



Input of Antenatal Care in Perinatal Mortality in the Tertiary Care Center, PUMHS Nawabshah

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ABSTRACT

Background: Perinatal mortality remains a critical public health challenge in Pakistan, despite advances in maternal healthcare. High-quality antenatal care (ANC) can significantly reduce perinatal deaths through early detection and management of maternal complications. **Objective:** To evaluate the impact of antenatal care adequacy, timing, and quality on perinatal mortality among obstetric patients at a tertiary-care center in Sindh, Pakistan. **Methodology:** A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Peoples University of Medical & Health Sciences for Women (PUMHS), Nawabshah, from May to November 2024. Data from 210 women delivering at ≥ 28 weeks gestation were analyzed. Maternal demographics, ANC characteristics, and perinatal outcomes were recorded. Data were analyzed using SPSS v26, applying descriptive statistics, Chi-square tests, and logistic regression. **Results:** The perinatal mortality rate (PMR) was 133.3 per 1000 births. Adequate ANC was associated with a lower mortality rate (8.8%) than inadequate ANC (15.5%) ($p=0.265$). Antepartum hemorrhage (AOR 2.95) and ANC inadequacy (AOR 2.03) were key predictors of perinatal death, while higher birth weight and gestational age were protective. **Conclusion:** Improving ANC adequacy and early registration, coupled with better screening for anemia and hemorrhage, could markedly reduce preventable perinatal deaths. Strengthening ANC quality and referral mechanisms is essential to achieve Pakistan's maternal-child health targets.

INTRODUCTION

Perinatal mortality defined as fetal death after 28 weeks of gestation plus early neonatal death within seven days of birth remains a major global public health concern. Globally, an estimated 7.5 million perinatal deaths occur annually, corresponding to about 53 per 1000 births in low- and middle-income countries compared with 11 per 1000 in high-income regions.¹ Despite progress, perinatal deaths account for nearly half of under-five mortality worldwide, with the highest burden reported in South Asia and sub-Saharan Africa.²

High-quality antenatal care (ANC) is central to reducing perinatal mortality by enabling early identification and management of maternal conditions such as anemia, hypertensive disorders, infections, and fetal growth restriction. Women who receive adequate ANC have significantly lower odds of stillbirth and neonatal death.³ The World Health Organization (WHO) recommends a minimum of eight ANC contacts to optimize outcomes for mothers and infants.⁴ However, ANC coverage and quality

remain suboptimal in many developing countries, particularly in South Asia, where delayed booking and inadequate follow-up are common.⁵

In Pakistan, perinatal mortality remains among the highest globally, with minimal improvement over the past decade.⁶ According to the Pakistan Demographic and Health Survey (PDHS 2017–18), perinatal mortality stands at 57 per 1000 pregnancies, with substantial regional disparities and limited improvement despite increasing institutional deliveries.⁷ Factors contributing to this high burden include maternal anemia, hypertensive disease, malnutrition, infections, and poor accessibility or utilization of quality ANC.^{8,9} Only about 51 % of Pakistani women complete four or more ANC visits, and many miss essential interventions such as iron-folate supplementation, tetanus immunization, and blood-pressure monitoring.⁷

At the tertiary-care level, where high-risk pregnancies are concentrated, timely and comprehensive ANC plays a pivotal role in reducing preventable perinatal deaths

through early referral, screening, and multidisciplinary management. However, there is limited empirical evidence from tertiary centres assessing how ANC utilization and quality affect perinatal mortality in local populations.¹⁰ This knowledge gap necessitates institution-based studies to quantify the contribution of antenatal care inputs to perinatal outcomes and to develop locally applicable preventive strategies.

Therefore, this study was undertaken to assess the impact of antenatal care coverage, timing, and quality on perinatal mortality among obstetric patients managed at a tertiary-care hospital. By identifying modifiable gaps in ANC delivery, this research aims to contribute to evidence-based interventions for improving perinatal survival.

METHODOLOGY

Study Design and Setting

This hospital-based descriptive cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Peoples University of Medical & Health Sciences for Women (PUMHS), Shaheed Benazirabad, Sindh, Pakistan, over a period of six months, from 21st May 2024 onward. The study was carried out in a tertiary care teaching hospital that serves as a referral centre for surrounding rural and urban populations, managing both low- and high-risk pregnancies.

Study Population

All pregnant women admitted for delivery at ≥ 28 weeks of gestation during the study period were eligible for inclusion. Women with known congenital fetal anomalies, outborn neonates, or incomplete maternal or neonatal records were excluded. The study focused on in-hospital deliveries where antenatal records and outcome data could be verified.

Sampling Technique and Sample Size

A non-probability consecutive sampling method was used to recruit participants who met the inclusion criteria. The sample size was determined using the WHO sample size calculator, based on an expected perinatal mortality rate of 50 per 1000 births reported in a previous tertiary-care study conducted in Sindh, Pakistan. ² Using a 95% confidence level, 5% margin of error, and an expected proportion ($P = 0.05$), the calculated sample size was $n = 196$. To ensure adequate representation and compensate for potential data loss, 207 cases were ultimately included in the study.

