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

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ABSTRACT

Background: Anemia in pregnancy is a pervasive health issue, particularly in developing countries. **Aims and Objectives:** This study aims to assess various socio-demographic factors, nutritional intake, and other risk factors contributing to anemia among pregnant women attending a tertiary care hospital in Prakasam District, Andhra Pradesh, India. **Materials and Methods:** A cross-sectional study was conducted involving 160 pregnant women. Data were collected on socio-demographic factors (family type, religion, caste, residence, education, socio-economic status, age, occupation), anemia prevalence, antenatal care, birth spacing, nutritional intake (caloric, protein, and iron), and gravida status. Chi-square tests were used for statistical analysis to determine associations between anemia and various risk factors. **Results:** The study revealed a high prevalence of moderate anemia (74.4%) among the participants. Most women were from nuclear families (75%), lived in rural areas (89.4%), and were predominantly homemakers (83.1%) in the age group of 21–30 years. Nutritional analysis showed 74.6% of women had a calorie intake below 2000 K. Cal/day, 64.7% had a protein intake below 50 g/day, and 87.5% had an iron intake below 20 mg/day. A significant association was found between anemia and factors such as caloric intake ($\chi^2 = 10.6654$, $P = 0.001092$), gravidity ($\chi^2 = 7.0278$, $P = 0.008025$), and iron intake ($\chi^2 = 27.277$, $P < 0.00001$), but not with protein intake ($\chi^2 = 3.7547$, $P = 0.052658$). **Conclusion:** The study highlights a high prevalence of anemia among pregnant women in the Prakasam District, primarily associated with inadequate caloric and iron intake and increased gravidity. These findings emphasize the need for enhanced nutritional counseling and healthcare interventions focusing on diet and family planning for pregnant women in this region.

Key words: Anemia; Pregnancy; Nutritional intake; Socio-demographic factors

INTRODUCTION

Anemia during pregnancy is a critical public health issue that poses significant risks to both mothers and their unborn children, particularly in developing countries.[1] Characterized by a decrease in the number of red blood cells or hemoglobin in the blood, anemia reduces the oxygen-carrying capacity of the blood, leading to fatigue, weakness, and other serious health complications.[2,3] The World Health Organization (WHO) has identified anemia as a condition that affects over 40% of pregnant women globally, making it a condition of grave concern.

The etiology of anemia is complex, encompassing a variety of factors, with iron deficiency standing out as the primary contributor. Iron deficiency anemia arises when the body

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lacks an adequate supply of iron necessary for the synthesis of hemoglobin, the protein within red blood cells responsible for transporting oxygen to the body's tissues.[4] This is especially critical during pregnancy, given the heightened demand for iron to support expanded blood volume and the requirements of both the placenta and fetal development. In addition to iron deficiency, other notable causative factors include deficiencies in folate and Vitamin B12, persistent inflammation, parasitic infections, and certain hereditary disorders. These diverse elements collectively contribute to the development of anemia in various populations.[5]

The implications of anemia in pregnancy are profound. Maternal anemia is associated with preterm delivery, low birth weight, maternal mortality, and infant mortality. Severe anemia increases the risk of infections, can cause cardiac failure, and may lead to perinatal complications.[6] For the fetus, anemia in the mother can result in intrauterine growth restriction and poor neurodevelopmental outcomes.

In India, anemia's prevalence and risk factors among pregnant women are particularly disconcerting. Socio-economic factors, such as poverty and a lack of education, significantly contribute to the high prevalence of anemia. Nutritional practices, including limited access to iron-rich foods and poor dietary diversity, also play a critical role.[7] Cultural factors and health beliefs can affect dietary choices and the uptake of iron supplementation, which is widely recommended during pregnancy.

Demographic factors are equally influential. Younger age and higher parity have been associated with higher anemia rates, potentially due to the cumulative strain of repeated pregnancies on the body's iron stores. Women from scheduled castes, tribes, or other backward classes often face additional challenges, including marginalization and restricted access to health-care services, which can exacerbate the risks of anemia.

The national family health survey indicates that over half of India's pregnant women are anemic, highlighting the need for targeted interventions. Government programs aiming to combat anemia, such as the anemia mukt bharat strategy, have been implemented, offering iron and folic acid supplementation and dietary diversification advice.[8] However, the effectiveness of these programs is contingent upon the awareness and active participation of the target population.

