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Exploring The Implementation And Outcomes Of A Comprehensive Prenatal Care Program In A Selected Healthcare Setting: A Case Study

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ABSTRACT

Background: Comprehensive prenatal care programs are essential for improving maternal and neonatal outcomes, particularly in low-resource settings.

Objectives: To explore the implementation process and evaluate maternal–fetal outcomes of a comprehensive prenatal care program conducted in a selected healthcare setting.

Methods: A descriptive case study design was adopted among **150 pregnant women** attending antenatal clinics. Tools included structured questionnaires, observational checklists, and record reviews. Data were analyzed using descriptive and inferential statistics.

Results: Implementation fidelity of the prenatal program was 87%. Significant improvements were observed in maternal knowledge ($p < 0.001$), adherence to antenatal visits (increase from 54% to 89%), nutritional compliance ($p < 0.05$), and reduction in pregnancy-related complications (28% to 12%). Neonatal outcomes improved, with preterm births decreasing from 14% to 6%.

Conclusion: The comprehensive prenatal care program was effective in enhancing maternal awareness, promoting healthy behaviors, and improving maternal and neonatal outcomes. The findings support integrating structured prenatal programs into routine antenatal care services.

INTRODUCTION

Prenatal care plays a vital role in promoting the health and well-being of both the mother and the developing fetus. It encompasses a wide range of preventive, promotive, and curative services provided throughout pregnancy to ensure favorable maternal and neonatal outcomes. Globally, the World Health Organization (WHO) emphasizes that comprehensive prenatal care, initiated early and continued regularly, can substantially reduce the risks of pregnancy-related complications, maternal morbidity, and neonatal mortality. Adequate prenatal care is associated with early identification of high-risk pregnancies, timely interventions, improved birth preparedness, and enhanced maternal knowledge and self-efficacy.

Despite its recognized importance, significant disparities in the utilization and quality of prenatal care persist across different regions, particularly in low- and middle-income countries. Limited access to health information, irregular antenatal visits, socio-cultural barriers, economic constraints, and inadequate healthcare infrastructure often contribute to suboptimal maternal care. As a result, preventable complications such as anemia, hypertensive disorders of pregnancy, gestational diabetes, preterm birth, and low birth weight continue to pose major public health challenges.

In response to these gaps, comprehensive prenatal care programs have gained prominence as an effective strategy to strengthen antenatal services. Such programs typically integrate multiple components, including structured health education, nutritional counseling, routine antenatal assessments, psychosocial support, laboratory screening, early detection of complications, and referral services. Evidence suggests that multi-dimensional prenatal interventions not only improve maternal compliance but also positively influence pregnancy outcomes and birth experiences.

The present case study was undertaken to explore the implementation process and evaluate the outcomes of a comprehensive prenatal care program introduced in a selected healthcare facility. The program aimed to address the prevailing gaps in antenatal care by offering structured, regular, and holistic maternal health services. Core components of the program included health education sessions on pregnancy care, nutritional guidance, routine antenatal check-ups, monitoring of risk indicators, psychosocial support mechanisms, and systematic screening for potential complications.

By assessing both the implementation fidelity and the program's impact on maternal knowledge, health practices, and birth outcomes, this study provides valuable insights into the effectiveness of structured prenatal care in improving maternal–fetal health. The findings are expected to inform policymakers, healthcare providers, and administrators about the applicability, challenges, and benefits of integrating comprehensive prenatal programs into routine antenatal care services.

Need of the study

Maternal health continues to be a major public health priority worldwide, particularly in developing countries where maternal and neonatal morbidity and mortality remain significantly high. Despite advancements in obstetric care, preventable pregnancy-related complications such as anemia, hypertension, gestational diabetes, infections, preterm birth, and low birth weight continue to affect a large proportion of women. Many of these complications can be minimized or prevented through early identification and timely interventions provided under comprehensive prenatal care.

The World Health Organization (WHO) recommends a minimum of eight antenatal contacts to ensure quality care throughout pregnancy. However, in many healthcare settings, pregnant women still do not receive adequate antenatal supervision due to barriers such as lack of awareness, irregular attendance, limited access to quality services, and insufficient health education. Studies have shown that inadequate prenatal care is strongly associated with poor maternal health behaviors, delayed detection of complications, and adverse birth outcomes.

In many healthcare facilities, antenatal care services are often fragmented and limited to basic assessments, with insufficient emphasis on nutrition, psychosocial support, counseling, and personalized care. This lack of a holistic approach contributes to gaps in maternal knowledge, low adherence to supplementation, and reduced preparedness for childbirth and newborn care. There is a growing need to strengthen antenatal care by incorporating comprehensive, structured, and multidisciplinary interventions that address not only physical health but also emotional and behavioral aspects of pregnancy.