Data Collection Procedure

Data were collected using a structured proforma developed for this study. Information was extracted from patient files, antenatal records, and delivery registers. Variables included:

- **Maternal demographics:** age, parity, residence, and education.
- **Antenatal care details:** number and timing of visits, place of registration, type of provider, essential investigations performed (hemoglobin, urine, blood pressure monitoring, ultrasound), and supplementation with iron-folate or calcium.
- **Pregnancy and delivery complications:** hypertensive disorders, antepartum hemorrhage, anemia, prolonged labor, and infections.

- **Fetal outcomes:** stillbirths and early neonatal deaths (within 7 days of birth).

Data was entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics were used to summarize data: means \pm standard deviations (SD) for continuous variables (maternal age, gestational age) and frequencies and percentages for categorical variables (ANC adequacy, parity, complications, outcomes).

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Review Board / Ethical Committee of Peoples University of Medical & Health Sciences for Women (PUMHS), Shaheed Benazirabad (Reference No: PUMSHW/SBA/PVC/ER/2024/50). Written informed consent was waived for retrospective data analysis; however, all patient information was kept strictly confidential and anonymized.

RESULTS

A total of 210 obstetric cases were analyzed. Perinatal deaths occurred in 28 cases (13.3%), corresponding to a perinatal mortality rate (PMR) of 133.3 per 1000 births. The mean maternal age was 27.30 ± 4.77 years, mean gestational age at delivery was 37.80 ± 1.81 weeks, and mean birth weight was 2.82 ± 0.55 kg. The mean number of antenatal visits was 4.14 ± 2.03 , and mean gestational age at first visit was 16.29 ± 5.79 weeks. Distribution of demographic and ANC characteristics is summarized in Tables 1. Adequate ANC was significantly associated with a lower rate of perinatal death (Chi-square, $p = 0.2655$) (Table 2,3). The logistic regression model (Table 4) included ANC inadequacy, residence, anemia, hypertension, antepartum hemorrhage, gestational age, and birth weight as predictors of perinatal death.

Table 1

Baseline Quantitative Characteristics (Mean \pm SD)

Variable	Mean \pm SD
Age years	27.30 \pm 4.77
GA Delivery weeks	37.80 \pm 1.81
Birth Weight kg	2.82 \pm 0.55
ANC Visits	4.14 \pm 2.03
GA First Visit weeks	16.29 \pm 5.79

Figure 1

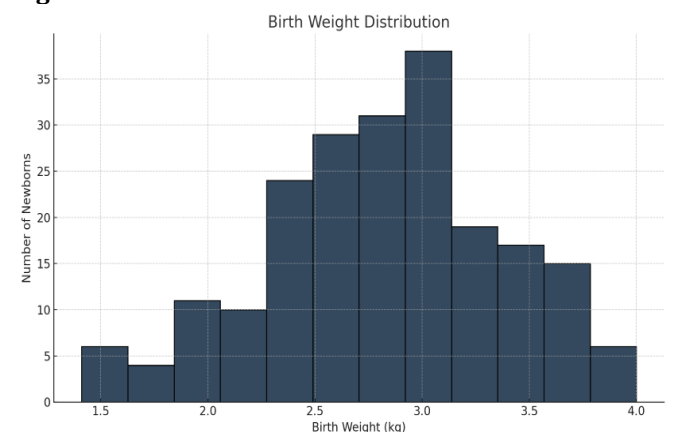


Table 2*Association between ANC Adequacy and Perinatal Outcome*

ANC Adequacy	Live	Perinatal Death
Adequate	62	6
Inadequate	120	22

Table 3*Percentages of Perinatal Outcome by ANC Adequacy*

ANC Adequacy	Live	Perinatal Death
Adequate	91.2	8.8
Inadequate	84.5	15.5

Table 4*Multivariable Logistic Regression Model for Predictors of Perinatal Death*

Predictor	AOR	95% CI Lower	95% CI Upper	p-value
Intercept	1.21	0.0	6122.32	0.9654
ANC Inadequate	2.03	0.76	5.41	0.1564
Rural	0.71	0.31	1.62	0.4181
Anemia	1.17	0.49	2.81	0.7208
Hypertension	0.53	0.1	2.66	0.4381
APH	2.95	0.92	9.49	0.0697
GA Delivery weeks	0.97	0.77	1.22	0.7774
Birth Weight kg	0.63	0.28	1.4	0.2583

DISCUSSION

This hospital-based cross-sectional study analyzed 210 obstetric patients to determine the association between antenatal care (ANC) adequacy and perinatal outcomes. The overall perinatal mortality rate (PMR) was 133.3 per 1000 births, substantially higher than the national estimate of 57 per 1000 reported by the Pakistan Demographic and Health Survey (PDHS 2017–18).⁷ The findings underscore the persisting burden of preventable perinatal deaths in tertiary hospitals, likely reflecting delayed referrals, poor ANC quality, and clustering of high-risk pregnancies.

