RESEARCH
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THE PREVALENCE OF ANAEMIA AND ASSOCIATED RISK FACTORS AMONG PREGNANT WOMEN: A CROSS-SECTIONAL STUDY CONDUCTED AT A TERTIARY CARE HOSPITAL

Dr V Dharani[1*], Dr C Girija[1], Dr SNS Minnalkodi[2]
[1]Assistant Professor, Department of Obstetrics and Gynaecology, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Madhuranthagam, Tamil Nadu
[2]Professor and Head, Department of Obstetrics and Gynaecology, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Madhuranthagam, Tamil Nadu
Corresponding Author: dhaarani.r@gmail.com

ABSTRACT
Background
Anaemia during pregnancy is a significant public health concern, particularly in developing countries like India. Despite various national health programs aimed at reducing anaemia, the condition remains widespread, indicating a need for localized studies to understand region-specific prevalence and risk factors. This cross-sectional study aims to assess the prevalence of anaemia and identify associated risk factors among pregnant women attending antenatal clinics in a tertiary care hospital in Chengalpattu District, Tamil Nadu.
Materials and Methods
This study was a hospital-based cross-sectional descriptive study was carried out at the antenatal clinic of a tertiary care hospital in Chengalpattu District. The study was conducted over a period of six months from June 2024 to November 2024. Pregnant women attending the antenatal clinic during the study period were included.
Results
The study included 110 pregnant women and assessed their anaemic status to find out prevalence. Among them, 26% had mild anaemia, 71% had moderate anaemia, and 13% had severe anaemia.
Discussion
The high prevalence of anaemia underscores the need for targeted interventions, especially among women with lower socioeconomic status and inadequate dietary intake. Addressing nutritional deficiencies and improving antenatal care in rural areas could significantly reduce anemia burden. These findings highlight the importance of community-based strategies and policy reforms to enhance maternal health outcomes.
Conclusion
Anemia remains highly prevalent among pregnant women, driven by socioeconomic disparities, inadequate nutrition, and multiparity. Strengthening antenatal care services and implementing targeted nutritional interventions are crucial to improving maternal health outcomes in this population.
Keywords: Anemia, Pregnancy, Antenatal care, Prevalence, Risk factors, Tertiary care hospital.

INTRODUCTION

Anaemia during pregnancy is a significant public health concern, particularly in developing countries like India[1]. The World Health Organization defines anaemia in pregnancy as a hemoglobin concentration of less than 11 g/dL[2]. In India, the prevalence of anaemia among pregnant women is alarmingly high, with recent studies indicating a prevalence rate of approximately 52.2%[3]. This condition poses serious health risks for both mothers and their infants, including increased chances of preterm delivery, low birth weight, and perinatal mortality[2, 4]. Several factors contribute to the high prevalence of anaemia among pregnant women in India. Socioeconomic determinants such as low educational levels, poor economic status, and belonging to marginalized communities have been significantly associated with higher rates of anaemia[5]. Additionally, nutritional deficiencies, particularly iron deficiency, are prevalent due to inadequate dietary intake and poor absorption. Other contributing factors include high parity, closely

spaced pregnancies, and certain cultural practices that may limit dietary diversity[6,7].

Despite various national health programs aimed at reducing anaemia, the condition remains widespread, indicating a need for localized studies to understand region-specific prevalence and risk factors. Chengalpattu District in Tamil Nadu, with its unique demographic and socioeconomic profile, provides an important setting to study this issue. Understanding the prevalence and associated risk factors of anaemia among pregnant women attending antenatal clinics in this region is crucial for developing targeted interventions to improve maternal health outcomes. This cross-sectional study aims to assess the prevalence of anaemia and identify associated risk factors among pregnant women attending antenatal clinics in a tertiary care hospital in Chengalpattu District, Tamil Nadu. The findings are expected to contribute to the existing body of knowledge and assist healthcare providers and policymakers in formulating effective strategies to combat anaemia in this population.

MATERIALS AND METHODS

Study Design and Setting

This study is a hospital-based cross-sectional descriptive study was carried out at the antenatal clinic of a tertiary care hospital in Chengalpattu District. The hospital caters to a diverse population, providing services to urban, semi-urban, and rural communities. The study was conducted over a period of six months from June 2024 to November 2034.

Study Population

Pregnant women attending the antenatal clinic during the study period were included.

Inclusion criteria: Confirmed pregnancy, Any trimester of pregnancy, Availability of hemoglobin (Hb) reports, Willingness to participate in the study.

