

Integrating Neonatology and Public Health Strategies to Reduce Preventable Neonatal Morbidity in Developing Countries

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Abstract: Background: Preventable neonatal morbidity remains a major public health challenge in developing countries, contributing significantly to infant mortality and long-term health complications. Many neonatal conditions, including low birth weight, infections, and birth asphyxia, are largely preventable through integrated clinical and public health interventions. **Objective:** To evaluate the effectiveness of combining clinical neonatology care with public health strategies in reducing neonatal morbidity. **Methods:** A descriptive cross-sectional study was conducted over twelve months in selected tertiary care hospitals and community health settings. Data were collected from neonates and their mothers using structured questionnaires, clinical assessments, and health record reviews. Risk factors for neonatal morbidity, healthcare accessibility, and implementation of public health strategies were analyzed. **Results:** Among 300 neonates assessed, 38% experienced at least one preventable morbidity. Low birth weight (28%), neonatal infections (22%), and birth asphyxia (15%) were the most common conditions. Implementation gaps were observed in maternal education, immunization coverage, and timely access to skilled neonatal care. Integration of clinical neonatology interventions with community-based public health measures, including maternal education programs, nutritional support, and early screening, was associated with a reduction in preventable morbidities. **Conclusion:** A coordinated approach that combines specialized neonatal care with public health strategies can significantly reduce preventable neonatal morbidity in developing countries. Strengthening healthcare systems, improving accessibility, and promoting community awareness are essential to achieving better neonatal outcomes and advancing maternal and child health goals.

Keywords: Neonatal morbidity, public health, Neonatology, Preventive strategies, Developing countries.

INTRODUCTION

Preventable neonatal morbidity remains a significant public health concern in developing countries, contributing substantially to infant mortality and long-term disability worldwide. Neonates are particularly vulnerable to conditions such as low birth weight, birth asphyxia, and infections due to their immature immune responses and physiological fragility, which place them at an increased risk of adverse outcomes in the early neonatal period [1, 2].

The burden of neonatal morbidity is disproportionately higher in low- and middle-income countries, where access to skilled healthcare, adequate maternal education, and resources for neonatal care are often limited [3]. Contributing factors include insufficient maternal health awareness, inadequate antenatal care, poor hygiene practices, and delayed recognition of neonatal complications. Furthermore, systemic challenges such as overcrowded health facilities, shortages of trained personnel, and weak referral systems magnify the risk of preventable neonatal conditions in resource-limited settings [4, 5].

Addressing preventable neonatal morbidity requires a coordinated strategy that integrates clinical neonatology with broader public health interventions. Early detection of high-risk neonates, timely clinical management, community-based health education, nutritional support, and immunization programs have all been shown to improve neonatal outcomes when implemented in a coordinated manner [6, 7]. Combining hospital-based care with community and population-level interventions enhances the overall effectiveness of neonatal health programs and supports sustainable reductions in morbidity and mortality [8].

This study aims to assess the prevalence of preventable neonatal morbidity and associated risk factors while highlighting the importance of integrating neonatology and public health approaches to strengthen neonatal care systems in developing countries.

Materials and Methods

Study Design and Setting:

A descriptive cross-sectional study was conducted over a 12-month period from first July 2024 to June 2025 in selected tertiary care hospitals and affiliated community health centers. The study aimed to assess the prevalence of preventable neonatal morbidity, identify associated clinical and maternal risk factors, and evaluate the integration of public health interventions with clinical neonatal care [1,2]. Hospitals were chosen based on their Neonatal Intensive Care Units (NICUs), which admit high-risk neonates for specialized care, while community health centers were selected to evaluate outreach programs such as maternal education, immunization, and nutritional support [3].

Study Population and Sampling:

The study population included all neonates aged 0–28 days admitted to the NICU or evaluated in community health centers during the study period. Neonates with major congenital anomalies incompatible with life were excluded. A continuous enrollment strategy was used to include all eligible neonates, minimizing selection bias and ensuring comprehensive coverage of the study population [4,5].

Inclusion Criteria:

- Neonates aged 0–28 days.
- Neonates with at least one clinical sign suggestive of preventable morbidity (e.g., low birth weight, birth asphyxia, neonatal infections).
- Neonates whose mothers/caregivers provided informed consent.

Exclusion Criteria:

- Neonates with major congenital anomalies incompatible with life.
- Neonates whose clinical data were incomplete or missing.

Data Collection:

Data were collected using a structured predesigned proforma, adapted from validated neonatal and maternal health surveys [6,7]. The proforma captured:

- **Demographic information:** age, sex, birth weight, gestational age, and mode of delivery.
- **Maternal and clinical data:** antenatal care visits, maternal education, hygiene practices, feeding patterns, and neonatal clinical assessment (low birth weight, birth asphyxia, infections).
- **Public health interventions:** maternal education programs, immunization coverage, nutritional support, and early neonatal screening initiatives.

Clinical assessments were performed by trained pediatricians and neonatal nurses, and community-based data were collected through interviews with mothers/caregivers and review of health records [8].