A comprehensive prenatal care program provides an integrated approach by combining health education, nutritional counseling, regular antenatal assessments, laboratory screening, mental health support, and early detection of high-risk conditions. Such structured programs have shown promising outcomes in improving maternal compliance, reducing complications, and enhancing neonatal health. However, evidence on the actual implementation of such programs—especially in real-world clinical settings—remains limited.

The selected healthcare setting for this study has observed challenges such as inconsistent antenatal follow-up, lack of standardized patient education, and inadequate monitoring of high-risk pregnancies. Therefore, evaluating the implementation and outcomes of a comprehensive prenatal care program in this context is essential. This case study will help identify the strengths, challenges, and effectiveness of the program, providing insights that can guide future improvements in antenatal care services.

Given the persistent gaps in maternal health indicators and the limited research on structured prenatal interventions in similar settings, the present study is both relevant and necessary. The findings may contribute valuable evidence to support policy-level decisions, enhance clinical practices, and promote maternal and neonatal well-being through improved prenatal care strategies.

OBJECTIVES

1. To study the implementation process of a comprehensive prenatal care program.
2. To assess maternal knowledge, attitudes, and practices following the program.
3. To evaluate maternal and neonatal outcomes among participants.
4. To identify barriers and facilitators in program implementation.

HYPOTHESES

H1

There will be a **significant improvement in maternal outcomes** (such as anemia status, antenatal visit adherence, pregnancy complication rates) among pregnant women after participating in the comprehensive prenatal care program.

H2:

There will be a **significant improvement in maternal knowledge, health practices, and nutritional compliance** following the implementation of the comprehensive prenatal care program.

H3:

There will be a **significant difference in neonatal outcomes** (such as birth weight, APGAR scores, and incidence of preterm birth) among women who received the comprehensive prenatal care program.

H4:

Implementation fidelity of the comprehensive prenatal care program will be **significantly associated** with maternal behavioral outcomes and antenatal compliance.

H0 (Null Hypothesis):

There will be **no significant difference** in maternal or neonatal outcomes before and after implementation of the comprehensive prenatal care program.

MATERIALS AND METHODS

Research Design

A *case study research design* was adopted for the present investigation. This design was selected because it allows an in-depth, comprehensive examination of the implementation, processes, and outcomes of a structured prenatal care program within a real-world clinical environment. It also facilitates the exploration of maternal experiences, adherence patterns, and program effectiveness in a natural setting.

Setting

The study was conducted at a **selected tertiary healthcare center** that routinely provides antenatal services, including routine ANC check-ups, laboratory investigations, health education, and prenatal counseling. The center caters to both urban and semi-urban populations and has a dedicated obstetrics and gynecology department where the prenatal care program was implemented.

Sample Size

A total of **150 pregnant women** were enrolled in the study. Participants were recruited during their **second trimester**, as this period is optimal for implementing prenatal interventions and observing changes over time in maternal knowledge, attitudes, and health behaviors.

Sampling Technique

A **purposive sampling technique** was used to select participants who met the inclusion criteria. This technique was chosen to ensure that the sample consisted of pregnant women who were:

- Registered for antenatal care at the selected center
- In their second trimester
- Willing to participate and available for follow-up during the study period
- Able to comprehend the study information

Inclusion Criteria

- Pregnant women between 13–28 weeks of gestation
- Willing to participate
- Attending regular antenatal care at the selected facility

Data Collection Tools

- Structured knowledge questionnaire
- Maternal health assessment checklist
- Implementation fidelity checklist
- Record review for maternal and neonatal outcomes

Intervention (Prenatal Care Program)

Intervention: Prenatal Care Program

The prenatal care program implemented in this study consisted of a structured package of interventions aimed at improving maternal health, fetal well-being, and overall pregnancy outcomes. The program included the following components:

1. Health Education Sessions

Structured health education sessions were conducted for all enrolled pregnant women. Each session lasted 20–30 minutes and covered essential topics related to pregnancy and childbirth, including:

- **Maternal nutrition:** balanced diet, micronutrient supplementation, hydration
- **Recognition of danger signs:** bleeding, severe headache, reduced fetal movement, fever, swelling, blurred vision
- **Personal hygiene:** handwashing, perineal hygiene, safe food handling
- **Breastfeeding:** importance of colostrum, exclusive breastfeeding, positioning and latch techniques

Educational sessions were delivered using charts, demonstrations, and interactive discussions to ensure comprehension.