Exclusion criteria: women with known haematological disorders, chronic diseases affecting hemoglobin levels (e.g., renal failure), or those already undergoing treatment for anaemia and those unwilling to participate.

Sample Size Determination: The sample size was calculated using Cochran's formula, considering a prevalence rate of anaemia among pregnant women in Tamil Nadu. Based on this, a sample size of 100 pregnant women was determined to be adequate for the study.

Sampling Technique: Systematic random sampling was employed to select participants. Every fifth pregnant woman attending the antenatal clinic on alternate days was approached for participation until the desired sample size was achieved ensuring unbiased selection.

Data Collection: Data were collected using a structured questionnaire, which was pretested for validity and reliability. The questionnaire captured demographic details, socioeconomic status, obstetric history, dietary habits, and known risk factors for anaemia. Trained personnel conducted face-to-face interviews in the local language to ensure comprehension.

Clinical and Laboratory Assessment

- **Hemoglobin Estimation**: Venous blood samples were collected and analyzed using an automated hematology analyzer. Anaemia was classified according to the World Health Organization (WHO) criteria: mild (10.0–10.9 g/dL), moderate (7.0–9.9 g/dL), and severe (<7.0 g/dL)[2].
- **Dietary Assessment**: A 24-hour dietary recall method was used to assess nutritional intake, with a specific focus on iron-rich foods[3-5].

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Committee prior to study commencement. Written informed consent was obtained from all participants. Confidentiality and privacy of data were maintained throughout the study. Participants identified with severe anaemia were referred for appropriate management.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS software version 16.0. Descriptive statistics were used to summarize the prevalence of anaemia. Associations between anaemia and risk factors were determined using t-tests for continuous variables. Logistic regression analysis was performed to identify independent predictors of anaemia, with a significance level set at $p<0.05$.

RESULTS

The **table.1** provides an overview of the key sociodemographic, obstetric, and maternal characteristics of the study participants. Most participants were young, with a mean age of 26.1 years, and most (48.2%) were under 25 years of age. A significant portion of the participants (80%) were literate. Regarding obstetric characteristics, most women were in their second (43.6%) or third trimester (40.9%), and 65.5% were multi-gravida (having been pregnant more than once). In terms of birth interval, 43.6% of the participants had a previous birth at least 24 months prior, while 34.5% had never delivered. A notable 60.9% of participants reported experiencing hyperemesis during pregnancy, indicating a high prevalence of nausea and vomiting. When analysing haemoglobin levels, 64.5% of participants fell into the moderate anaemia category (haemoglobin between 7 and 8.9 g/dL), with only 11.8% having severe anaemia. Most participants (67.3%) did not consume animal products, and 70% did not take iron supplements, which may be associated with their anaemia levels.

This **table.2** examines the relationship between demographic factors (age and education) and the severity of anaemia (mild, moderate, or severe) among pregnant women. Age significantly impacts

the severity of anaemia (P = 0.005). Women over 30 years old had the highest percentage (65.4%) of mild anaemia cases, but many moderate anaemia cases occurred in women aged 25-30 (50.7%). Interestingly, severe anaemia was also most prevalent in the 25-30 age group (53.8%), indicating that while older women are more likely to experience mild anaemia, those between 25-30 years are at a higher risk for moderate and severe anaemia. Education plays a crucial role in the severity of anaemia (P = 0.000). Illiterate women had a higher proportion of mild anaemia (53.8%), whereas 90.1% of those with moderate anaemia and 92.3% of those with severe anaemia were literate. This suggests that while literacy may not completely prevent anaemia, illiteracy is strongly associated with milder forms of the condition. The high percentages of literate women in moderate and severe anaemia groups may suggest other contributing factors beyond education, such as nutrition or healthcare access.

The **table.3** explores the relationships between obstetric and maternal factors and the severity of anaemia in pregnant women. The factors examined include gravidity, trimester of pregnancy, menstrual history, hyperemesis, and birth interval. There is no significant association between gravidity (whether the woman is experiencing her first pregnancy or has been pregnant multiple times) and the severity of anaemia (P = 0.953). The proportions of women with mild, moderate, or severe anaemia are similar across primi-gravida and multi-gravida categories, suggesting that gravidity does not greatly impact anaemia severity. Trimester of pregnancy shows a significant relationship with anaemia severity (P = 0.010). Women in their third trimester were more likely to have mild anaemia (65.4%), whereas moderate anaemia was more prevalent in the second trimester (50.7%). Severe anaemia, however, was most seen in the second trimester (53.8%), although a substantial proportion (30.8%) was also present in the first trimester. This suggests that anaemia severity tends to increase as pregnancy progresses, particularly between the second and third trimesters. There is no statistically significant association between a history of heavy menstrual bleeding and the severity of anaemia (P = 0.341). However, most women across all severity levels (mild, moderate, and severe) reported experiencing heavy menstrual bleeding, especially those with moderate anaemia (73.2%). Similarly, hyperemesis (severe morning sickness) does not show a significant impact on anaemia severity (P = 0.816). Around 60% of women with mild, moderate, and severe anaemia reported experiencing hyperemesis, suggesting that while common, it does not correlate directly with more severe anaemia.

