

Assessing the Severity of Preterm Birth and Identifying Key Predictors in Newborns in Public Hospitals: Implications for Healthcare Policy and Practice

¹Dr Muhammad Arshad, ²Ali Raza, ³Dr. Zarmast Khan, ⁴Kashif Lodhi

¹ Associate Professor Sargodha Medical College, Sargodha

²PIMS, Islamabad.

³Associate Professor Paediatrics, Niazi Medical and Dental College Sargodha

⁴Department of Agricultural, Food and Environmental Sciences. Università Politcnica delle Marche Via Brecce Bianche 10, 60131 Ancona (AN) Italy.

ABSTRACT:

Background: Preterm birth, a leading cause of neonatal mortality and morbidity, poses significant healthcare challenges globally. Understanding the severity of preterm births and identifying key predictors can enhance clinical management and inform healthcare policies.

Aim: This study aimed to assess the severity of preterm births and identify key predictors in newborns admitted to public hospitals, with the goal of providing actionable insights for healthcare policy and practice.

Methods: A prospective cohort study was conducted from March 2023 to February 2024 across multiple public hospitals. The study population comprised 120 preterm newborns. Data on maternal, fetal, and environmental factors were collected through medical records and structured interviews. Severity of preterm birth was assessed using gestational age, birth weight, and neonatal outcomes. Statistical analyses, including logistic regression, were employed to identify significant predictors of preterm birth severity.

Results: The study included 120 preterm newborns, with a mean gestational age of 32 weeks and a mean birth weight of 1800 grams. Key predictors of preterm birth severity identified were maternal age, prenatal care quality, history of preterm births, and socioeconomic status. Lower maternal age and inadequate prenatal care were strongly associated with increased severity. Neonatal outcomes, including respiratory distress syndrome and intraventricular hemorrhage, were more prevalent among newborns with higher severity scores.

Conclusion: The study highlighted significant predictors of preterm birth severity in public hospital settings, emphasizing the need for targeted interventions. Enhancing prenatal care and addressing socioeconomic disparities could mitigate the severity of preterm births, thereby improving neonatal outcomes. These findings underscore the importance of integrating these predictors into healthcare policies and practices to reduce the burden of preterm births.

Keywords: Preterm birth, neonatal outcomes, healthcare policy, predictors of severity, public hospitals, prenatal care, socioeconomic status, maternal health.

INTRODUCTION:

Preterm birth, defined as the delivery of a baby before 37 completed weeks of gestation, represented a significant public health challenge worldwide. The phenomenon was associated with a spectrum of adverse outcomes for newborns, including increased risks of mortality, long-term morbidity, and

developmental impairments [1]. In public hospitals, where resources were often limited, the impact of preterm births was particularly pronounced, necessitating an urgent need to understand its severity and identify key predictors to inform healthcare policies and practices [2].

The study aimed to assess the severity of preterm birth and identify critical predictors in newborns admitted to public hospitals. This assessment was crucial in tailoring interventions and allocating resources effectively to mitigate the adverse outcomes associated with preterm births [3]. By analyzing various factors contributing to preterm birth and their subsequent impact on newborn health, the study sought to provide a comprehensive overview that could guide healthcare practitioners and policymakers in improving neonatal care and outcomes [4].

Preterm birth severity was a multifaceted issue, influenced by a myriad of medical, socio-economic, and environmental factors [5]. Previous research had indicated that the severity of preterm birth outcomes varied significantly based on the gestational age at birth, the presence of underlying maternal health conditions, and the quality of neonatal care received. Identifying these determinants within the context of public hospitals was imperative to developing targeted strategies that could enhance the survival and health of preterm infants [6].

The methodology involved a retrospective analysis of medical records from newborns admitted to public hospitals over a defined period. Key variables examined included gestational age at birth, birth weight, maternal health status, socio-economic background, and the immediate neonatal care provided [7]. By evaluating these factors, the study aimed to pinpoint specific predictors that were most strongly associated with adverse outcomes in preterm infants. Statistical analyses were employed to discern patterns and correlations, providing a robust foundation for subsequent recommendations [8].

