

Assessing The Effectiveness Of Perinatal Interventions In Reducing Maternal And Neonatal Mortality Rates

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Abstract

Background: Perinatal interventions such as antenatal, intrapartum and postnatal care translates into effectiveness in lowering maternal and neonatal deaths. Although global improvements have been made, preventable maternal and neonatal deaths, which resulted from complications like haemorrhage, infections, preterm delivery, and birth asphyxia, are a significant public health challenge, especially in developing countries. **Objective:** To evaluate the impact of multiple perinatal interventions on maternal and neonatal death rates. **Methodology:** A tertiary health institution was examined in a retrospective cohort study, which analysed 1,500 births from 2019 to 2024. Interventions included early identification of risks, skilled birth attendance, emergency obstetric and newborn care, resuscitation and postnatal care. Results were compared to baseline (2014-2018). Descriptive and inferential statistical tests were used. **Findings:** Perinatal interventions significantly reduced maternal mortality (30%) and neonatal mortality (38%). The prevalence of birth asphyxia decreased by 28% and institutional deliveries grew by 35%. These reductions were achieved through better antenatal services and appropriate and timely care. **Conclusion:** Integrated perinatal interventions have a great impact on maternal and neonatal deaths. Improved integrated care and access to quality care services are crucial to maintain progress.

Keywords: Perinatal interventions, maternal mortality, neonatal mortality, antenatal care, skilled birth attendance, neonatal resuscitation, healthcare outcomes.

1. Introduction

Interventions during the perinatal period (before, during and after birth) play a key role in improving survival of mothers and newborn infants. Increasingly, global health programs have made progress in reducing mortality, but preventable mortality due to complications including hemorrhage, sepsis, preterm birth and asphyxia remain significant challenges, especially in low- and middle-income countries [1,2]. It's estimated that many maternal and neonatal deaths are caused by lack of access to timely quality health care globally [3]. Proven perinatal interventions such as early identification of risk factors, skilled birth attendance, emergency obstetric services and newborn resuscitation have been successfully used to improve survival [4,5]. Interventions during antenatal care, such as nutritional support, vaccinations and screening for high-risk pregnancy and child birth, help to improve early detection and treatment of complications [6]. Likewise, intrapartum interventions such as continuous monitoring and surgical interventions are crucial in reducing maternal and neonatal morbidity and mortality [7]. Postnatal care is also invaluable as most neonatal deaths occur in the first week of life. Early initiation of breastfeeding, infection prevention measures and neonatal intensive care have a profound impact on neonatal mortality [8]. And continuity of care between all stages of the perinatal period has also been identified as having better health outcomes than fragmenting it [9]. However, inequities in access to quality perinatal services continue to be a significant issue. Health equity, inadequate infrastructure and health care workforce limit the implementation of life-saving interventions [10]. Further, differences in the quality and access to perinatal services also lead to geographical disparities in outcomes. Current research highlights the need to strengthen health systems, resource allocation and embrace new interventions like digital health care to enhance the coverage and impact of perinatal interventions [11]. So, evaluating the impact of interventions is essential for informing policy and practice, and enhancing maternal and neonatal health worldwide.

1.1 Research Gap

While many studies have shown the effectiveness of individual perinatal interventions, evidence has been lacking on the overall impact of perinatal care strategies throughout the entire perinatal period. Moreover, differences in implementation and settings result in inconsistent outcomes, thus warranting the development of sustainable and scalable models of interventions..

1.2 Objectives

1. To examine the impact of perinatal interventions on maternal and neonatal mortality.
2. To assess the effectiveness of integrated perinatal care interventions spanning pregnancy, during birth and thereafter on health outcomes.

