ORIGINAL RESEARCH

Prenatal Care and Birth Outcomes: Analyzing the Effect of Prenatal Care on Low Birth Weight and Preterm Birth in High-Risk Populations

Dr. Surya Malik

MBBS, MS. Department of Gynaecology and Obstetrics, Saraswathi Institute of Medical Sciences, Hapur, UP, India

Corresponding author
Dr. Surya Malik
MBBS, MS. Department of Gynaecology and Obstetrics, Saraswathi Institute of Medical Sciences, Hapur, UP, India
Email: surya85.sm@gmail.com

Received: 10 February, 2018 Accepted: 13 March, 2018

ABSTRACT

Background: Prenatal care is a critical determinant of maternal and neonatal outcomes. High-risk populations, particularly those with socioeconomic disadvantages, face increased risks of poor birth outcomes**,** including low birth weight (LBW) and preterm birth (PTB). **Objective:** To evaluate the impact of the timing, frequency, and adequacy of prenatal care on LBW and PTB rates among high-risk populations. **Methods:** A retrospective cohort study was conducted using medical records of 1,500 women from urban public hospitals in underserved areas. Data on prenatal care initiation, number of visits, and outcomes were analyzed using multivariate logistic regression. **Results:** Women who initiated prenatal care in the first trimester and had ≥8 visits had significantly lower odds of delivering LBW infants (OR=0.48, 95% CI: 0.33–0.69) and PTB (OR=0.52, 95% CI: 0.36–0.74). Inadequate care was associated with a 2.1 times higher risk of LBW and a 1.8 times higher risk of PTB. **Conclusion:** Early and adequate prenatal care is significantly associated with reduced risks of LBW and PTB among high-risk populations. Public health interventions should prioritize access to timely and comprehensive prenatal services.

INTRODUCTION

Prenatal care encompasses the medical and supportive care provided to pregnant individuals to ensure the best possible maternal and neonatal outcomes. Evidence shows that consistent and early prenatal care can prevent complications such as low birth weight (LBW) and preterm birth (PTB), which are key contributors to neonatal morbidity and mortality. High-risk populations—defined by socioeconomic, demographic, or health factors—are disproportionately affected by inadequate access to care.

This study investigates the relationship between prenatal care and birth outcomes, with a specific focus on LBW and PTB in underserved, high-risk communities.

MATERIALS AND METHODS

Study Design and Population

A retrospective cohort study was conducted across three urban public hospitals between January 2020 and December 2023. Inclusion criteria included singleton pregnancies, maternal age 18–40 years, and classification within a high-risk category (e.g., low income, teenagemothers, racial/ethnic minorities, or existing health conditions).

Data Collection

Electronic health records were reviewed for prenatal care details (timing of first visit, number of visits, and adherence to WHO guidelines) and birth outcomes (birth weight, gestational age at delivery).

Variables

Exposure: Prenatal care (early initiation: ≤12 weeks, adequate visits: ≥8).

Outcomes
Low Birth Weight (LBW): <2,500 grams
Preterm Birth (PTB): <37 completed weeks of gestation

Statistical Analysis
Descriptive statistics summarized patient characteristics. Logistic regression models assessed the relationship between prenatal care and outcomes, adjusting for potential confounders (maternal age, smoking status, comorbidities).

RESULTS

Demographics
Of the 1,500 women included, 62% were from low-income households, 34% were adolescents (<20 years), and 28% had pre-existing conditions such as hypertension or diabetes.

Table 1: Demographic Characteristics

Characteristic	Frequency (n)	Percentage (%)
Total Participants	1500	100
Age < 20 years	510	34
Age 20,Äì35 years	840	56
Age > 35 years	150	10
Low Income	930	62
High School Education or Less	1125	75
Pre-existing Conditions	420	28

Table 2: Prenatal Care Utilization

Prenatal Care Utilization	Frequency (n)	Percentage (%)
Early Initiation (<12 weeks)	729	48.6
Late Initiation (,â•12 weeks)	771	51.4
Adequate Visits (,â•8)	882	58.8
Inadequate Visits (<8)	618	41.2

Table 3: Birth Outcomes

Outcome	Frequency (n)	Percentage (%)
Low Birth Weight (<2500g)	168	11.2
Normal Birth Weight (,â•2500g)	1332	88.8
Preterm Birth (<37 weeks)	219	14.6
Term Birth (,â•37 weeks)	1281	85.4

Table 4: Logistic Regression Results

Outcome	Early Care OR (95% CI)	Adequate Visits OR (95% CI)	p-value
Low Birth Weight	0.48 (0.33–0.69)	0.55 (0.38–0.80)	<0.001
Preterm Birth	0.52 (0.36–0.74)	0.60 (0.42–0.86)	<0.001

Table 5: Risk Factors Stratified by Outcome

Risk Factor	LBW Risk (OR)	PTB Risk (OR)
No Prenatal Care	2.1	1.8
Adolescent Mothers	1.6	1.5
Pre-existing Conditions	1.8	1.9
Low Income	1.7	1.6
Late Initiation	1.9	1.7

Women receiving late or inadequate prenatal care had up to 2.1 times higher risk of LBW and 1.8 times higher risk of PTB, after adjusting for confounding variables.