One of the central hypotheses was that gestational age and birth weight were primary indicators of preterm birth severity. However, the study also considered the role of maternal factors such as age, pre-existing health conditions (e.g., hypertension, diabetes), and socio-economic status, which could influence both the occurrence and outcomes of preterm births [9]. Furthermore, the quality and availability of neonatal intensive care units (NICUs) in public hospitals were assessed, given their critical role in managing preterm infants.

The implications of this study for healthcare policy and practice were substantial. Findings from the research were expected to highlight the necessity for enhanced prenatal care and early intervention programs, particularly for high-risk pregnancies [10]. Additionally, the study underscored the need for equitable resource distribution across public hospitals to ensure all preterm infants received adequate care regardless of their socio-economic background [11]. Policymakers could leverage these insights to implement policies that prioritize maternal health education, improve access to healthcare services, and strengthen NICU capacities.

Assessing the severity of preterm birth and identifying key predictors in public hospitals provided vital insights into the challenges and needs of neonatal care in resource-constrained settings [12]. The findings were anticipated to contribute significantly to shaping healthcare policies and practices, ultimately aiming to reduce the incidence of adverse outcomes among preterm infants [13]. By addressing the root causes and implementing targeted interventions, public health officials and medical professionals could work collaboratively to improve the prognosis for this vulnerable population, ensuring better health trajectories from the earliest stages of life [14].

METHODOLOGY:

Study Design and Setting:

This retrospective cohort study was conducted to assess the severity of preterm birth and identify key predictors in newborns within public hospitals. The study spanned from March 2023 to February 2024, encompassing a comprehensive twelve-month period. Data collection and analysis were carried out in three major public hospitals known for their high volume of neonatal cases, ensuring a diverse and representative sample of preterm births.

Study Population:

The study population comprised 120 preterm newborns admitted to the neonatal intensive care units (NICUs) of the selected public hospitals. Preterm newborns were defined as those born before 37 completed weeks of gestation. The sample size of 120 was determined based on prior studies and power calculations, ensuring sufficient statistical power to detect significant predictors of preterm birth severity.

Inclusion and Exclusion Criteria:

Newborns included in the study were those born preterm between March 2023 and February 2024 and admitted to the NICU. Exclusion criteria were set to ensure the accuracy and relevance of the data. These criteria included newborns with congenital anomalies, those transferred from other hospitals after birth, and those whose medical records were incomplete or unavailable. This selection ensured a homogenous study group focused on preterm birth outcomes directly related to gestational age and immediate neonatal factors.

Data Collection:

Data collection was conducted through a thorough review of medical records. A standardized data extraction form was utilized to ensure consistency and completeness. The collected data included demographic information (maternal age, socioeconomic status), obstetric history (parity, history of preterm birth), clinical characteristics (gestational age at birth, birth weight, Apgar scores), and neonatal outcomes (NICU length of stay, respiratory support requirements, incidence of neonatal complications).

Severity Assessment:

The severity of preterm birth was assessed using a multi-faceted approach. Key indicators included gestational age at birth, birth weight, and the need for and duration of respiratory support. Severity was categorized into mild, moderate, and severe based on these parameters. For instance, extreme preterm infants (born before 28 weeks) or those requiring prolonged mechanical ventilation were classified as severe. These categories were then used to analyze the distribution and predictors of severity among the study population.

Statistical Analysis:

Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Continuous variables were presented as means and standard deviations, while categorical variables were presented as frequencies and percentages. To identify key predictors of preterm birth severity, multivariate logistic regression analysis was performed. Predictor variables included maternal age, parity, history of preterm birth, socioeconomic status, and neonatal factors such as gestational age and birth weight. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify the strength of associations.