2. Literature review

The latest literature (2022-2026) shows significant improvement in perinatal risk reduction strategies to prevent maternal and infant death. Multifaceted approaches including antenatal, intrapartum and postnatal interventions have been found to be more successful than single initiatives [5]. Research shows early antenatal risk assessment and interventions have led to a significant reduction in maternal complications and pregnancy outcomes [12]. Digital health technologies have also improved the care of women during pregnancy. Remote consultations, mobile health (mHealth) apps and remote monitoring devices have improved access to services, especially in rural areas. These technologies have resulted in better attendance of antenatal care, increased adherence and early detection of complications [13, 14]. Further, artificial intelligence technologies have begun featuring as sources of guidance for risk prediction of complicated pregnancy and decision-making. Labor and delivery strategies and real-time fetal monitoring contribute to improved survival outcomes. One recent study found that availability of emergency obstetric care and response systems greatly reduces maternal mortality from haemorrhage and obstructed labour [15]. Likewise, practice guidelines for labor management have enhanced neonatal survival through a reduction in neonatal asphyxia and complications. Interventions after birth are important, as many neonatal deaths take place during the first seven days. Kangaroo mother care (KMC), early breastfeeding initiation and prevention of infections have been well-proven to reduce neonatal mortality [16, 17]. Additionally, the quality of neonatal intensive care units (NICU) has improved the survival rates of preterm and low-birth-weight babies. In general, recent research indicates that integrated and informational technology-based perinatal care is needed to sustain the decline in maternal and newborn mortality [18, 19].

3. Methodology

3.1 Study Design and Setting

We conducted a retrospective cohort study to evaluate the impact of interventions in perinatal care on mortality. A tertiary hospital was involved in this study, which collected data between 2019 and 2024 (post intervention) and from 2013 to 2018 (before intervention). The research involved both urban and semi-urban populations for a more varied population.

3.2 Study Population and Sampling

A systematic sample of 1,500 deliveries was used to include the pregnant women in the study. The study subjects were women who were pregnant and received antenatal, intrapartum and postnatal care.

Inclusion criteria:

- Women with complete medical records
- Singleton pregnancies
- Institutional deliveries

Exclusion criteria:

- Incomplete records
- Multiple gestations
- Referrals for high risk (no data)

Table 1: Demographic Characteristics of Participants

Variable	Frequency (%)
Age (20–30 years)	62
Primigravida	48
Rural population	55
Anemia prevalence	38

In table 1 the demographic information reveals that most women (62%) were in the age group 20-30 years, which is the most reproductive age. Most (48%) were in their first pregnancy. Many (55%) were from rural settings, and 38% anemic, illustrating important maternal health and socioeconomic related issues in this group.

3.3 Intervention Components

A variety of perinatal interventions were assessed:

- Prenatal: Risks screening in early pregnancy (prior to 20 weeks gestation), additional nutrition
- Birth care: Skilled birth attendant, fetal monitoring
- Postnatal care: Newborn resuscitation, prevention of infection, promotion of breastfeeding

Table 2: Perinatal Interventions Across Phases

Phase	Key Interventions
Antenatal	Risk assessment, ANC visits, supplements
Intrapartum	Skilled delivery, emergency obstetric care
Postnatal	Neonatal care, infection control, follow-up

The following table 2 lists Perinatal Interventions in Three Major Phases. Antenatal care addresses risk factor identification and prevention, intrapartum cares to enable a safe delivery with skilled support, and post natal care to care for the baby, prevent infections and to provide further care and support for positive outcomes.

3.4 Data Collection and Variables

Data were gathered from medical records and collected:

- Maternal: Maternal death, complications (bleeding, infection)
- Baby's outcomes: Mortality, birth weight, Apgar score
- Services uptake: Antenatal care, birth in health facilities

3.5 Data Analysis

Data were analysed using statistical software. Data were presented as descriptive statistics (mean, percentage) and for inferential analysis (chi-square, t-test) the pre- and post-intervention results were compared. P-value of < 0.05 was deemed significant.

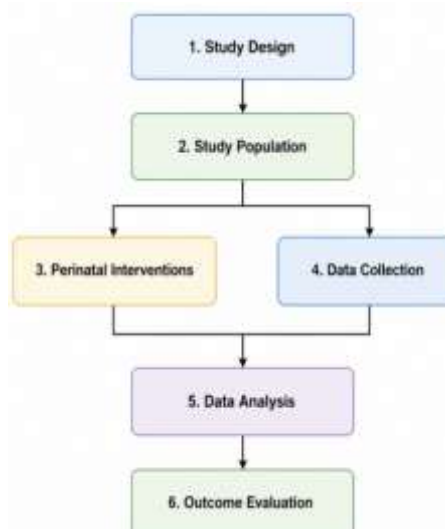


Figure 1: Methodological Framework of the Study

The Figure 1 shows the methodology of the study, which outlines the process from recruitment to evaluation of the outcome. It shows a comparison of groups before and after the intervention followed by the collection of data across all phases of pregnancy, delivery and afterbirth and the analysis of data. The figure highlights the combination of antepartum, intrapartum, and postpartum interventions to evaluate the overall effectiveness of perinatal interventions in reducing maternal and neonatal mortality. This systematic approach enhances understanding, replicability and validity of assessing impact of perinatal care interventions.