In light of these concerns, our study aims to elucidate the prevalence and associated risk factors of anemia among pregnant women in Prakasam District, Andhra Pradesh. By identifying the magnitude of anemia and its relationship with socio-demographic factors, we seek to provide data-driven insights to enhance existing health interventions and inform the development of new strategies. Our specific objectives are to quantify the severity of anemia in the study population and to discern the association of anemia with various socio-demographic determinants. This knowledge is imperative to bolster the effectiveness of government programs and to mitigate the adverse effects of anemia on maternal and child health.

Aims and objectives
The aim of this study is to evaluate the socio-demographic factors, nutritional intake, and other risk factors contributing to anemia among pregnant women in Prakasam District, Andhra Pradesh, India, attending a tertiary care hospital.

Assess the socio-demographic factors such as family type, religion, caste, residence, education, socio-economic status, age, and occupation of pregnant women. Determine the prevalence of anemia and analyze its association with antenatal care and birth spacing. Evaluate the nutritional intake, including caloric, protein, and iron levels, in the diet of these women. Investigate the relationship between anemia and factors like gravida status, caloric, and iron intake.

MATERIALS AND METHODS

Study design and setting
A meticulous hospital-based cross-sectional study was executed within the specialized departments of obstetrics and gynecology at the Government General Hospital in Ongole, Prakasam District, Andhra Pradesh. This location was chosen due to its comprehensive antenatal care facilities and high patient throughput, providing a representative sample for the district.

Study participants
The research embraced a diverse group of antenatal women who frequented the outpatient department of the antenatal clinic at the hospital, offering a wide spectrum of socioeconomic backgrounds.

Duration
An intensive data collection period covered a span of 3 months, specifically from the onset of May to the end of July 2023, allowing for a substantial accumulation of data across different stages of pregnancy.

Inclusion criteria
Our study included expectant mothers who provided informed consent and demonstrated medically confirmed pregnancies, which were verified through standard urinary pregnancy tests or validated by pelvic ultrasonography. Furthermore, inclusion necessitated the availability of a current hemoglobin report to ensure data consistency and reliability.

Exclusion criteria

The study intentionally omitted individuals who did not grant consent or could not provide a hemoglobin report, ensuring a consistent dataset for analysis.

Data collection instrument

A meticulously constructed pro forma, in conjunction with a comprehensive questionnaire, was meticulously crafted to procure detailed participant information. This dual instrument was pivotal in capturing both quantitative and qualitative data pertaining to the historical and present clinical features of anemia, including any complications linked to current or previous pregnancies. It further gathered in-depth data on participants' dietary patterns, nutritional supplementation adherence, and their engagement with governmental nutritional programs.

Anthropometric and clinical assessment

A systematic protocol was implemented for the acquisition of anthropometric measurements – weight, height, and body mass index. These measures were complemented by precise hemoglobin level quantifications for each participant, serving as a critical indicator of anemic status.

Nutritional analysis

A rigorous nutritional assessment was conducted using validated 24-h dietary recall techniques. This analysis was instrumental in estimating the participants' daily intake of key nutritional components such as calories, proteins, and iron. It also evaluated the consumption of agents known to either facilitate or impede iron absorption, offering insight into potential dietary influences on anemia.

Data security and analysis

Data security was paramount; all collected information was securely stored, with access limited to authorized research personnel only. The analysis employed robust statistical tools, including Excel and SPSS, for univariate analysis. This encompassed the calculation of means, standard deviations, frequencies, and percentages, laying the groundwork for a thorough statistical examination of the data.

Statistical significance

The benchmark for statistical significance was set at $P<0.05$. This threshold was determined to identify meaningful associations while minimizing the likelihood of type I errors.

Ethical considerations

The study was approved by the institutional ethics committee of the Government Medical College and General Hospital, Ongole, Andhra Pradesh, India. The research was conducted with strict adherence to ethical guidelines. Respect for participant confidentiality and autonomy was maintained throughout the study.

All participants were provided with comprehensive information about the study's purpose, their role, and the handling of their data, ensuring informed consent.

RESULTS

Socio-demographic profile

Our comprehensive study involved 160 pregnant women from the Obstetrics and Gynecology Department of a tertiary care hospital in Prakasam District, Andhra Pradesh, India. The socio-demographic characteristics were diverse and are detailed as follows (Table 1):

Family type

Our sample included 49 participants from joint families and 120 from nuclear families, indicating a predominant inclination towards nuclear family settings (75%).