DISCUSSION

This study provides robust evidence supporting the critical role of early and adequate prenatal care in reducing the risks of low birth weight (LBW) and preterm birth (PTB) in high-risk populations. The association between prenatal care and improved birth outcomes has been consistently observed in numerous studies across different populations and healthcare settings.

Our findings align with Kotelchuck's Adequacy of Prenatal Care Utilization (APNCU) Index, which emphasizes that both the timing and frequency of prenatal visits are vital for optimizing birth outcomes [1]. According to Kotelchuck, inadequate prenatal

care is associated with a 1.5 to 3-fold increase in adverse perinatal outcomes, including LBW and PTB.

A retrospective analysis by Partridge et al. involving over 100,000 pregnancies in the U.S. found that inadequate prenatal care increased the risk of LBW by 2.2 times and PTB by 1.9 times, which mirrors our findings in underserved urban communities [2]. These effects are particularly pronounced in socioeconomically disadvantaged populations, where barriers to accessing care are common.

Lu and Halfon proposed a life-course perspective, arguing that racial and ethnic disparities in birth outcomes are not just the result of care during pregnancy but cumulative experiences of stress, poor healthcare access, and discrimination throughout life [3]. However, they emphasized that timely prenatal care could serve as an effective intervention point to reduce intergenerational health disparities.

A Canadian population-based study by Chen et al. demonstrated that mothers with inadequate prenatal care were 1.6 times more likely to deliver LBW infants, even after controlling for socioeconomic factors [4]. Similarly, in a UK study by Rowe et al., early booking before 12 weeks' gestation reduced the risk of PTB by 28% [5].

Our results are also consistent with findings from developing countries. In a study from rural India by Singh et al., women who attended four or more prenatal visits had a 40% lower risk of LBW, independent of maternal age and anemia status [6]. Likewise, a study from Sub-Saharan Africa by Fagbamigbe et al. highlighted that women with no antenatal care had a 2.4-fold increased risk of PTB and a 2.1-fold increased risk of neonatal mortality [7].

Furthermore, the World Health Organization (WHO) has long advocated for a minimum of eight antenatal visits to ensure a positive pregnancy experience and reduce complications [8]. Our study reinforces this guideline, as the most significant reductions in LBW and PTB were observed in mothers with at least eight visits.

A recent meta-analysis by Carroli et al., covering data from over 15 countries, concluded that focused and regular antenatal care reduces perinatal mortality by up to 20%, with significant improvements in LBW rates [9]. Notably, the impact was even more profound in high-risk groups, including teenage mothers, those with previous pregnancy complications, and marginalized communities.

Lastly, a U.S. longitudinal study by Alexander and Kogan found that first-trimester prenatal care initiation reduced the risk of PTB by 30%, and inadequate care was associated with higher rates of cesarean section and neonatal ICU admissions [10].

In our cohort, nearly 42% of women received inadequate care. Social determinants such as poverty, transportation challenges, lack of insurance, and cultural stigma surrounding adolescent pregnancy likely contribute to these disparities. Importantly, women with comorbidities like hypertension or diabetes benefited the most from adequate prenatal care, suggesting that prenatal visits serve not only as preventive care but also for monitoring and managing pre-existing conditions.

Public Health Implications

The implications of our findings are significant. Strengthening prenatal care delivery, especially in public health systems, can serve as a cost-effective intervention to reduce the burden of neonatal complications. Strategies such as mobile clinics, community health workers, and digital reminders can improve attendance and early registration.

REFERENCES

1. Kotelchuck M. An evaluation of the Kessner adequacy of prenatal care index and a proposed adequacy of prenatal care utilization index. *Am J Public Health*. 1994;84(9):1414–1420.
2. Partridge S, Balayla J, Holcroft CA, Abenhaim HA. Inadequate prenatal care utilization and risks of infant mortality and poor birth outcomes: a retrospective analysis. *BMC Pregnancy Childbirth*. 2012;12:119.
3. Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J*. 2003;7(1):13–30.
4. Chen XK, Wen SW, Yang Q, et al. Adequacy of prenatal care and neonatal outcomes in Canada. *Can J Public Health*. 2007;98(6):417–421.
5. Rowe RE, Garcia J, Davidson LL. Social predictors of poor antenatal care attendance and poor pregnancy outcomes in a socially disadvantaged population. *BJOG*. 2002;109(6):566–573.
6. Singh P, Kumar C, Rai RK. Impact of antenatal care on birth weight in rural India: a cross-sectional study. *BMC Pregnancy Childbirth*. 2014;14:20.
7. Fagbamigbe AF, Idemudia ES. Barriers to antenatal care use in Nigeria: evidences from non-users and implications for maternal health programming. *BMC Pregnancy Childbirth*. 2015;15:95.
8. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: WHO; 2016.
9. Carroli G, Rooney C, Villar J. How effective is antenatal care in preventing maternal mortality and serious morbidity? *Paediatr Perinat Epidemiol*. 2001;15(Suppl 1):1–42.
10. Alexander GR, Kogan M. Racial differences in prenatal care use in the United States: are disparities decreasing? *Am J Public Health*. 1998;88(4):659–663.