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Antenatal Care Utilization And Maternal-Fetal Outcomes In Rural Haryana: A Prospective Observational Study

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Abstract
Background: Antenatal care (ANC) is a key component of reproductive health, significantly contributing to the reduction of maternal and perinatal morbidity and mortality. The World Health Organization (WHO) emphasizes a minimum of eight ANC contacts to ensure a positive pregnancy experience. In India, especially in rural settings, there remains a discrepancy in ANC service uptake, resulting in missed opportunities for early detection of pregnancy-related complications.
Objective: To assess the utilization patterns of ANC services and evaluate maternal and fetal outcomes associated with ANC in a rural setting in Haryana, India.
Methods: A prospective observational study was conducted from January 2021 to December 2022 at a Primary Health Center (PHC) in rural Haryana. A total of 1,245 pregnant women were enrolled and followed until delivery. Data on sociodemographic characteristics, ANC registration timing, number of visits, anemia status, delivery details, birth weight, and neonatal outcomes were collected using structured questionnaires, ANC registers, and hospital records. Statistical analyses included descriptive statistics and multivariate logistic regression to assess the association between ANC utilization and health outcomes.
Results: First trimester registration was achieved by 38% of women, while 65% received at least four ANC visits. Institutional deliveries accounted for 93%, with a cesarean section rate of 33.3%. Anemia (Hb <11 g/dL) was observed in 48% of pregnant women. The rates of preterm birth and low birth weight were 11% and 21%, respectively. Early ANC registration and adequate ANC visits were associated with reduced risk of adverse neonatal outcomes.
Conclusions: While institutional delivery rates are encouraging, early and adequate ANC coverage remains suboptimal. There is a pressing need to strengthen community-based interventions, improve supply chain logistics for supplements, and enhance healthcare worker capacity to ensure holistic maternal care.
Keywords: *Antenatal care, maternal health, fetal outcomes, rural India, anemia, low birth weight, caesarean section*

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I. Introduction

Antenatal care (ANC) is recognized globally as a fundamental component of maternal health services, facilitating early risk identification, management of complications, and promotion of healthy behaviours during pregnancy. The WHO updated its guidelines in 2016 to recommend at least eight ANC contacts per pregnancy to optimize maternal and neonatal outcomes [1]. ANC includes nutritional supplementation, tetanus immunization, monitoring of fetal growth and maternal health, and counselling on birth preparedness.

Despite improvements in maternal health infrastructure in India, rural areas continue to lag behind urban counterparts in terms of both access to and quality of ANC. According to the National Family Health Survey-5 (NFHS-5), 58.1% of pregnant women in rural India had four or more ANC visits, and only 22.3% registered during the first trimester [2]. In Haryana, the figures are slightly better—65% had at least four ANC visits, but only 38.2% registered in the first trimester [3]. These statistics reflect the pressing need for targeted research to understand service utilization trends and barriers in rural populations.

This study investigates ANC coverage and timeliness, maternal and fetal health indicators, and systemic barriers to optimal ANC utilization in rural Haryana.

II. Objectives

1. To assess the coverage and utilization of ANC services among pregnant women in rural Haryana.
2. To determine the maternal and fetal outcomes associated with ANC utilization.
3. To identify systemic and operational gaps in ANC service delivery.

III. Materials And Methods

Study Design and Setting

A prospective observational study was conducted at a government-run PHC in rural Haryana, serving a population of approximately 50,000 across five villages.

Study Participants

All pregnant women (n=1,245) who registered at the PHC from January 2021 to December 2022 were included. Women with incomplete records or who migrated out of the study area before delivery were excluded.

Data Collection Tools and Techniques

Data were collected using:

Structured interviews with the pregnant women after obtaining consent from patients and permission from authority were granted.

ANC and delivery registers

Hospital case sheets and postnatal follow-ups

Information collected included maternal age, parity, education, gestational age at registration, number of ANC visits, hemoglobin levels, mode of delivery, birth weight, gestational age at delivery, and maternal complications.

Outcome Measures

Primary outcomes were maternal anemia, mode of delivery, preterm delivery (<37 weeks), and low birth weight (<2.5 kg). Secondary outcomes included maternal complications such as preeclampsia, postpartum haemorrhage, and infections.

Statistical Analysis

Descriptive statistics (means, percentages) were used to summarize the data. Associations were tested using chi-square and logistic regression. A p-value <0.05 was considered statistically significant.