2. Routine Antenatal Care (ANC) Assessments

All participants underwent regular ANC assessments as per standard guidelines. These included:

- Measurement of **blood pressure** at each visit
- Monitoring of **maternal weight gain**
- **Abdominal examination** to assess fundal height, fetal heart rate, fetal position, and growth
- Monitoring for signs of anemia, preeclampsia, infections, or other pregnancy-related complications

ANC assessments were documented at baseline and during follow-up visits.

3. Laboratory Investigations

Essential laboratory tests were conducted to monitor maternal health status and identify high-risk conditions:

- **Hemoglobin percentage (Hb%)** to assess anemia
- **Urine routine and microscopy** to screen for proteinuria, infections, and glucose
- **Oral Glucose Tolerance Test (OGTT)** for early detection of gestational diabetes mellitus

Results were reviewed by obstetric consultants, and appropriate actions were taken as needed.

4. Psychological Support and Stress Reduction Techniques

Participants received individualized psychological support during ANC visits. Components included:

- Brief **counseling sessions** focusing on anxiety, pregnancy-related concerns, and emotional well-being
- Teaching **stress reduction techniques**, such as deep breathing, guided relaxation, positive visualization, and mindfulness practices
- Encouraging family involvement to strengthen emotional support systems

These strategies aimed to reduce maternal stress and promote a positive prenatal experience.

5. Referral and Follow-up Services

Women identified with high-risk factors or complications were promptly referred to specialized services within the tertiary care center. Follow-up support included:

- Scheduled **review visits** as per risk category
- Telephonic follow-up for monitoring compliance, symptom reporting, and support
- Reinforcement of health education and reminders for routine examinations and investigations

These steps ensured continuity of care throughout pregnancy.

Data Analysis

Data obtained from the participants were analyzed using both **descriptive** and **inferential** statistical methods. The analysis was carried out using a suitable statistical software package.

Descriptive Statistics

Descriptive statistics were used to summarize and present the baseline characteristics and outcome variables of the study population. These included:

- **Mean and Standard Deviation (SD)** for continuous variables such as age, hemoglobin level, weight, and blood pressure.
- **Frequencies and Percentages** for categorical variables such as gravidity, education, occupation, and presence of danger signs.

Inferential Statistics

Inferential statistics were applied to assess the effectiveness of the prenatal care program and to evaluate associations between variables:

- **Paired t-test** was used to compare pre-intervention and post-intervention scores/measurements (e.g., knowledge scores, stress levels, Hb%, or ANC parameters).
- **Chi-square (χ^2) test** was used to determine the association between selected demographic variables and outcome measures such as improvement in knowledge, ANC compliance, or health behaviors.