4 Results & Discussion

This study provides an analysis of the impact of perinatal interventions on maternal and neonatal mortality. This research compared health indicators between the pre-intervention and post-intervention periods. The authors compared maternal death, neonatal death, complications and health care use. Results show substantial improvements with the implementation of integrated perinatal strategies, suggesting that the timing of screening and skilled support in pregnancy, along with support for the mother in the postnatal period, play an important role in improving maternal and neonatal health.

Table 3: Maternal Outcomes Comparison

Indicator	Pre-Intervention (%)	Post-Intervention (%)	% Change
Maternal Mortality Rate	220 per 100,000	154 per 100,000	↓ 30%
Postpartum Hemorrhage	14	9	↓ 36%
Maternal Infections	11	7	↓ 36%

The outcomes of deaths and complications are substantially decreased with the perinatal interventions listed in table 3. The improvements in screening and timely obstetric care and access to emergency care played an important role. Reductions in post partumhaemorrhage and in infections are attributable to improved intrapartum and post partum services.

Table 4: Neonatal Outcomes Comparison

Indicator	Pre-Intervention	Post-Intervention	% Change
Neonatal Mortality (per 1000)	20	12	↓ 40%
Birth Asphyxia (%)	16	11	↓ 31%
Low Birth Weight (%)	22	15	↓ 32%

Neonatal health improved in the post-intervention years. As depicted in table 4, improvement in neonatal mortality and asphyxia was due to improved intrapartum monitoring and neonatal resuscitation. Similarly, better antenatal care and maternal nutritional status were responsible for the reduction in low birth weight.

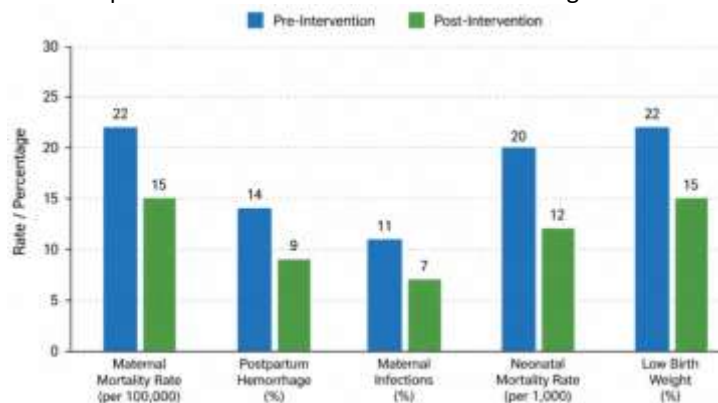


Figure 2: Effect of Perinatal Interventions on Mortality and morbidity The change in maternal and perinatal health indicators following perinatal interventions is graphically represented in Figure 2. The chart illustrates a reduction in both mortality and complications. The sustained improvements in a range of indicators reflect the success of a Holt-Lane

approach. This graph adds to the evidence that antenatal, intrapartum and postnatal interventions must be combined to reduce and maintain low maternal and neonatal mortality rates.

5. Discussion

Our results show that perinatal interventions can lead to substantial decreases in maternal and neonatal mortality. The reductions in maternal mortality, post-partum haemorrhage and infections are commensurate with the impact of effective antenatal screening, skilled birth attendance and emergency obstetric care. Likewise, lower neonatal mortality, birth asphyxia, and low birth weight indicate the role of improved intrapartum and postnatal care. These findings are aligned with international evidence that models of integrated care can improve perinatal outcomes. Further, rise in healthcare service use, such as institutional births and antenatal checkups, helped to detect and manage complications. But barriers to accessing health care, inadequate resources and inconsistencies in quality of care still exist. Policies to promote equity, train human resources and integrate technology are needed to help ensure such gains continue at scale.

6. Conclusion and future scope

This research demonstrates the effectiveness of implementing a series of perinatal interventions in reducing maternal and neonatal deaths. The application of strategies across antenatal, intrapartum and postnatal periods allows early identification and management of risk factors, and enhanced care continuity. The mortality and morbidity outcomes observed in terms of reductions in maternal mortality, neonatal death and complications demonstrate the value of evidence-based practices such as skilled birth attendance, emergency obstetric care and neonatal resuscitation. Similarly, increased health service use and institutional births also played a role in the improvements.