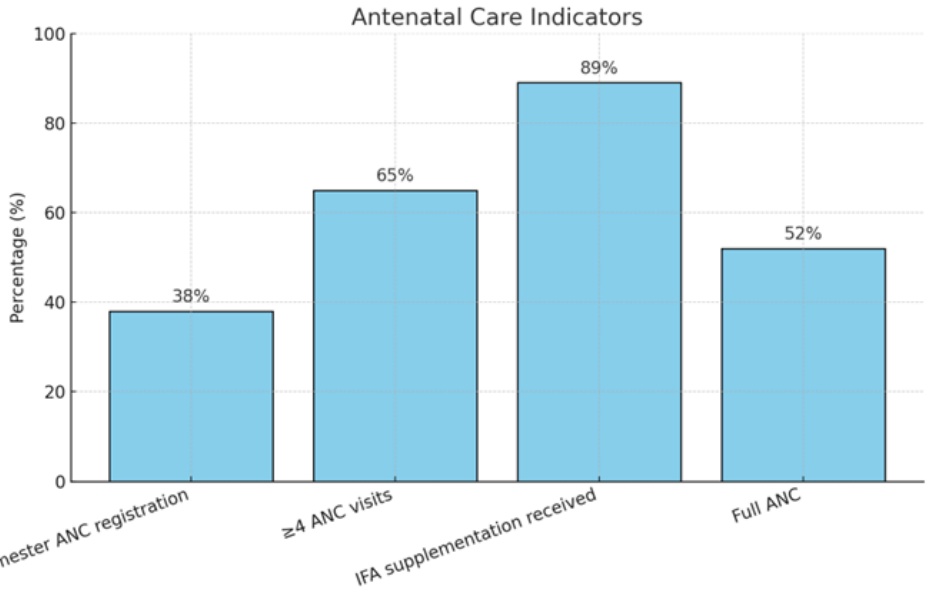
IV. Results

Demographics and ANC Coverage

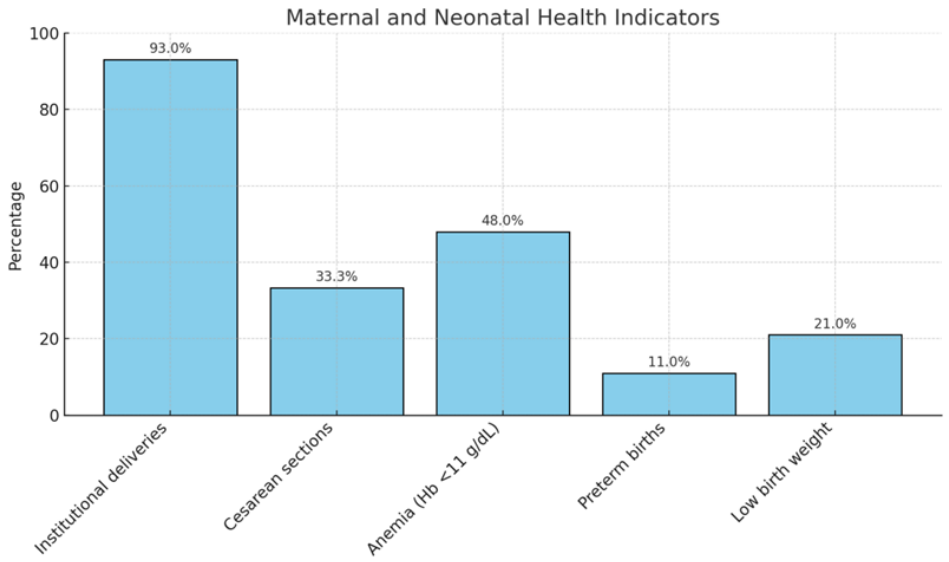
Of the 1,245 women, the majority were aged between 20–30 years, and 82% were multigravida. Education levels varied, with 44% having only primary-level education.

* First trimester ANC registration: 38%
* ≥4 ANC visits: 65%
* IFA supplementation received: 89%
* Full ANC (TT, ≥4 visits, IFA for 100+ days): 52%

Antenatal Care Indicators-



Maternal and Neonatal Outcomes
Institutional deliveries: 93%
Cesarean sections: 33.3%
Anemia (Hb <11 g/dL): 48%
Preterm births: 11%
Low birth weight: 21%



Association between ANC and Outcomes

Early registration and ≥4 ANC visits were significantly associated with reduced risk of anemia (p=0.01), preterm delivery (p=0.04), and low birth weight (p=0.03).

V. Discussion

Timeliness and Coverage of ANC

The low rate of early ANC registration mirrors national data and suggests a need for early pregnancy detection, community sensitization, and better tracking systems [5–8].

High Cesarean Section Rates

A 33.3% cesarean rate is substantially higher than the WHO threshold (10–15%) and may reflect both increased access to surgical obstetrics and non-medical drivers, such as patient preference or provider incentives [9–11].

Anemia and Nutritional Gaps

Despite high reported coverage of IFA tablets, anemia remains prevalent, indicating challenges in adherence, side effects, and nutrition insecurity [12–14].

Preterm and Low Birth Weight Trends

Preterm and low birth weight outcomes are influenced by late ANC initiation, maternal infections, and poor nutrition [15–19]. Community-based nutrition programs need reinforcement.

Health System and Operational Barriers

Issues such as lack of emergency transport, inadequate ASHA training, and poor referral coordination emerged during interviews. Strengthening community health systems, digitizing ANC tracking, and integrating private facilities may improve outcomes [20–23].

VI. Conclusion

This study identifies critical gaps in the timing and adequacy of ANC services in rural Haryana. While institutional delivery coverage is high, early registration and anemia control remain areas of concern. Interventions must focus on strengthening health education, enhancing community outreach, and ensuring continuity of care through a strengthened PHC system.

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