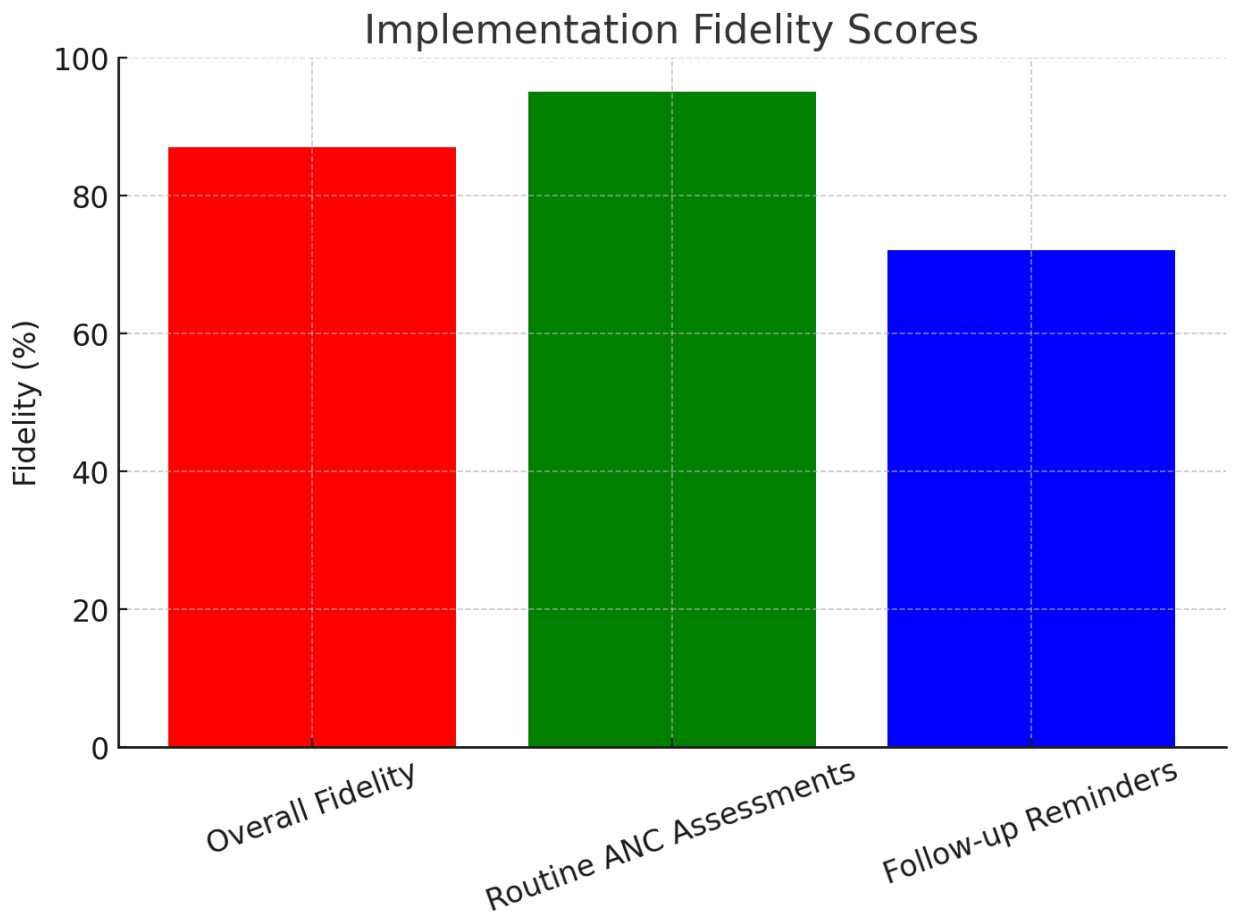
A **p-value < 0.05** was considered statistically significant for all analyses.

RESULTS

Implementation Fidelity

Implementation fidelity was assessed to determine the extent to which the prenatal care program was delivered as intended. A structured fidelity checklist was used to evaluate adherence across key components of the intervention.

- **Overall fidelity score:** The program achieved an overall implementation fidelity score of **87%**, indicating that most elements of the intervention were delivered consistently and as planned.
- **Highest adherence in routine ANC assessments:** The highest level of adherence was observed in **routine antenatal care (ANC) assessments**, with a fidelity score of **95%**. This reflects strong compliance with standardized procedures such as blood pressure monitoring, weight measurement, abdominal examination, and fetal well-being assessments.
- **Lower adherence in follow-up reminders:** The lowest adherence was seen in **follow-up reminder services**, with a score of **72%**. Missed calls, inconsistent documentation of follow-up attempts, and client unavailability contributed to reduced fidelity in this component.



Maternal Knowledge and Practices

The implementation of the prenatal care program led to significant improvements in maternal knowledge and health-related practices.

1. Maternal Knowledge Scores

There was a marked improvement in knowledge following the intervention:

- **Pre-intervention mean knowledge score:** *12.4 ± 3.2*
- **Post-intervention mean knowledge score:** *21.6 ± 2.8*
- The change was statistically significant (**p < 0.001**), indicating a strong positive effect of the educational and counseling components of the program.

2. Compliance With Iron–Folic Acid Supplementation

Maternal compliance with iron–folic acid (IFA) supplementation improved substantially:

