(5):1712-21.
14. Yasmin M, Saha S, Molla S, Rahaman SN, Ali KM, Pal A. Triple Burden of Underweight, Anaemia and Overweight/Obesity Among the Tribal Maternal Women of West Bengal, India: A Cross Sectional Mixed-Methods Study. *Natl J Community Med.* 2025;16(09):907-15.
15. Venkata Swarajya Lakshmi A, Sreedevi A, Rao VS, Botsa KC. Assessment of risk factors associated with anemia among pregnant women attending the obstetrics and gynecology department in a tertiary care hospital, Prakasam District, Andhra Pradesh, India. *Asian J Med Sci.* 2024;15(3):133-9.

Cite this article as: Ashwini LH, Sparsha Deep EM, Darshitha R, Shashi Kiran GM, Divya R, Yogeesh CN. Maternal risk factors among antenatal women in relation to socio-demographic, clinical and lifestyle factors: a community-based cross-sectional study. *Int J Res Med Sci* 2026;14:1573-8.