Data Management and Analysis:

All collected data were entered into SPSS version 26 for analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics, prevalence of neonatal morbidities, and coverage of public health interventions. Chi-square tests and logistic regression analysis were performed to examine associations between risk factors, public health interventions, and neonatal outcomes. Statistical significance was set at $p < 0.05$ [9].

Ethical Considerations:

The study protocol was approved by the Institutional Ethical Review Board. Written informed consent was obtained from all participating mothers or caregivers. Confidentiality of patient information was strictly

maintained, and the study adhered to the Declaration of Helsinki guidelines for biomedical research [10]

RESULTS

Study Population

A total of **300 neonates** were enrolled during the study period. Among these, 52% were male and 48% were female. The mean gestational age was 37.8 ± 2.1 weeks, and the mean birth weight was 2.7 ± 0.6 kg. Most deliveries were spontaneous vaginal deliveries (62%), while 38% were cesarean sections. These demographic characteristics are consistent with previous studies in developing countries [1,2].

Prevalence of Preventable Neonatal Morbidities

Out of the 300 neonates, 114 (38%) experienced at least one preventable morbidity. The most common conditions observed were low birth weight, neonatal infections, and birth asphyxia.

Table 1: Prevalence of Preventable Neonatal Morbidities

Neonatal Morbidity	Frequency (n)	Percentage (%)
Low birth weight (<2.5 kg)	84	28%
Neonatal infections	66	22%
Birth asphyxia	45	15%
Hypothermia	21	7%
Jaundice requiring treatment	18	6%

Low birth weight and infections remain the leading causes of preventable neonatal morbidity, aligning with findings from similar low-resource settings [3,4].

Associated Risk Factors

Several maternal and clinical factors were significantly associated with neonatal morbidity. Logistic regression analysis identified inadequate antenatal care, maternal malnutrition, preterm birth, home delivery, and lack of maternal education as key contributors.

Table 2: Risk Factors Associated with Preventable Neonatal Morbidity

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Inadequate antenatal care (<4 visits)	2.8	1.7 – 4.6	<0.001
Maternal malnutrition	2.3	1.4 – 3.8	0.002
Preterm birth (<37 weeks)	3.1	1.8 – 5.2	<0.001
Home delivery	1.9	1.1 – 3.3	0.021
Lack of maternal education	1.8	1.1 – 3.0	0.015

These results highlight the importance of maternal health, antenatal care, and skilled delivery services in reducing preventable neonatal morbidity [5,6].

Coverage and Effectiveness of Public Health Interventions

The study evaluated the reach and impact of public health strategies aimed at reducing neonatal morbidity. Coverage rates and effectiveness (measured as the proportion of neonates avoiding morbidity) are shown below:

Table 3: Coverage and Effectiveness of Public Health Interventions

Intervention	Coverage (%)	Effectiveness (%)
Maternal education programs	65%	72%
Neonatal immunization	78%	80%
Nutritional support (maternal/neonatal)	54%	61%
Early neonatal screening	47%	55%

Integration of clinical neonatal care with community-level interventions, such as maternal education and early screening, significantly improved neonatal outcomes, consistent with prior studies in developing countries [7,8].

Summary

- 38% of neonates experienced at least one preventable morbidity.
- Low birth weight, neonatal infections, and birth asphyxia were the most common conditions.

- Maternal and clinical factors, including inadequate antenatal care, maternal malnutrition, preterm birth, and lack of maternal education, were significant risk factors.
- Integration of clinical and public health interventions was associated with improved neonatal outcomes.

DISCUSSION

Preventable neonatal morbidity remains a major public health challenge in developing countries [1,2]. The 38% prevalence of neonatal morbidity observed in this study, with low birth weight, infections, and birth asphyxia as the leading causes, is consistent with prior studies [3,4].

Maternal and clinical factors—including inadequate antenatal care, maternal malnutrition, preterm birth, home delivery, and lack of maternal education—were significant predictors of neonatal morbidity, underscoring the importance of maternal health and care-seeking behaviors [5,6].

Public health interventions were associated with improved outcomes. Maternal education, immunization, nutritional support, and early screening contributed to reduced morbidity, supporting evidence that integrated clinical and community-based approaches enhance neonatal survival [7,8].

Limitations

1. Cross-sectional design limits causal inference [9].
2. Single-region focus may affect generalizability [10].
3. Self-reported maternal data could introduce recall bias [11].
4. Resource constraints limited complete documentation of some interventions [7].

CONCLUSION

Preventable neonatal morbidity is a significant public health issue in developing countries. Low birth weight, infections, and birth asphyxia were the most common morbidities, and maternal health factors strongly influenced neonatal outcomes.

Integration of clinical neonatal care with public health strategies—including maternal education, immunization, nutritional support, and early screening—was associated with reductions in preventable neonatal morbidity. Strengthening healthcare systems, expanding outreach, and increasing maternal awareness are crucial for improving neonatal health outcomes in resource-limited settings.

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