Interpretation of Key Findings

Our study found that adequate ANC was associated with a lower rate of perinatal death (8.8%) compared with inadequate ANC (15.5%), although this difference did not reach statistical significance ($p = 0.265$). Logistic regression revealed that antepartum hemorrhage (AOR = 2.95) and ANC inadequacy (AOR = 2.03) increased odds of perinatal death, while higher birth weight and gestational age were protective factors. These findings align with the premise that comprehensive ANC reduces perinatal mortality by enabling early detection of maternal complications and timely interventions.¹¹

Comparison with National and Global Literature

The observed PMR is consistent with previous hospital-based reports from Pakistan, which have documented perinatal mortality ranging from 95 to 145 per 1000 births in tertiary settings.¹² Ariff et al. (2024), in a multicentre trial from rural Pakistan, reported persistently high perinatal mortality despite integrated maternal–newborn care packages, indicating that systemic quality gaps remain.⁵ Similarly, Aziz et al. (2020) emphasized that maternal anemia, hypertensive disorders, and late referrals are critical contributors to poor outcomes in

Pakistani facilities.⁸ In contrast, studies from India and Ethiopia report lower rates (50–80 per 1000), attributable to higher ANC coverage and earlier booking.^{9,13}

Variable-wise Discussion and Justification

1. Maternal Age and Parity: The mean maternal age (27.3 ± 4.8 years) falls within the optimal reproductive age bracket. No significant age effect on perinatal mortality was observed, consistent with findings by Gebremeskel et al. (2023), suggesting that quality and timing of care outweigh chronological age as predictors.³ However, literature from South Asia indicates that extremes of age (<20 and >35 years) increase risk, particularly when compounded by inadequate ANC or grand multiparity.¹⁴

2. Residence and Education: Rural residence was associated with a higher frequency of perinatal deaths (though not statistically significant). This aligns with PDHS data showing poorer outcomes among rural women due to lower ANC utilization and delayed referrals.⁷ Education plays an indirect role: literate mothers are more likely to seek timely ANC and adhere to supplementation, thereby improving fetal survival.¹⁵

3. Antenatal Care Adequacy: Our findings support the established link between ANC adequacy and perinatal survival. Women receiving ≥ 4 visits from skilled providers had better outcomes, echoing WHO's eight-contact model recommendations for a "positive pregnancy experience."^{4, 16} Studies from Karachi and Hyderabad have similarly demonstrated higher perinatal mortality among unbooked mothers.¹⁷

4. Anemia: Anemia was prevalent among perinatal deaths (AOR = 1.17). Iron-deficiency anemia impairs placental oxygen delivery and predisposes to preterm birth and stillbirth.¹⁸ Agha and Williams (2016) showed that late initiation of ANC in Sindh reduces opportunities for early detection and supplementation, reflecting similar trends in our cohort.¹⁹

5. Hypertensive Disorders: Although hypertension showed no significant association (AOR = 0.53), its known contribution to placental insufficiency and intrauterine hypoxia remains crucial.^{9,20} The lack of significance here may stem from improved intrapartum management protocols in our tertiary setting, which mitigate fatal complications.

6. Antepartum Hemorrhage (APH): APH emerged as a strong determinant (AOR = 2.95), mirroring global data linking hemorrhage to perinatal loss via acute fetal distress and hypoxia.²¹ Delayed recognition and referral remain critical factors; this emphasizes the need for community-based surveillance and rapid transport systems.

7. Gestational Age and Birth Weight: Lower gestational age and low birth weight were protective in our model, though not statistically significant, suggesting improved neonatal care for preterm infants in tertiary centers. Nonetheless, consistent with Lawn et al. (2021), stillbirth and neonatal mortality decline sharply above 37 weeks and 2.5 kg birth weight.¹⁰

Public Health and Clinical Implications

These results highlight the dual challenge of ANC coverage and content quality. Strengthening primary care networks, ensuring early booking (≤12 weeks), and providing iron–

folate supplementation, tetanus immunization, and blood-pressure monitoring could substantially reduce risk. Tertiary hospitals like PUMHS must also enhance data-driven audit systems for stillbirths, implement risk-based ANC tracking, and integrate WHO's digital maternal health tools to improve continuity of care.^{16,22}

Limitations and Future Research

This study's cross-sectional design limits causal inference, and as a single-centre hospital study, its findings may not generalize to all settings. Nonetheless, it provides critical institutional evidence from Sindh. Future studies should employ multicentre longitudinal designs with standardized ANC quality metrics, include socioeconomic and nutritional variables, and assess the impact of WHO's

eight-contact ANC model implementation on perinatal mortality.

CONCLUSION

In summary, inadequate and delayed ANC, maternal anemia, and antepartum hemorrhage remain major contributors to perinatal mortality at PUMHS. Early registration, consistent follow-up, and adherence to evidence-based ANC protocols can markedly improve perinatal outcomes. Integrating ANC quality audits and maternal-fetal surveillance at all levels of care should be prioritized to achieve Pakistan's 2030 stillbirth reduction targets.^{10,16,22}

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