



A STUDY ON NUTRITIONAL STATUS, DIETARY HABITS AND SUPPLEMENTATION COMPLIANCE AMONG ANTENATAL MOTHERS ATTENDING AN URBAN PRIMARY HEALTH CENTRE IN KARNATAKA

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ABSTRACT

Background: Maternal risk factors such as anemia, abnormal body mass index (BMI), pregnancy-induced hypertension and gestational diabetes mellitus continue to adversely influence pregnancy outcomes in India despite improved antenatal coverage.

Objectives: To identify common maternal risk factors among antenatal mothers and to assess their association with selected clinical parameters.

Methods: A Community based cross-sectional study was conducted using antenatal screening records of 61 pregnant women who attended an antenatal health check-up camp at an urban primary health centre in Karnataka. Data on socio-demographic variables, hemoglobin status, BMI, blood pressure and random blood sugar were extracted using a structured proforma. Descriptive statistics and the chi-square test were used to analyze the data. Findings: Of the 61 expectant mothers, 36.1% had mild anemia and 49.2% had moderate to severe anemia.

Results: Among the 61 expectant mothers, 36.1% had mild anemia and 49.2% had moderate to severe anemia. Nearly half (47.5%) were obese, while 16.4% were underweight. Raised blood pressure suggestive of pregnancy-induced hypertension was observed in 6.6% of mothers. Abnormal blood sugar levels were detected in 9.8%, including suspected gestational diabetes and overt diabetes. A statistically significant association was found between BMI category and anemia status ($p < 0.05$), whereas associations between BMI and hypertension or diabetes were not significant.

Conclusion: The study highlights a high burden of preventable maternal risk factors, particularly anemia and abnormal BMI. Strengthening routine antenatal screening, nutritional counseling and early referral can improve maternal and fetal outcomes.

Keywords: Antenatal care; Maternal anemia; Body mass index; Pregnancy risk factors; Urban health centre.

INTRODUCTION

Maternal health is still a major concern to the health sector in India despite major advancements in maternal care services. Pregnancy is often accompanied by several risk factors including malnutrition and medical issues like anemia, abnormal BMI, gestational hypertension (PIH) and gestational diabetes mellitus (GDM) contribution to maternal and perinatal mortality rates. Prompt detection and care of these conditions remain to be the cornerstone for programs related to safe motherhood.^{1,2}

In India, maternal anemia is disproportionately high. According to the National Family Health Survey ⁵, half the pregnant women in the country suffer from anemia.³ Additionally, disordered nutritional patterns characterized by the rising prevalence of overweight and obesity pose a problem due to the rapid change in lifestyle. These issues predispose to issues related to high blood pressure, diabetes mellitus, Caesarean delivery, and undesirable outcomes in the newborn.^{4,5}

Antenatal screening offered at the primary and secondary levels of care will contribute to the early identification of high-risk pregnancies. However, studies to evaluate the current programs are limited and not readily possible at the urban primary care levels. It would be more economical and contribute toward estimating the effectiveness of the current antenatal services offered, including the identification of the gaps generated.^{1,5}

Knowing the distribution pattern of the maternal risk factors at the facility level is important in informing intervention measures. The current study was conducted to determine the prevalence rate of some selected maternal risk factors and their relationship with some clinical parameters among antenatal mothers attending an urban health facility in Karnataka.¹

METHODS

Study design:

This was a community-based cross-sectional descriptive study conducted using routinely maintained antenatal care records generated during an antenatal care camp held at an urban field practice area.

Study area:

This study took place in Urban Primary Health Centre (UPHC) that is known as the urban field practice area for Department of Community Medicine, Chitradurga medical college and research institute (CMCRI), Chitradurga, Karnataka.. The one day prenatal check-up camp was arranged in UPHC Buddhanagara on 30th September 2025 in collaboration with Department of OBG, AYUSH, District Health & Family Welfare, CMCRI, Chitradurga.

Study participants:

All pregnant women who attended the ANC camp conducted at the UPHC and whose records were complete.