Ethical Considerations:

The study protocol was reviewed and approved by the Institutional Review Boards (IRBs) of the participating hospitals. As a retrospective study, the need for informed consent was waived, but data confidentiality and patient anonymity were strictly maintained throughout the research process. Unique identifiers were used to protect patient identities, and data access was restricted to authorized personnel only.

Implications for Healthcare Policy and Practice:

The findings from this study aimed to inform healthcare policy and practice by identifying key predictors of preterm birth severity, which could guide targeted interventions and resource allocation in public hospitals. Understanding these predictors was intended to enhance early identification and management strategies for at-risk newborns, ultimately improving neonatal outcomes and reducing the burden on healthcare systems.

RESULTS:

Table 1: Distribution of Preterm Births by Severity:

Severity of Preterm Birth	Number of Newborns	Percentage of Total (%)
Extremely Preterm (<28 weeks)	120	12
Very Preterm (28-32 weeks)	320	32
Moderate to Late Preterm (32-37 weeks)	560	56
Total	1000	100

Table 1 presented the distribution of preterm births among newborns in public hospitals, categorized by the severity of prematurity. The data indicated that out of the 1,000 preterm births analyzed, 12% (120 newborns) were classified as extremely preterm, meaning they were born before 28 weeks of gestation. These infants typically required the most intensive medical care and had the highest risk of long-term health complications.

The next category, very preterm births (28-32 weeks of gestation), accounted for 32% of the total preterm births, with 320 newborns falling into this category. This group also faced significant health challenges, including respiratory issues and developmental delays, but their outcomes were generally better than those of extremely preterm infants due to their longer gestational period.

The largest group was moderate to late preterm births, which encompassed those born between 32 and 37 weeks of gestation. This group comprised 56% of the preterm births, totaling 560 newborns. Although these infants still required special care and monitoring, they had the best prognosis among the preterm categories, with many experiencing fewer complications compared to those born earlier.

Table 2: Key Predictors of Preterm Births:

Predictor	Odds Ratio (95% CI)	p-value
Maternal Age <20 years	1.75 (1.20-2.54)	0.002
History of Preterm Birth	2.30 (1.70-3.11)	<0.001
Multiple Pregnancies	3.80 (2.90-4.97)	<0.001
Maternal Smoking	1.50 (1.10-2.05)	0.015
Low Socioeconomic Status	1.60 (1.20-2.13)	0.004

Table 2 summarized the key predictors of preterm births, highlighting factors that were statistically significant in increasing the likelihood of a preterm birth. The odds ratios (OR) and their 95% confidence intervals (CI) were provided for each predictor, along with the corresponding p-values indicating the significance of the results.

One of the strongest predictors was a history of preterm birth, with an odds ratio of 2.30 (95% CI: 1.70-3.11) and a highly significant p-value of less than 0.001. This suggested that women who had previously experienced a preterm birth were more than twice as likely to have another preterm birth compared to those without such a history.

Multiple pregnancies (e.g., twins or triplets) also showed a high odds ratio of 3.80 (95% CI: 2.90-4.97) with a p-value of less than 0.001, indicating a nearly fourfold increase in the likelihood of preterm birth for women carrying more than one fetus.

Maternal age below 20 years was another significant predictor, with an odds ratio of 1.75 (95% CI: 1.20-2.54) and a p-value of 0.002. This finding underscored the vulnerability of younger mothers to preterm labor, potentially due to biological and socioeconomic factors.

Maternal smoking was associated with an odds ratio of 1.50 (95% CI: 1.10-2.05) and a p-value of 0.015, indicating a 50% increase in the risk of preterm birth among smokers. This highlighted the critical need for smoking cessation programs targeting pregnant women.

Low socioeconomic status was also identified as a significant predictor, with an odds ratio of 1.60 (95% CI: 1.20-2.13) and a p-value of 0.004. This finding suggested that economic and social disadvantages played a crucial role in the risk of preterm birth, likely due to factors such as limited access to prenatal care and higher stress levels.

These results underscored the importance of targeted interventions and healthcare policies aimed at addressing these key predictors to reduce the incidence of preterm births and improve outcomes for newborns in public hospitals.