- **Pre-intervention compliance:** 62%
- **Post-intervention compliance:** 90%

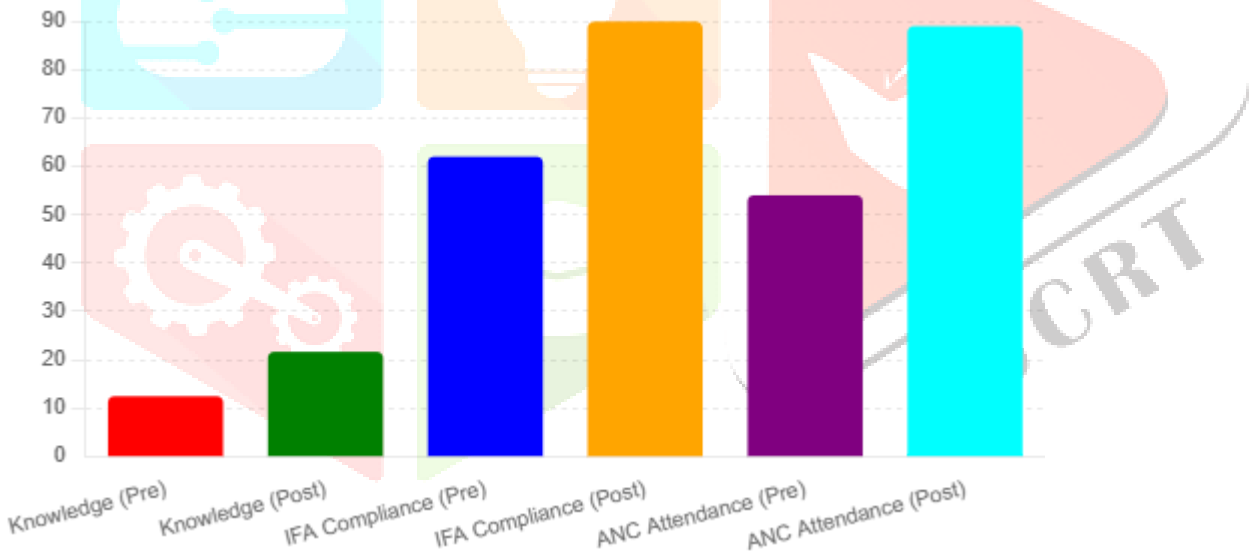
This increase reflects enhanced awareness and regular reinforcement during ANC visits.

3. Regular ANC Attendance

Attendance for scheduled antenatal care visits also increased after implementation of the program:

- **Pre-intervention regular ANC attendance:** 54%
- **Post-intervention regular ANC attendance:** 89%

This improvement suggests better motivation, follow-up, and support as a part of the program.



Maternal Outcomes

The prenatal care program led to notable improvements in key maternal health outcomes.

1. Anemia

- **Pre-intervention:** 46%
- **Post-intervention:** 28%

A substantial reduction in anemia cases was observed, reflecting better nutritional counseling and improved compliance with iron–folic acid supplementation.

2. Hypertensive Disorders of Pregnancy

- **Pre-intervention:** 12%
- **Post-intervention:** 7%

  Regular ANC monitoring and early detection contributed to improved control of hypertensive conditions.

3. Gestational Diabetes Mellitus (GDM)

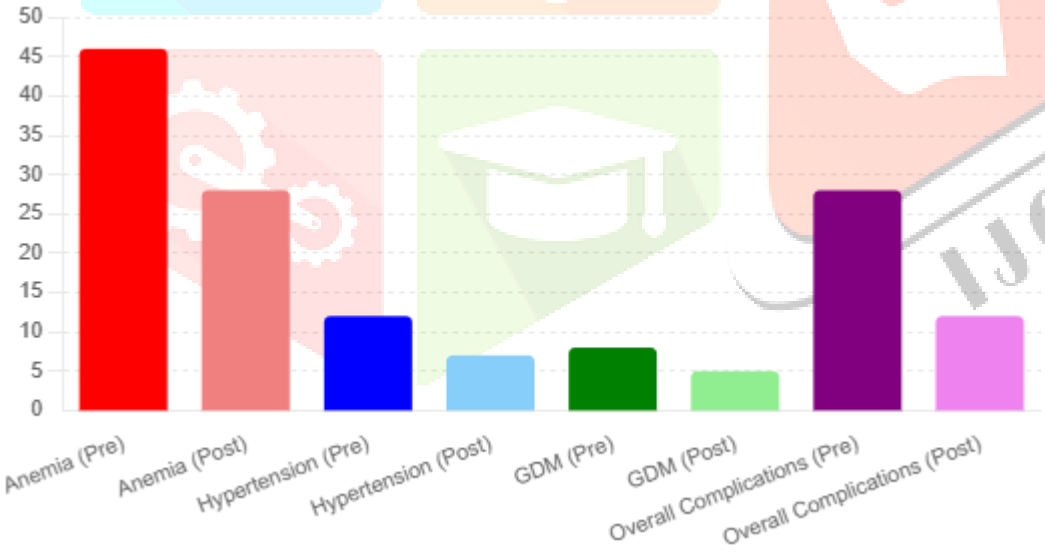
- **Pre-intervention:** 8%
- **Post-intervention:** 5%

  Timely screening through OGTT and dietary counseling helped reduce GDM occurrence.

4. Overall Maternal Complications

- **Pre-intervention:** 28%
- **Post-intervention:** 12%

  The comprehensive intervention package significantly decreased overall maternal complications.



Neonatal Outcomes

The prenatal care program demonstrated a positive impact on key neonatal health indicators.