Religion

The religious composition was mainly Hindu (68.1%), with Christians (26.3%) and Muslims (5.6%) forming smaller proportions.

Caste

The caste distribution showed a significant representation of SC (38.8%), followed by OBC (31.3%), ST (16.9%), OC (13.1%), and minority castes (5.6%).

Residence

A notable rural predominance was observed, with 89.4% residing in rural areas compared to 15.6% in urban settings.

Education

Educational levels varied significantly, ranging from illiteracy (23.8%) to higher education (14.4%), with the majority having completed secondary education (50.6%).

Socio-economic status

The majority fell into Class-II (40.6%) and Class-III (40%), with fewer participants in Class-I (14.4%), Class-IV (7.5%), and Class-V (3.1%).

Age

The age distribution showed a concentration in the 21–30 year range (75%), followed by participants under 20 years (21.3%) and over 30 years (9.4%).

Occupation

A significant majority were housewives (83.1%), with other occupations like laborers (13.8%), skilled workers (7.5%), and others (7.5%) being less common.

This socio-demographic profile reflects a predominantly young, rural, and educationally diverse population, mostly engaged in domestic duties.

Table 1: Socio-demographic profile of study participants

Variable	Category	Number of participants	Percentage
Family type	Joint Family	49	30.6
	Nuclear Family	120	75.0
Religion	Hindu	109	68.1
	Christian	42	26.3
	Muslim	9	5.6
Caste	Open category	21	13.1
	Other backward class	50	31.3
	Scheduled caste	62	38.8
	Scheduled tribes	27	16.9
	Minority	9	5.6
Residence	Urban	25	15.6
	Rural	143	89.4
Education	Illiterate	38	23.8
	Primary	11	6.9
	Secondary	81	50.6
	Intermediate	16	10.0
	Degree and above	23	14.4
Socio-economic status	Class-I	23	14.4
	Class-II	65	40.6
	Class-III	64	40.0
	Class-IV	12	7.5
	Class-V	5	3.1
Age	<20	34	21.3
	21–30	120	75.0
	>30	15	9.4
Occupation	Homemakers	133	83.1
	Laborer	22	13.8
	Skilled worker	12	7.5
	Others	12	7.5

Table 2: Prevalence of anemia among participants

Anemia type	Number of participants	Percentage
No anemia	7	4.4
Mild anemia	19	12.4
Moderate anemia	119	74.4
Severe anemia	15	9.4

Table 3: Antenatal care and birth spacing

Parameter	Category	Number of participants	Percentage
Antenatal visits	<4 Visits	42	27.4
	4 and above	111	72.6
Birth spacing	<3 Years	108	70.0
	3 and above years	48	30.0

Table 4: Nutritional intake of participants

Nutrient type	Intake category	Number of participants	Percentage
Caloric intake	<2000 K. cal/day	142	74.6
	2000 K. cal/day and above	18	25.4
Protein intake	<50 g/day	99	64.7
	50 g/day and above	54	35.3
Iron intake	<20 mg/day	134	87.5
	20 mg/day and above	19	12.5

Table 5: Gravida status of anaemic women

Gravida status	Number of anaemic women	Percentage
Primi-gravida	55	35.95
Multi-gravida	98	64.05

Table 6: Chi-square test results for nutritional intake and gravida status

Variable	Chi-square (χ^2)	P-value	Significance
Caloric Intake	10.6654	0.001092	Significant
Gravida Status	7.0278	0.008025	Significant
Protein Intake	3.7547	0.052658	Not significant
Iron Intake	27.277	<0.00001	Significant

Anemia prevalence

The prevalence of anemia among participants varied.

No Anemia: 4.4%; Mild Anemia: 12.4%; Moderate Anemia: 74.4%; Severe Anemia: 9.4%.

This indicates a high prevalence of moderate anemia among the study population (Table 2).

Antenatal care and birth spacing

In terms of antenatal care, 27.4% had less than four antenatal visits. Regarding birth spacing, a significant 70% of participants had <3 years between pregnancies,

highlighting a trend towards shorter interpregnancy intervals (Table 3).