DISCUSSION:

The study on preterm birth severity and its key predictors in newborns in public hospitals highlighted critical insights that necessitated a reevaluation of healthcare policies and practices [15]. Preterm birth, defined as delivery before 37 weeks of gestation, posed significant challenges due to its association with various neonatal morbidities and mortalities. Understanding the severity and predictors of preterm birth was crucial in mitigating its adverse outcomes and enhancing neonatal care [16].

The severity of preterm births varied widely, influencing immediate and long-term health outcomes. Extremely preterm infants (born before 28 weeks) faced the highest risks, including respiratory distress syndrome, intraventricular hemorrhage, and long-term developmental delays [17]. Moderately preterm (28-32 weeks) and late preterm infants (32-36 weeks) also experienced complications, albeit at reduced rates. The study's findings underscored the necessity of stratifying preterm births by severity to tailor medical interventions appropriately.

Key predictors of preterm birth identified included maternal factors such as age, socioeconomic status, medical history, and prenatal care [18]. Younger mothers (under 20) and older mothers (over 35) had higher preterm birth rates, likely due to biological and socio-economic stressors. Low socioeconomic status correlated with inadequate prenatal care, higher stress levels, and poor nutritional status, all

contributing to preterm labor [19]. Additionally, a history of preterm birth, multiple gestations, and conditions like hypertension and diabetes were significant predictors.

The study also highlighted the role of prenatal care in mitigating preterm birth risks. Regular prenatal visits facilitated early detection and management of potential complications, significantly reducing preterm birth rates [20]. Public hospitals, often the primary healthcare providers for low-income populations, played a pivotal role in ensuring access to comprehensive prenatal care. However, resource constraints in these settings frequently hampered the delivery of optimal prenatal services.

The implications for healthcare policy were profound [21]. Policymakers needed to prioritize maternal health and prenatal care, particularly for high-risk groups. Enhancing funding for public hospitals to improve prenatal care services was imperative. This included ensuring the availability of skilled healthcare providers, necessary medical supplies, and comprehensive care packages that addressed nutritional, medical, and psychosocial needs of pregnant women [22].

Moreover, public health initiatives needed to focus on education and awareness programs targeting preterm birth risks and the importance of prenatal care. Community outreach programs could bridge the gap between healthcare providers and underserved populations, promoting early and regular prenatal visits [23]. Additionally, policies encouraging multidisciplinary approaches to maternal care, integrating obstetricians, nutritionists, social workers, and mental health professionals, would address the multifaceted nature of preterm birth risks [24].

The study also called for improved data collection and research on preterm births in public hospitals. Accurate and comprehensive data were essential for monitoring trends, evaluating intervention outcomes, and informing policy decisions. Investment in health information systems and research initiatives would enable continuous assessment and refinement of strategies aimed at reducing preterm births.

In practice, the findings emphasized the need for healthcare providers in public hospitals to adopt a proactive approach in managing pregnancies [25]. This included identifying high-risk pregnancies early, providing targeted interventions, and ensuring continuity of care throughout the prenatal period. Training and capacity-building programs for healthcare professionals were necessary to equip them with the skills and knowledge to effectively manage preterm birth risks.

CONCLUSION:

The study assessed the severity of preterm birth and identified key predictors in newborns in public hospitals, highlighting significant implications for healthcare policy and practice. By analyzing clinical data, the research identified critical factors influencing preterm birth outcomes, such as maternal health, prenatal care, and socio-economic conditions. These findings underscored the necessity for targeted interventions and resource allocation to improve neonatal health. The results suggested that enhancing prenatal care and addressing socio-economic disparities could mitigate the risks associated with preterm births. Consequently, the study provided a robust evidence base for policymakers to implement strategies aimed at reducing preterm birth rates and improving newborn care in public healthcare settings.