Study duration:

It will be carried out two months. While the data extraction and entry will be completed during this time, the analysis and writing of the final report would be completed.

Source of data:

Primary data

- ANC proforma
- Clinical examination findings
- Laboratory investigation reports
- Prescription sheets & treatment records

- Referral slips
- IEC attendance and participation logs
- MBBS student documentation sheets

Inclusion criteria

- Pregnant women residing in the UPHC Buddha nagara catchment area.
- Pregnant women who attended the antenatal screening camp.
- Pregnant women with available records of complete ANC check-ups.

Exclusion criteria

- Pregnant women having incomplete data.
- Pregnant women who visited for immunization or non-ANC visits only.

Sample size calculation:

The sample size was calculated to estimate the proportion of high-risk pregnancies detected during the ANC camp.

Formula used:

$$\text{Sample size (n)} = \frac{Z^2 * p * q * DEFF}{d^2}$$

Where:

n = required sample size

Z = 1.96 (95% confidence interval)

p = anticipated prevalence of high-risk pregnancy = 50% (used to obtain maximum sample size due to lack of precise prior estimates).

q = 1 – p

d = absolute precision = 10%

DEFF = design effect = 1.5 (considering field-based camp setting)

Sample size calculation:

$$\text{Sample size (n)} = \frac{(1.96)^2 * 0.5 * 0.5 * 1.5}{(0.10)^2} = \frac{3.84 * 0.25 * 1.5}{0.01} = 144$$

Thus, the minimum required sample size was 144 antenatal women at a 95% confidence level and 10% precision.

Sampling technique

Since the ANC camp was conducted on a single pre-specified day, universal sampling (total enumeration) was adopted. All pregnant women who attended the camp and had complete ANC records were included in the study.

Justification for sample size shortfall

Although the calculated sample size was 144, the final sample size depended on actual camp attendance on the day of service delivery.

- ANC camps are service-driven, not survey-driven.
- Attendance is influenced by:
- Registration status
- Gestational age
- Health-seeking behaviour
- Logistic and personal factors

Therefore, all eligible attendees present on the camp day were included, and the achieved sample size represents the true service coverage of the intervention, which is acceptable and methodologically valid for program evaluation and descriptive research.

This justification is ethics-committee approved language

Final sample

Although the calculation required 144, the final sample consisted of 61 women who attended and had complete records. This shortfall is justified as the study represents true service coverage of a service-driven intervention.

Method of data collection :

Data were collected retrospectively from structured records documented during the camp. A data extraction proforma was developed to abstract variables systematically.

Registration and identification:

Upon arrival, each participant was assigned a unique camp ID number. Only initials were taken; identifiers were stored separately and removed during analysis.

Clinical Examination:

- Height, weight and BMI
- Blood pressure (sitting position, two readings)
- Pallor assessment
- Edema assessment
- Obstetric examination (fundal height, fetal heart sound)
- High-risk pregnancy screening

Laboratory testing:

- Hemoglobin estimation (Hemocue/sahli depending on availability).
- Random Blood Sugar (glucometer)
- Urine albumin & sugar dipstick test
- Blood group/Rh typing when indicated
- All results were recorded in laboratory sheets linked to camp IDs.

Treatment and Supplementation: Based on clinical and lab findings:

- IFA tablets
- Calcium supplements
- Albendazole (if needed)
- Protein powder supplements
- AYUSH Chyavanprash multivitamin powder
- Nutrition counselling leaflets

IEC and health education: IEC sessions were held periodically during the camp.

Topics covered:

- Importance of ANC
- Dietary counselling & iron-rich foods
- Danger signs in pregnancy
- Birth preparedness
- Importance of institutional delivery
- Newborn care practices

Documentation during the camp

- Semi-structured ANC proforma completed for each participant
- Lab sheets attached to corresponding IDs
- Treatment register and referral register maintained

- IEC participation logs filled
- Attendance and mobilization documentation maintained
- All records stored securely at the department office

Retrospective data extraction and analysis

Data extraction process-

- After the camp, records were collected and audited for completeness.
- A structured data extraction sheet was developed.
- Data were entered into Excel with double-entry validation.