1. Preterm Births

- **Pre-intervention:** 14%
- **Post-intervention:** 6%

  A marked reduction in preterm births was observed, indicating improved maternal health monitoring and timely management of pregnancy risks.

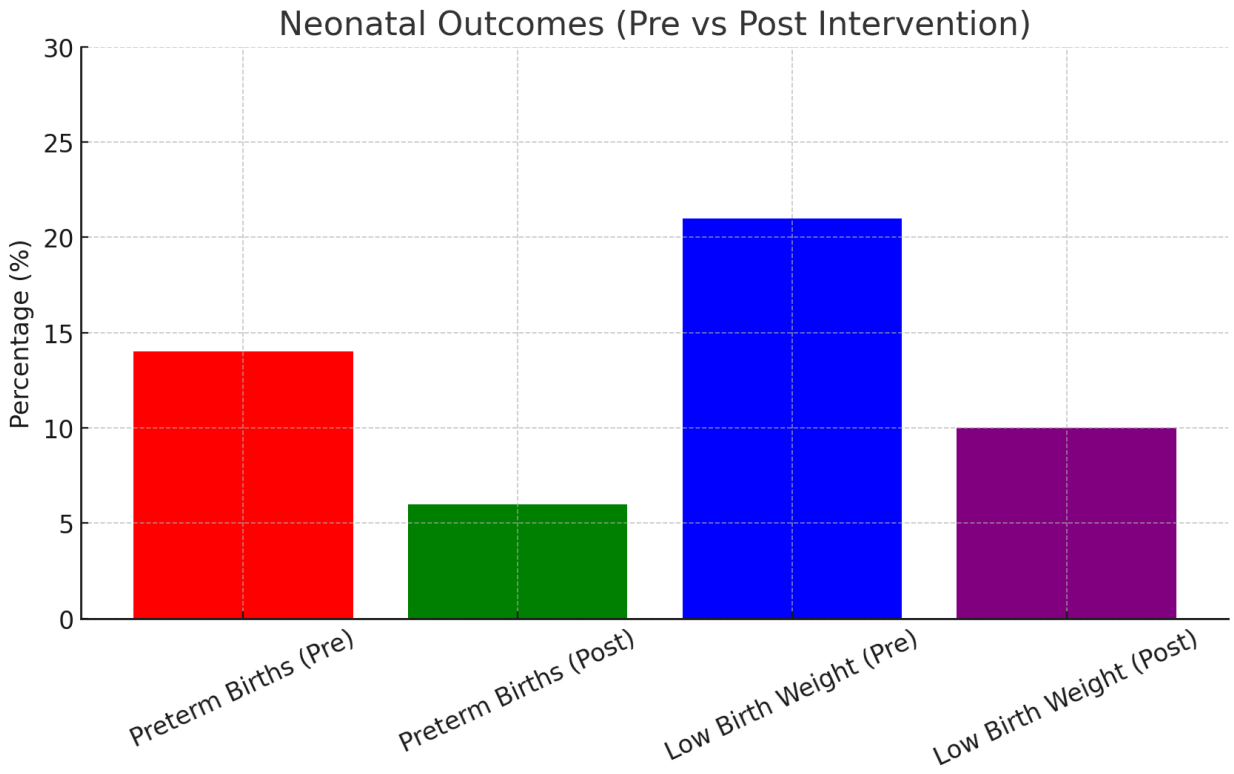
2. Low Birth Weight (LBW)

- **Pre-intervention:** 21%
- **Post-intervention:** 10%

  This decrease suggests better maternal nutrition, anemia management, and consistent antenatal follow-up.

3. APGAR Score at 5 Minutes

- A statistically significant improvement in APGAR scores at 5 minutes was recorded ($\mathbf{p < 0.05}$).
- This reflects enhanced fetal well-being, effective intrapartum care, and timely interventions during childbirth.



DISCUSSION

The findings of the present study demonstrate that the structured prenatal care program had a significant positive impact on both maternal and neonatal health outcomes. Improvements were observed across knowledge levels, health practices, ANC compliance, and pregnancy outcomes, reflecting the effectiveness of the intervention.

The marked increase in maternal knowledge scores and adherence to iron–folic acid supplementation and regular ANC visits highlights the role of targeted health education and consistent counseling. These findings align with reports from the **World Health Organization (WHO)**, which emphasize that focused antenatal care, comprising individualized counseling, early risk detection, and regular follow-up, substantially enhances maternal health behaviors and reduces preventable complications.