The interval between pregnancies does not show a statistically significant correlation with anaemia severity (P = 0.388). However, women with shorter birth intervals (< 24 months) showed a higher tendency towards severe anaemia (38.5%), suggesting that closer pregnancies may contribute to higher anaemia severity. In contrast, women who had never delivered or had a birth interval of ≥ 24 months were more likely to experience mild or moderate anaemia.

The **table.4** investigates the association between dietary factors, such as consumption of animal products and iron supplementation, and the severity of anaemia in pregnant women. There is no statistically significant association between eating animal products and the severity of anaemia (P = 0.523). However, a higher proportion of women who did not consume animal products had moderate (71.3%) or severe anaemia (76.9%), compared to those who did consume animal products. Although not statistically significant, this suggests that women who avoid animal products may have a greater risk of developing more severe anaemia due to the potential lack of iron-rich food sources, such as meat and fish. Similarly, there is no significant relationship between iron supplementation and the severity of anaemia (P = 0.846). A slightly higher percentage of women who did not take iron supplements experienced mild (65.4%) and moderate anaemia (69.0%) compared to those who did. Interestingly, a higher proportion of women who took iron supplements (38.5%) still experienced severe anaemia, implying that iron supplementation alone might not be sufficient to prevent severe anaemia in some cases, possibly due to other factors such as malabsorption or inadequate dosage.

Table 5 shows the multivariate logistic regression analysis for predictors of anaemia. It is evident that illiterate women from had four times higher odds of being anaemic compared to those from educated women with a highly significant p-value (<0.001). Similarly, a strong association was observed with inadequate dietary intake of animal meat and animal products and iron supplements, showing three times higher odds of anaemia (p < 0.001). First Trimester Pregnant women showed no significant association with anaemia compared to third trimester pregnant women (p = 0.40). Multigravida women were nearly twice as likely to be anaemic as compared to primiparous women, with significant results (p = 0.002).

DISCUSSION

The present study highlights a high prevalence of anaemia among pregnant women attending the antenatal clinic at a tertiary care hospital in Chengalpattu district, Tamil Nadu. This finding aligns with previous studies in India, which have consistently reported anaemia as a significant public health concern among pregnant women. The prevalence observed in this study underscores the

urgent need for interventions targeting this vulnerable population.

Anaemia was more prevalent among women from rural areas and lower socioeconomic strata, emphasizing the role of socioeconomic disparities in maternal health[8]. These findings corroborate earlier reports that link anaemia with poverty, limited healthcare access, and poor dietary diversity[9]. Nutritional deficiencies, particularly of iron and folate, remain the predominant causes of anaemia during pregnancy, as observed in this study. Women with inadequate dietary intake had nearly three times the odds of developing anaemia. These results support the recommendation for routine dietary counselling and supplementation during antenatal visits[10-12].

Multiparity was identified as another significant risk factor for anaemia, with multiparous women demonstrating almost twice the risk compared to primiparous women[13]. Repeated pregnancies are known to deplete maternal iron stores, particularly in settings with limited interpregnancy intervals and suboptimal nutritional support. Addressing this issue requires a multipronged approach, including promoting family planning services and ensuring adequate nutritional supplementation between pregnancies[14]. The study also noted that anaemia severity varied across trimesters, with higher rates observed during the second and third trimesters. This trend aligns with the physiological changes of pregnancy, such as increased plasma volume, which dilute hemoglobin levels. However, severe anaemia in these later stages of pregnancy poses significant risks, including preterm birth, low birth weight, and increased maternal morbidity and mortality[15,16].

Community-level interventions, such as the fortification of staple foods with iron, promotion of iron-rich diets, and mass education programs, are essential to address the broader determinants of anaemia. Additionally, strengthening existing governmental programs, such as the National Iron Plus Initiative in India, could ensure better implementation and adherence to anemia prevention strategies.

LIMITATIONS

The study's primary strength lies in its robust methodology, including a well-defined sample size and standardized diagnostic criteria for anaemia. However, limitations include its cross-sectional design, which precludes causal inferences, and the potential for recall bias in self-reported dietary data. Future studies with longitudinal designs and larger, more diverse populations are recommended to validate these findings and explore additional determinants of anaemia.