Confidentiality measures

- Personal identifiers removed before analysis
- Camp ID used for anonymization
- Datasets stored in password-protected institutional computers
- Only PI had access to it.

Plan of statistical analysis:

Data were entered into Microsoft Excel using double-entry for accuracy, while personal identifiers were omitted to maintain confidentiality. Data were analyzed using IBM SPSS Statistics for Windows (Version 29; IBM Corp., Armonk, NY, USA), employing the following statistical methods: Descriptive statistics were presented as percentages, proportions, and mean with standard deviation (where relevant). For inferential statistics, a Chi-square test was utilized to explore categorical associations, with a significance level set at $p < 0.05$.

RESULTS

A total of 61 antenatal records were examined. In the current study, the prevalence of anemia was found to be high among antenatal mothers. Only 14.7% mothers had normal hemoglobin levels, while 36.1% mothers had mild anemia, and 49.2% mothers had moderate to severe anemia. In total, more than four – fifths of the study population were anemic, which signifies a high prevalence of anemia among pregnant women attending the urban primary health center (Table 1).

Indicates that large proportion of antenatal mothers had abnormal nutritional status. Nearly half of the participants (47.5%) were obese, while 16.4% were underweight and 13.1% were overweight. Only 23.0% of mothers had normal BMI, reflecting the coexistence of both undernutrition & overnutrition in the study population (Table 2). The majority of antenatal mothers (93.4%) had normal blood pressure at the time of assessment. Raised blood pressure suggestive of pregnancy – induced hypertension was observed in 6.6% of the participants, indicating the presence of hypertensive disorders in a small proportion of mothers (Table 3). Study Reveals that most antenatal mothers (90.2%) had normal random blood sugar levels. Suspected gestational diabetes was identified in 8.2% of mothers, while 1.6% had overt diabetes. These findings indicate that abnormal glucose levels were present in nearly one-tenth of the study population (Table 4). Demonstrates a statistically significant association between BMI Category and anemia status ($p < 0.05$). All underweight and overweight mothers were anemic, while anemic was also observed in a large proportion of obese mothers. Mothers with normal BMI showed a comparatively lower prevalence of anemia (Table 5). Raised blood pressure was observed predominantly among mothers in the obese BMI category. However, the association between BMI category and blood pressure status was not statistically significant ($p = 0.583$), indicating no clear relationship between nutritional status and hypertension in the present study (Table 6).

abnormal blood sugar levels were more frequently observed among mothers with higher BMI. However, the association between BMI category and blood sugar status was not statistically

significant ($p = 0.619$), suggesting that BMI alone did not predict abnormal glucose levels in this study (Table 7).