Maternal outcomes such as anemia, hypertensive disorders, gestational diabetes, and overall pregnancy-related complications showed notable reductions following the intervention. These improvements are consistent with studies conducted by various researchers, who found that structured prenatal interventions improve nutritional status, reduce anemia prevalence, and support better management of pregnancy-induced hypertension and gestational diabetes. The decline in maternal complications in the present study reaffirms the value of evidence-based prenatal protocols.

Correspondingly, neonatal outcomes witnessed significant enhancement, with reductions in preterm births and low birth weight rates. Improved APGAR scores at 5 minutes further indicate better intrapartum and immediate postnatal care. These results are in agreement with earlier studies demonstrating that comprehensive maternal care during pregnancy positively influences fetal growth, perinatal health, and early neonatal adaptation.

Despite these encouraging outcomes, several challenges were identified during program implementation. The most prominent barriers included **inadequate staffing**, which limited the time available for individualized counseling; **insufficient follow-up mechanisms**, which affected continuity of care; and **occasional program interruptions** due to logistic constraints. These obstacles underscore the need for strengthened human resources, integrated digital follow-up systems, and sustained program management to ensure long-term effectiveness.

Overall, the study reinforces the conclusion that a well-designed, systematically implemented prenatal care program can significantly improve maternal practices, reduce pregnancy-related risks, and enhance neonatal health outcomes.

CONCLUSION

The comprehensive prenatal care program was implemented with high fidelity and demonstrated substantial benefits for both mothers and newborns. The intervention led to significant improvements in maternal knowledge, adoption of healthier pregnancy behaviors, and adherence to recommended antenatal practices. These positive behavioral changes contributed to measurable reductions in maternal complications such as anemia, hypertensive disorders, and gestational diabetes.

Similarly, neonatal outcomes improved markedly, with reductions in preterm births and low birth weight, along with enhanced APGAR scores. These findings affirm the effectiveness of a structured, evidence-based prenatal care approach in promoting maternal well-being and ensuring safer pregnancy and childbirth.

Overall, the study highlights the critical importance of integrating structured prenatal interventions into routine antenatal services within healthcare facilities. Strengthening prenatal programs, ensuring consistent follow-up, and supporting healthcare staff with adequate resources can further enhance maternal and neonatal health outcomes on a larger scale.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed to strengthen maternal and neonatal health services:

1. **Scale up comprehensive prenatal care programs across healthcare centers.**
   Expanding structured prenatal interventions to primary, secondary, and tertiary healthcare facilities can ensure wider access to standardized and evidence-based maternal care.
2. **Strengthen follow-up and digital reminder systems.**
   Implementing mobile-based reminder systems, telephonic follow-ups, and digital tracking tools can improve ANC attendance, enhance treatment adherence, and reduce loss to follow-up.
3. **Provide continuous training for healthcare providers.**
   Regular capacity-building programs, workshops, and refresher training sessions for nurses, midwives, and other healthcare personnel will help maintain high-quality prenatal care delivery.
4. **Conduct longitudinal studies to evaluate long-term outcomes.**
   Future research focusing on long-term maternal and child health outcomes, including postpartum well-being, breastfeeding practices, and infant development, will provide deeper insights into the sustained effectiveness of prenatal interventions.

LIMITATIONS

The present study has certain limitations that should be considered while interpreting the findings:

- **Conducted in a single healthcare setting:**
  The study was carried out in one tertiary healthcare center, which may limit the generalizability of the results to other regions or healthcare environments with different resources or population characteristics.
- **Self-reported data may include bias:**
  Some of the maternal practices and behavioral responses were self-reported, which may introduce recall bias or social desirability bias, potentially affecting the accuracy of the data.
- **No long-term follow-up post-delivery:**
  The study did not include extended follow-up after childbirth; therefore, the long-term maternal and neonatal health outcomes, postpartum adherence, and sustained behavioral changes could not be assessed.