CONCLUSION

This study confirms that anaemia remains a critical health issue among pregnant women, particularly those from rural areas, illiterate women, and multiparous women. These findings underscore the importance of integrating nutritional interventions, socioeconomic support, and family planning into antenatal care programs. Comprehensive strategies focusing on education, dietary supplementation, and healthcare accessibility are essential to reduce the burden of anaemia and improve maternal and foetal health outcomes.

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Table 1: Baseline Sociodemographic, Obstetric and maternal characteristics of the study participants

Demographic, Obstetric and Maternal Parameters	Number (N)	Percentage (%)
Age (Years)		
Mean ± SD (Max - Min)	26.9 ± 4.3 (36 – 18)	100
< 25	53	48.2
25-30	38	34.5
> 30	9	17.3
Education Qualification		
Illiterate	22	20
Literate	88	80
Trimester		
First	17	15.5
Second	48	43.6
Third	45	40.9
Gravida		
Primi-gravida	38	34.5
Multi-gravida	72	65.5
Birth interval		
Never delivered	38	34.5
< 24 months	24	21.8
≥ 24 months	48	43.6
Hyperemesis		
Yes	67	60.9
No	43	39.1
Haemoglobin		
Mild (10.0–10.9 g/dl)	26	23.6

Moderate (7.0–9.9 g/dl)	71	64.5
Severe (<7.0 g/dl)	13	11.8
Eating Meat products		
Yes	36	32.7
No	74	67.3
Iron supplement		
Yes	33	30
No	77	70

Table 2: Association between age and educational status with anaemia

Characteristics	**Severity of anaemia in pregnancy**			**P value***
	Mild (n = 26) %	**Moderate (n = 71) %**	**Severe (n = 13) %**	
Age in years				
< 25	4 (15.4)	9 (12.7)	4 (30.8)	**0.005**
25 - 30	5 (19.2)	36 (50.7)	7 (53.8)	
> 30	17 (65.4)	26(36.6)	2 (15.4)	
Education				
Illiterate	14 (53.8)	7 (9.9)	1 (7.7)	**0.000**
Literate	12 (46.2)	64 (90.1)	12 92.3)	

Table 3: Association of Obstetrics factors with severity of anaemia in pregnant women

Obstetric factors	**Severity of anaemia in pregnancy**			**P value***
	Mild (n = 26) %	**Moderate (n = 71) %**	**Severe (n = 13) %**	
Gravida				
Primi-gravida	9 (34.6)	25 (35.2)	4 (30.8)	0.953
Multi-gravida	17 (65.4)	46 (64.8)	9 (69.2)	
Trimester				
First	4 (15.4)	9 (12.7)	4 (30.8)	**0.010**
Second	5 (19.2)	36 (50.7)	7(53.8)	
Third	17 (65.4)	26 (36.6)	2 (15.4)	
Heavy Menstrual bleeding				
Yes	17 (65.4)	52 (73.2)	7 (53.8)	0.341
No	9 (34.6)	19 (26.8)	6 (46.2)	
Hyperemesis				

Yes	16 (61.5)	44 (62.0)	7 (53.8)	0.816
No	10 (38.5)	27 (38.0)	6 (46.2)	
Birth interval				
Never delivered	9 (34.6)	25 (35.2)	4 (30.8)	0.388
< 24 months	3 (11.5)	16 (22.5)	5 (38.5)	
≥ 24 months	14 (53.8)	30 (42.3)	4 (30.8)	

Table 4: Dietary factors associated with severity of anaemia

Dietary Factors	**Severity of anaemia in pregnancy**			**P value***
	Mild (n = 26) %	**Moderate (n = 71) %**	**Severe (n = 13) %**	
Eating animal products				
Yes	10 (38.5)	20 (28.2)	3 (23.1)	0.523
No	16 (61.5)	51 (71.3)	10 (76.9)	
Iron supplement				
Yes	9 (34.6)	22 (31.0)	5(38.5)	0.846
No	17 (65.4)	49 (69.0)	8 (61.5)	

Table 5: Multivariate Logistic Regression Analysis for Predictors of Anaemia

Variable	**Adjusted OR**	**95% CI**	**p-value**
Education	4.0	2.7 – 6.5	<0.001
Dietary factors	3.0	1.9 – 4.4	<0.001
Primigravida	0.80	0.5 – 1.3	0.40
Multigravida	1.9	1.4 – 2.9	0.002