DISCUSSION

The present community-based cross-sectional study aimed to assess the nutritional status and selected maternal risk factors among antenatal mothers attending an urban primary health centre in Karnataka. The findings indicate a high burden of preventable maternal risk factors, particularly anemia and abnormal BMI. In the present study, anemia was detected in 85.3% of antenatal mothers, including 36.1% with mild anemia and 49.2% with moderate to severe anemia, while only 14.7% had normal hemoglobin. This prevalence is significantly higher when compared to the NFHS-5 India report that documented anemia among approximately 52% of pregnant women.³ Kalaivani reported the prevalence of anemia in pregnancy in India as 40 - 70%.⁷ The higher prevalence in the present study could be due to poor dietary intake, late antenatal registration, and poor compliance with iron-folic acid supplementation. Anemia in pregnancy increases the risk of preterm birth, low birth weight, and maternal morbidity.^{7,12} Although early detection of anemia through camp-based screening has an advantage in this present study, the larger percentage of moderate to severe anemia (49.2%) is still a big concern. With regard to nutritional status, 23.0% of the respondents had normal BMI. Almost half (47.5%) of them were obese, 13.1% were overweight, and 16.4% were underweight, suggesting double malnutrition. Moreover, abnormal pre-pregnancy BMI was identified by the Institute of Medicine as one of the significant risk factors for complications during pregnancy.⁴ Williams's Obstetrics indeed reported that obese women are prone to gestation diabetes and hypertensive disorders.⁵ Bilano et al. identified a trend of increasing obesity rates in women in low- and middle-income countries.⁹ The high percentage of obesity in this study is due to the urban nutritional transition. Though objectively evaluated, co-occurrence of obesity and anemia reveals poor nutrition. There was a statistically significant association found between BMI and anemia ($p < 0.05$). All the underweight mothers, overweight mothers, and 93.1% of obese mothers were anemic. This implies that anemia does not restrict its occurrence to underweight states but may be present concurrently in overweight and obese mothers due to micronutrient deficiencies as discussed in the past literature.⁷ Hypertension was observed in 6.6% of mothers, with 93.4% normotensive. These findings are comparable to global figures showing hypertensive complications occurring in 5-10% of pregnancies.⁸ Although this risk was higher in obese women, it was not statistically significant ($p = 0.583$). Although most women are normotensive, this is a worrying trend. Abnormal blood glucose levels were present in 9.8% of mothers (8.2% suspected GDM and 1.6% overt diabetes). These observations are concordant with studies from India, which have estimated the prevalence of GDM to vary from 5 to 15%.^{3,10,11} Although abnormal glucose levels were more prevalent in obese women, this was not statistically significant ($p = 0.619$). Random blood glucose was used as a screening tool and sample size was small. Thus, the research also emphasizes the significance of annual antenatal screening, nutritional counseling, and enhanced supplementation programs in accordance with WHO and national ANC recommendations for the improvement of maternal and foetal health outcomes.^{1,12}

CONCLUSION

This study brings to the forefront the high prevalence of preventable maternal risk factors such as anemia and BMI among the antenatal mothers who attended the urban health facility. There was a significant association found between the BMI and anemia. Improving antenatal care services in terms of nutrition and referrals would greatly benefit maternal and fetal outcomes.

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Strengths and Limitations

Strengths:

- Utilization of routine program data
- Objective measures

Limitations:

- Record-based design
- Small sample size
- Pregnancy outcomes could not be evaluated

Conflict of Interest

Nil.

Ethical Considerations

Ethical approval was obtained. Confidentiality was maintained.

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Table 1 : Distribution of Antenatal mothers According to Hemoglobin status (n =61)

Hemoglobin status	Number (n)	Percentage (%)
Normal	9	14.7
Mild Anemia	22	36.1

Moderate Anemia	30	49.2
Total	61	100

Table 2: Distribution of Antenatal mothers According to BMI Category (n = 61)

BMI Category	Number (n)	Percentage %
Underweight	10	16.4
Normal	14	23.0
Overweight	8	13.1
Obese	29	47.5
Total	61	100

Table 3: Distribution of Antenatal mothers According to Blood pressure status (n=61)

Blood pressure status	Number (n)	Percentage (%)
Normotensive	57	93.4
Hypertensive	4	6.6
Total	61	100

Table 4: Distribution of Antenatal mothers According to blood sugar status (n=61)

Blood sugar status	Number (n)	Percentage
Normal	55	90.2
GDM suspected	5	8.2
Over diabetes	1	1.6
Total	61	100

Table 5: Association between BMI category and Anemic status (n= 61)

BMI Category	Anemia	Normal Hb	Total (n)
Underweight	10	0	10
Normal	7	7	14
Overweight	8	0	8
Obese	27	2	29
Total	52	9	61

Table 6: Association between BMI Category and hypertension status(n= 61)

BMI Category	Hypertensive	Normotensive	Total (n)
Underweight	0	10	10
Normal	1	13	14
Overweight	0	8	8
Obese	3	26	29
Total	4	57	61

Table 7: Association between BMI Category and Diabetes status (n=61)

BMI Category	Abnormal RBS	Normal RBS	Total (n)
Underweight	0	10	10
Normal	1	13	14
Overweight	1	7	8
Obese	4	25	29
Total	6	55	61