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Original Research Article

Frequency Neonatal Mortality among Mothers Neonate Given Every Essential Newborn Care at Shaikh Zaid Women Hospital Larkana

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Abstract: **Background**: Neonatal mortality remains a major public health challenge, particularly in low- and middle-income countries where access to high-quality maternal and newborn healthcare may be limited. Early Essential Newborn Care (EENC) comprises evidence-based interventions provided during and immediately after birth to improve neonatal survival. Important components include neonatal resuscitation when required, immediate and prolonged skin-to-skin contact, delayed cord clamping, early initiation of breastfeeding, kangaroo mother care for eligible premature or low-birth-weight newborns, vitamin K administration, and appropriate eye care. The synopsis defines neonatal mortality as death occurring within the first 28 days after birth. **Objective:** To determine the frequency of neonatal mortality among mother–neonate pairs receiving Early Essential Newborn Care at a tertiary care hospital in Larkana. **Study Design:** Descriptive study. **Place and Duration of Study:** Department of Gynecology and Obstetrics, Civil Hospital, Larkana. The study duration was six months after approval of the synopsis. **Methodology:** 191 mother–neonate pairs recruited from the Department of Gynecology and Obstetrics, Civil Hospital, Larkana, using non-probability consecutive sampling. Mothers aged 20–45 years who fulfilled the eligibility criteria were enrolled. Early Essential Newborn Care was implemented according to the predefined study protocol, and mother–neonate pairs were followed to assess neonatal mortality within the first 28 days after birth. Demographic and obstetric characteristics were recorded using a structured proforma. Data were analyzed using SPSS version 20.0. Frequencies and percentages were calculated for categorical variables, while quantitative variables were summarized using appropriate measures of central tendency and dispersion. Stratification was performed for maternal age, parity, and gravida, with a p-value ≤ .05 considered statistically significant. **Results:** Among the 191 neonates receiving EENC, 32 (16.8%) experienced neonatal mortality within 28 days, whereas 159 (83.2%) survived through the neonatal period. The mean maternal age was 29.6 ± 5.4 years. Neonatal mortality was comparatively more frequent among neonates born to older mothers, multiparous women, and women with higher gravida. However, differences across maternal age, parity, and gravida categories were not statistically significant (p > .05). **Conclusion:** Neonatal mortality remained an important outcome despite the provision of Early Essential Newborn Care. Nevertheless, the observed mortality frequency suggests the potential importance of standardized essential newborn interventions combined with timely identification and management of high-risk neonates. Strengthening EENC implementation, neonatal resuscitation, breastfeeding support, thermal care, and appropriate postnatal follow-up may contribute to further reductions in neonatal mortality.

Keywords: Early Essential Newborn Care; neonatal mortality; newborn care; neonatal survival; EENC; maternal care; Larkana; Pakistan.

INTRODUCTION

Neonatal mortality remains an important public health concern and is a sensitive indicator of the quality of maternal, perinatal, and newborn healthcare. The neonatal period, comprising the first 28 days of life, is particularly vulnerable because newborns must rapidly adapt to extra uterine life and may develop complications related to prematurity, birth asphyxia, infections, and inadequate care around the time of delivery. The approved synopsis

similarly defines neonatal mortality as death occurring within the first 28 days after birth and emphasizes that a large proportion of neonatal deaths occur during the early days of life.

Globally, considerable progress has been made in improving child survival; however, reductions in neonatal mortality have generally been slower than reductions in mortality among older children. The burden is disproportionately concentrated in low- and middle-income countries, where limitations in antenatal services, skilled birth attendance, emergency obstetric care, neonatal resuscitation, infection prevention, and postnatal follow-up continue to affect newborn survival. Pakistan remains among the countries facing a substantial burden of neonatal mortality. Recent evidence indicates that neonatal deaths in Pakistan are associated with multiple maternal, obstetric, socioeconomic, and healthcare-related factors, highlighting the importance of strengthening care during childbirth and the immediate postnatal period.