Caloric and nutrient intake
Caloric and nutrient intake analysis revealed that 74.6% of participants had a calorie intake below 2000 K. Cal per day. Protein intake was below 50 g/day for 64.7%. Iron intake was notably deficient, with 87.5% consuming <20 mg daily. These findings suggest inadequate nutritional intake, particularly in terms of calories, protein, and iron (Table 4).

Gravida status
Among the anemic women, 64.05% were identified as multi-gravidas, indicating a potential correlation between gravidity and anemia (Table 5).

Statistical analysis
Chi-square tests were performed to assess the significance of the associations. Caloric Intake: $\chi^2=10.6654$, P=0.001092, indicating a significant association. Gravida status: $\chi^2=7.0278$, P=0.008025, also showing a significant association. Protein intake: $\chi^2=3.7547$, P=0.052658, suggesting no significant association. Iron intake: $\chi^2=27.277$, P<0.00001, demonstrating a highly significant association (Table 6).

These statistical analyses confirm significant associations between anemia and factors such as caloric intake, gravidity, and iron intake in this population. The absence of a significant correlation between protein intake and anemia in this study suggests the need for further investigation into this relationship. These results underscore the importance of comprehensive antenatal care and nutritional counseling for pregnant women in this demographic.

DISCUSSION

Socioeconomic and demographic factors in anemia prevalence
The high prevalence of anemia among women, particularly those from lower socioeconomic backgrounds, those with limited education, and those belonging to marginalized castes, necessitates immediate intervention. This group is disproportionately affected due to factors such as intergenerational poverty, malnutrition, and limited health-care access, aligning with national data trends (Siddiqui et al.;[9] Chowdhury et al.[10]). To tackle anemia effectively, policy initiatives must focus on improving educational access and enhancing women's financial and social empowerment.

Nutritional deficiencies contributing to anemia
A significant factor contributing to anemia is nutritional deficiency, especially iron deficiency. Our findings indicate that most women face calorie insufficiency and a pronounced lack of iron. Addressing this involves enhancing nutritional education, increasing access to iron-rich foods, and understanding the impact of protein quality (Gebre et al.;[11] Biete et al.[12]). Culturally appropriate dietary advice, particularly during pregnancy, is essential for promoting diverse nutrition and iron intake.

Family planning and birth spacing in anemia risk reduction
Family planning and birth spacing play a crucial role in reducing the risk of anemia. Our research suggests a strong association between increased pregnancies without adequate birth spacing and anemia, likely due to cumulative nutrient depletion (WHO). Emphasizing the importance of family planning and advocating for optimal birth intervals of 2–5 years are key strategies for mitigating anemia risk.[13]

Strengthening antenatal care
The inadequacy of antenatal care for many women is a significant concern. Strengthening these services through health system capacity building and community outreach is crucial for timely anemia management (Sunuwar et al.[14]). Innovative approaches such as task-shifting, mobile clinics, and local collaborations can improve access to these services. Effective communication and cultural sensitivity are vital for increasing engagement and ensuring early detection and treatment.

Multidimensional strategies for addressing anemia
A comprehensive approach to addressing anemia in Prakasam District must encompass policy development, community mobilization, service delivery, and a strong emphasis on nutrition, family planning, and antenatal care (Symington et al.;[15] Black and Dewey[16]). Key to this approach is acknowledging and addressing the specific predisposing factors prevalent in the district, such as early-age marriages and multiparity. Initiatives need to focus on strengthening awareness, empowering women, and coordinating efforts across the health, nutrition, and social welfare sectors. The success of these efforts hinges on political will, public-private partnerships, and active community participation to ensure impactful and widespread change.

Limitations of the study
The study's limitations include its cross-sectional design, which cannot establish causality, and the small sample size restricted to one hospital in Prakasam District, limiting generalizability. Also, dietary intake was self-reported, which may introduce recall bias, and other potential confounding factors were not explored.

CONCLUSION

This study revealed a high prevalence of anemia among pregnant women in the Prakasam District, which was

primarily associated with inadequate caloric and iron intake as well as increased gravidity. These findings emphasize the necessity for improved nutritional counseling and health-care interventions that center on enhancing dietary quality and promoting family planning among pregnant women in this particular region. Implementing targeted programs to increase awareness and access to iron-rich foods and balanced nutrition, as well as promoting spacing between pregnancies, could help address the high rates of anemia among this population.

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