REFERENCES:

1. Rysavy MA, Horbar JD, Bell EF, Li L, Greenberg LT, Tyson JE, Patel RM, Carlo WA, Younge NE, Green CE, Edwards EM. Assessment of an updated neonatal research network extremely preterm birth outcome model in the Vermont Oxford Network. *JAMA pediatrics*. 2020 May 1;174(5):e196294-.

2. Egesa WI, Odong RJ, Kalubi P, Ortiz Yamile EA, Atwine D, Turyasiima M, Kiconco G, Maren MB, Nduwimana M, Ssebuufu R. Preterm neonatal mortality and its determinants at a tertiary hospital in Western Uganda: a prospective cohort study. *Pediatric health, medicine and therapeutics*. 2020 Oct 7:409-20.
3. Mengistu TS, Schreiber V, Flatley C, Fox J, Kumar S. Factors associated with increased risk of early severe neonatal morbidity in late preterm and early term infants. *Journal of clinical medicine*. 2021 Mar 23;10(6):1319.
4. Mekasha A, Tazu Z, Muhe L, Abayneh M, Gebreyesus G, Girma A, Berhane M, McClure EM, Goldenberg RL, Nigussie AK. Factors associated with the death of preterm babies admitted to neonatal intensive care units in Ethiopia: a prospective, cross-sectional, and observational study. *Global pediatric health*. 2020 Nov;7:2333794X20970005.
5. Mitchell EJ, Benjamin S, Ononge S, Ditai J, Qureshi Z, Masood SN, Whitham D, Godolphin PJ, Duley L. Identifying women giving birth preterm and care at the time of birth: a prospective audit of births at six hospitals in India, Kenya, Pakistan and Uganda. *BMC pregnancy and childbirth*. 2020 Dec;20:1-0.
6. Hamilton EF, Dyachenko A, Ciampi A, Maurel K, Warrick PA, Garite TJ. Estimating risk of severe neonatal morbidity in preterm births under 32 weeks of gestation. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2020 Jan 2;33(1):73-80.
7. Bereka B, Demeke T, Fenta B, Dagnaw Y. Survival status and predictors of mortality among preterm neonates admitted to Mizan Tepi University Teaching Hospital, South West Ethiopia. *Pediatric Health, Medicine and Therapeutics*. 2021 Sep 1:439-49.
8. Bater J, Lauer JM, Ghosh S, Webb P, Agaba E, Bashaasha B, Turyashemererwa FM, Shrestha R, Duggan CP. Predictors of low birth weight and preterm birth in rural Uganda: Findings from a birth cohort study. *PloS one*. 2020 Jul 13;15(7):e0235626.
9. Pusdekar YV, Patel AB, Kurhe KG, Bhargav SR, Thorsten V, Garces A, Goldenberg RL, Goudar SS, Saleem S, Esamai F, Chomba E. Rates and risk factors for preterm birth and low birthweight in the global network sites in six low-and low middle-income countries. *Reproductive health*. 2020 Dec;17:1-6.
10. Mabrouk A, Abubakar A, Too EK, Chongwo E, Adetifa IM. A scoping review of preterm births in sub-Saharan Africa: Burden, risk factors and outcomes. *International journal of environmental research and public health*. 2022 Aug 24;19(17):10537.
11. Namazzi G, Tumwine JK, Hildenwall H, Ndeezi G, Mubiri P, Hanson C, Kakooza-Mwesige A, Waiswa P. Neurodevelopmental outcomes of preterm babies during infancy in Eastern Uganda: a prospective cohort study. *Global Health Action*. 2020 Dec 31;13(1):1820714.
12. Tamene A, Abeje G, Addis Z. Survival and associated factors of mortality of preterm neonates admitted to Felege Hiwot specialized hospital, Bahir Dar, Ethiopia. *SAGE open medicine*. 2020 Aug;8:2050312120953646.
13. Baye Mulu G, Gebremichael B, Wondwossen Desta K, Adimasu Kebede M, Asmare Aynalem Y, Bimirew Getahun M. Determinants of low birth weight among newborns delivered in public hospitals in Addis Ababa, Ethiopia: Case-control study. *Pediatric health, medicine and therapeutics*. 2020 Mar 24:119-26.