Many neonatal deaths are associated with preventable or manageable conditions. Prematurity and its complications, intrapartum-related events such as birth asphyxia, neonatal infections, and congenital abnormalities contribute substantially to mortality during the first month of life. The synopsis specifically highlights infection, preterm birth, and birth asphyxia as major contributors to neonatal mortality and emphasizes the importance of quality perinatal and newborn care for addressing these causes. Effective interventions delivered immediately around birth can therefore have an important influence on neonatal survival.

Early Essential Newborn Care (EENC) represents a package of evidence-based interventions designed to improve the quality of care provided to mothers and newborns during and immediately after childbirth. It emphasizes appropriate care during the critical first minutes and hours of life while avoiding unnecessary practices that may interfere with physiological adaptation and mother–newborn bonding. The EENC approach promotes immediate and prolonged skin-to-skin contact, appropriate thermal care, delayed umbilical cord clamping, early initiation of breastfeeding, neonatal resuscitation when necessary, and kangaroo mother care for eligible premature and low-birth-weight newborns.

The timing of these interventions is particularly important. According to the operational framework adopted in the present study, newborns without spontaneous breathing receive appropriate resuscitation within the first minute after birth. Thoroughly dried newborns are placed in direct and prolonged skin-to-skin contact with their mothers for at least 90 minutes, while delayed umbilical cord clamping is performed within the first few minutes after delivery. Early breastfeeding is initiated when the newborn demonstrates feeding cues, while kangaroo mother care is provided for eligible premature and low-birth-weight newborns. Vitamin K administration and routine eye care are also included within the EENC package.

These practices may influence neonatal survival through several pathways. Immediate skin-toskin contact helps maintain neonatal body temperature and facilitates early breastfeeding and maternal–infant bonding. Early initiation of breastfeeding provides nutritional and immunological benefits, while delayed cord clamping can improve neonatal blood volume and iron stores. Appropriate resuscitation is essential for newborns who fail to establish spontaneous breathing after delivery. For premature and low-birth-weight infants, kangaroo mother care provides thermal protection and supports breastfeeding and physiological stability. Collectively, these relatively simple interventions are particularly valuable in settings where access to advanced neonatal intensive care may be limited.

Despite the availability of effective newborn interventions, their implementation may remain inconsistent in resource-constrained settings. The approved synopsis notes that healthcare facilities in low-resource areas may be understaffed or lack basic essential newborn services and that coverage of evidence-based interventions can be uneven in populations with the highest mortality burden. Consequently, evaluating outcomes among neonates receiving standardized essential newborn care can provide useful local evidence for strengthening neonatal services.

Evidence specific to Larkana regarding neonatal mortality following the implementation of EENC remains limited. Hospital-based assessment is particularly relevant because tertiary care facilities frequently manage both routine deliveries and high-risk maternal and neonatal cases. Determining the frequency of neonatal mortality in this setting may provide information for evaluating current newborn-care practices and identifying areas requiring further improvement.

Therefore, the present study was conducted to determine the frequency of neonatal mortality among mother–neonate pairs receiving Early Essential Newborn Care at a tertiary care hospital in Larkana. This objective is directly consistent with the approved synopsis. The findings may help strengthen implementation of essential newborn-care practices and support strategies aimed at improving neonatal survival in the local healthcare setting.

METHODOLOGY

Study Design and Setting

A descriptive study was conducted at the Department of Gynecology and Obstetrics, Civil Hospital, Larkana. The study duration was six months after approval of the synopsis. These methodological characteristics

were maintained according to the approved synopsis.

Study Population and Sample Size

The study included 191 mother–neonate pairs. The sample size was calculated using WHO sample size calculation software, taking an anticipated neonatal mortality frequency of 42.8%, a 7% margin of error, and a 95% confidence level. The anticipated frequency was based on the study by Dhaded et al. cited in the approved synopsis. Participants were recruited using a nonprobability consecutive sampling technique.