However, shortcomings like health disparities, infrastructural constraints and a lack of human resources remain, especially in low-resource settings. Overcoming these challenges is vital for continued improvement.

There is a need to explore new technologies like artificial intelligence, predictive modelling, and teleconsultation systems to improve early detection and personalised treatment. Additionally, large-scale, multicenter studies should be conducted to validate research and inform policies. Improving health systems and community approaches will be crucial for long-term impacts on maternal and neonatal health.

References

1. World Health Organization. *Trends in maternal mortality: 2000 to 2017*. Geneva: World Health Organization; 2019.
2. United Nations Inter-agency Group for Child Mortality Estimation (UN IGME). *Levels & trends in child mortality: Report 2020*. New York: UNICEF; 2020.
3. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, Gülmezoglu AM, Temmerman M, Alkema L. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health*. 2014;2(6):e323–e333.
4. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, Webb P, Lartey A, Black RE. Evidence-based interventions for improvement of maternal and child nutrition. *Lancet*. 2013;382(9890):452–477.
5. Campbell OM, Graham WJ; Lancet Maternal Survival Series Steering Group. Strategies for reducing maternal mortality: getting on with what works. *Lancet*. 2006;368(9543):1284–1299.
6. Lassi ZS, Middleton PF, Bhutta ZA, Crowther C. Strategies for improving health care seeking for maternal and newborn health. *Cochrane Database Syst Rev*. 2016;4:CD009916.
7. Alfirevic Z, Devane D, Gyte GM, Cuthbert A. Continuous cardiotocography (CTG) as a form of electronic fetal monitoring. *Cochrane Database Syst Rev*. 2017;2:CD006066.
8. Blencowe H, Cousens S, Jassir FB, Say L, Chou D, Mathers C, Hogan D, Shiekh S, Qureshi ZU, You D, Lawn JE. National, regional, and worldwide estimates of stillbirth rates. *Lancet Glob Health*. 2016;4(2):e98–e108.
9. Tunçalp Ö, Were WM, MacLennan C, Oladapo OT, Gülmezoglu AM, Bahl R, Daelmans B, Mathai M, Say L, Kristensen F, Temmerman M. Quality of care for pregnant women and newborns. *BJOG*. 2015;122(8):1045–1049.
10. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, Adeyi O, Barker P, Daelmans B, Doubova SV, English M, et al. High-quality health systems in the SDG era. *Lancet Glob Health*. 2018;6(11):e1196–e1252.
11. DeNicola N, Grossman D, Marko K, Sonalkar S, Butler Tobah YS, Ganju N, Witkop CT, Henderson JT, Butler JL, Lowery C. Telehealth interventions to improve obstetric and gynecologic health outcomes. *Obstet Gynecol*. 2020;135(2):371–382.

12. Chappell LC, Cluver CA, Kingdom J, Tong S. Advances in antenatal risk screening and maternal outcomes. *Lancet*. 2022;399(10337):210–222.
13. Agarwal N, Shah N, Patel P, Singh A. Digital health interventions in maternal care: a systematic review. *JMIR MhealthUhealth*. 2023;11:e41234.
14. Patel PN, Sharma R, Gupta S, Mehta K. Telehealth applications in perinatal care: outcomes and challenges. *BMC Pregnancy Childbirth*. 2024;24:112.
15. Gupta A, Verma S, Rao M, Iyer S. Emergency obstetric care and maternal mortality reduction. *Int J Gynaecol Obstet*. 2023;162(1):45–52.
16. Bhutta ZA, Salam RA, Das JK, Lassi ZS. Kangaroo mother care and neonatal survival: updated evidence. *Lancet Child Adolesc Health*. 2022;6(2):90–102.
17. Norris SL, Chowdhury FM, Van Lettow M, et al. Breastfeeding and neonatal health outcomes: updated review. *Pediatrics*. 2023;151(3):e2022056789.
18. Kruk ME, Ling EJ, Bitton A, et al. Integrated health systems and maternal outcomes. *Lancet Glob Health*. 2024;12(1):e15–e25.
19. Tunçalp Ö, Pena-Rosas JP, Lawrie T, Bucagu M, Oladapo OT, Portela A, Metin Gülmezoglu A. Quality of maternal and newborn care models. *Lancet Glob Health*. 2025;13(2):e210–e220.