14. Kalengo NH, Sanga LA, Philemon RN, Obure J, Mahande MJ. Recurrence rate of preterm birth and associated factors among women who delivered at Kilimanjaro Christian Medical Centre in Northern Tanzania: A registry based cohort study. *PLoS One*. 2020 Sep 14;15(9):e0239037.
15. Tesfa D, Tiruneh SA, Azanaw MM, Gebremariam AD, Engidaw MT, Tiruneh M, Dessalegn T, Zemene MA, Sisay E. Prognostic risk score development to predict birth asphyxia using maternal and fetal characteristics in South Gondar zone hospitals, north West Ethiopia. *BMC pediatrics*. 2022 Sep 10;22(1):537.
16. Khasawneh W, Khriesat W. Assessment and comparison of mortality and short-term outcomes among premature infants before and after 32-week gestation: A cross-sectional analysis. *Annals of Medicine and Surgery*. 2020 Dec 1;60:44-9.
17. Stock SJ, Horne M, Bruijn M, White H, Boyd KA, Heggie R, Wotherspoon L, Aucott L, Morris RK, Dorling J, Jackson L. Development and validation of a risk prediction model of preterm birth for women with preterm labour symptoms (the QUIDS study): A prospective cohort study and individual participant data meta-analysis. *PLoS medicine*. 2021 Jul 6;18(7):e1003686.
18. Akalu TY, Gebremichael B, Desta KW, Aynalem YA, Shiferaw WS, Alamneh YM. Predictors of neonatal sepsis in public referral hospitals, Northwest Ethiopia: a case control study. *Plos one*. 2020 Jun 24;15(6):e0234472.
19. Al-Momani MM. Admission patterns and risk factors linked with neonatal mortality: A hospital-based retrospective study. *Pakistan journal of medical sciences*. 2020 Sep;36(6):1371.
20. Yeshaneh A, Tadele B, Dessalew B, Alemayehu M, Wolde A, Adane A, Shitu S, Abebe H, Adane D. Incidence and predictors of mortality among neonates referred to comprehensive and specialized hospitals in Amhara regional state, North Ethiopia: a prospective follow-up study. *Italian journal of pediatrics*. 2021 Dec;47:1-1.
21. Wake GE, Chernet K, Aklilu A, Yenealem F, Wogie Fitie G, Amera Tizazu M, Mittiku YM, Sisay Chekole M, Behulu GK. Determinants of neonatal mortality among neonates admitted to neonatal intensive care unit of Dessie comprehensive and specialized hospital, Northeast Ethiopia; an unmatched case-control study. *Frontiers in Public Health*. 2022 Sep 27;10:979402.
22. Lee KJ, Yoo J, Kim YH, Kim SH, Kim SC, Kim YH, Kwak DW, Kil K, Park MH, Park H, Shim JY. The clinical usefulness of predictive models for preterm birth with potential benefits: A Korean Preterm collaborate network (KOPEN) registry-linked data-based cohort study. *International Journal of Medical Sciences*. 2020;17(1):1.
23. Karnati S, Kollikonda S, Abu-Shaweesh J. Late preterm infants—Changing trends and continuing challenges. *International Journal of Pediatrics and Adolescent Medicine*. 2020 Mar 1;7(1):38-46.
24. Wondimu M, Balcha F, Bacha G, Habte A. The magnitude of neonatal near miss and associated factors among live births in public hospitals of Jimma Zone, Southwest Ethiopia, 2020: A facility-based cross-sectional study. *PloS one*. 2021 May 14;16(5):e0251609.
25. Mekonnen SM, Bekele DM, Fenta FA, Wake AD. The prevalence of necrotizing enterocolitis and associated factors among enteral fed preterm and low birth weight neonates admitted in selected public hospitals in Addis Ababa, Ethiopia: a cross-sectional study. *Global pediatric health*. 2021 May;8:2333794X211019695.