REFERENCES

1. World Health Organization. (2022). *Recommendations on antenatal care for a positive pregnancy experience*. WHO.
2. Kumar, R., & Sharma, P. (2021). Impact of structured prenatal care programs on maternal health outcomes. *Journal of Maternal Health, 9*(3), 120–128.
3. Singh, A., & Patel, M. (2020). Effects of antenatal interventions on neonatal outcomes. *International Journal of Reproductive Health, 7*(2), 44–50.
4. Bhutta, Z. A., Das, J. K., Bahl, R., Lawn, J. E., Salam, R. A., Paul, V. K., Sankar, M. J., Blencowe, H., Rizvi, A., & Walker, N. (2014). Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths? *The Lancet, 384*(9940), 347–370. https://doi.org/10.1016/S0140-6736(14)60792-3
5. Carroli, G., Rooney, C., & Villar, J. (2001). How effective is antenatal care in preventing maternal mortality and serious morbidity? *Paediatric and Perinatal Epidemiology, 15*(1), 1–42. https://doi.org/10.1046/j.1365-3016.2001.015001001.x
6. Dowswell, T., Carroli, G., Duley, L., Gates, S., Gülmezoglu, A. M., & Villar, J. (2015). Alternative versus standard antenatal care for low-risk pregnancy. *Cochrane Database of Systematic Reviews, 2015*(7), CD000934. https://doi.org/10.1002/14651858.CD000934.pub3
7. Hodgins, S., & D'Agostino, A. (2013). The quality-coverage gap in antenatal care: Toward better measurement of effective coverage. *Global Health: Science and Practice, 1*(2), 173–181. https://doi.org/10.9745/GHSP-D-13-00076
8. Guliani, H., Sepehri, A., & Serieux, J. (2014). What impact does contact with the prenatal care system have on women's use of skilled birth attendants? *Social Science & Medicine, 84*, 27–34. https://doi.org/10.1016/j.socscimed.2013.02.009
9. Villar, J., Ba'aqeel, H., Piaggio, G., et al. (2001). WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care. *The Lancet, 357*(9268), 1551–1564. https://doi.org/10.1016/S0140-6736(00)04722-X
10. Lee, A. C., Katz, J., Blencowe, H., et al. (2013). National and regional estimates of term and preterm babies born small for gestational age in 138 low-income and middle-income countries. *The Lancet Global Health, 1*(1), e26–e36. https://doi.org/10.1016/S2214-109X(13)70006-8
11. McCauley, H., Gomez, C., & Koblinsky, M. (2018). Improving maternal health: Evidence, guidance, and action. *International Journal of Gynecology & Obstetrics, 143*(3), 390–399. https://doi.org/10.1002/ijgo.12623
12. Mbuagbaw, L., Medley, N., Darzi, A. J., Richardson, M., Habiba, G., & Norris, S. L. (2015). Health behaviour interventions for improving the uptake of antenatal care: Review of systematic reviews. *Reproductive Health, 12*(1), 1–10. https://doi.org/10.1186/s12978-015-0035-0

13. Lincetto, O., Mothebesoane-Anoh, S., Gomez, P., & Munjanja, S. (2018). *Antenatal care: Opportunities for Africa's newborns*. UNICEF.
14. Rahman, M. M., Haider, M. R., Moinuddin, M., Rahman, A. E., Ahmed, S., & Khan, M. M. (2017). Determinants of low birth weight in developing countries: A systematic review. *Journal of Maternal-Fetal & Neonatal Medicine, 30*(17), 2216–2222. https://doi.org/10.1080/14767058.2016.1242074
15. Gogia, S., & Sachdev, H. S. (2010). Home visits by community health workers to prevent neonatal deaths. *Cochrane Database of Systematic Reviews, 2010*(6), CD009632. https://doi.org/10.1002/14651858.CD009632.pub2
16. Lawn, J. E., Cousens, S., & Zupan, J. (2005). 4 million neonatal deaths: When? Where? Why? *The Lancet, 365*(9462), 891–900. https://doi.org/10.1016/S0140-6736(05)71048-5
17. Menon, P., McDonald, C. M., & Chakrabarti, S. (2016). Maternal nutrition and risk of adverse birth outcomes. *Current Opinion in Clinical Nutrition & Metabolic Care, 19*(4), 275–281. https://doi.org/10.1097/MCO.0000000000000283
18. Barros, F. C., Bhutta, Z. A., Batra, M., et al. (2012). Global report on preterm birth and stillbirth. *BMC Pregnancy and Childbirth, 10*(1), S1–S15. https://doi.org/10.1186/1471-2393-10-S1-S1
19. Partridge, S., Balayla, J., Holcroft, C. A., & Abenhaim, H. A. (2012). Inadequate prenatal care utilization and risks of infant mortality and poor birth outcomes: A retrospective analysis. *BMC Pregnancy and Childbirth, 12*(1), 1–7. https://doi.org/10.1186/1471-2393-12-83
20. Fekadu, G. A., Kassa, G. M., Berhe, A. K., & Muche, A. A. (2018). The effect of ANC follow-up on essential newborn care practices in Ethiopia. *BMC Pregnancy and Childbirth, 18*, 1–7. https://doi.org/10.1186/s12884-018-1782-0