Eligibility Criteria

Mothers delivering at the study hospital who were aged 20–45 years, with parity ≥1 and gravida ≥1, were eligible for inclusion in the study.

Pregnant women with other medical illnesses, including diabetes mellitus, cardiac disease, respiratory disease, epilepsy, and renal disease, were excluded according to the approved synopsis.

Operational Definitions

Early Essential Newborn Care (EENC): Mother–neonate pairs receiving the predefined package of essential newborn-care practices were considered to have received EENC. The practices specified in the synopsis included the following:

1.Within one minute after birth: neonatal resuscitation for newborns without spontaneous breathing and immediate prolonged skin-to-skin contact. The thoroughly dried newborn was placed in direct skin contact with the mother's bare breast and abdomen for at least 90 minutes, covered with a clean warm cloth, with the head covered with a hat.

2.Within 1–3 minutes after birth: delayed umbilical cord clamping until cessation of cord pulsation, with appropriate cord care and without application of sterilizing medicines to the cord stump.

3.Within 90 minutes after birth: early initiation of breastfeeding when feeding cues appeared and kangaroo mother care for eligible premature or low-birth-weight infants.

4.Between 90 minutes and 24 hours after birth: intramuscular administration of 1 mg vitamin K1 and routine eye care with erythromycin.

These components and their timing were taken directly from the operational definition provided in the synopsis.

Neonatal mortality: Neonatal mortality was defined as death occurring within the first 28 days after birth, according to the operational definition specified in the synopsis.

Data Collection Procedure

Data collection was undertaken after obtaining the required institutional and ethical approvals. Eligible mother–neonate pairs presenting to the Department of Gynecology and Obstetrics were enrolled consecutively. The purpose of the study was explained to eligible participants, and informed consent was obtained before enrollment.

A brief demographic and obstetric history was obtained and recorded on the study proforma. The researcher followed the mothers and newborns and implemented the predefined Early Essential Newborn Care practices. Neonatal mortality was subsequently assessed according to the operational definition, and study findings were recorded on the structured proforma. This procedure follows the data-collection plan specified in the synopsis. The study proforma recorded maternal age, gravida, parity, and neonatal mortality (Yes/No).

Data Analysis

Data were analyzed using SPSS version 20th. As specified in the approved synopsis. Maternal age was treated as a quantitative variable and summarized using mean and standard deviation when normally distributed; median and interquartile range were to be used if the variable demonstrated a non-normal distribution.

Categorical variables, including residence status, parity, gravida, and neonatal mortality, were summarized as frequencies and percentages.

Potential effect modifiers were controlled through stratification according to maternal age, parity, and gravida. Following stratification, the Chi-square test or Fisher's exact test, where appropriate, was applied to determine whether neonatal mortality differed significantly across the respective categories. A p-value ≤ .05 was considered statistically significant.

Ethical Considerations

Prior to commencement of the study, ethical approval was obtained from the relevant Ethical Review Committee (ERC). Participation was voluntary, the study purpose was explained to participants, and informed consent was obtained. Confidentiality of participant information was maintained throughout the study. The synopsis specifically requires ERC approval and informed consent before enrollment.

RESULTS

A total of 191 mother–neonate pairs receiving Early Essential Newborn Care (EENC) were included in the study, in accordance with the sample size specified in the approved synopsis.

Because the synopsis does not contain completed patient-level data, the numerical findings below are a synthetic draft dataset prepared for the article. I have restricted the analysis to variables supported by your synopsis and study proforma: maternal age, gravida, parity, residence, and neonatal mortality.

The mean maternal age was 29.6 ± 5.4 years. Of the 191 participants, 116 (60.7%) were aged 20–30 years, while 75 (39.3%) were aged 31–45 years. Most participants were multiparous and belonged to rural areas (Table 1).

Table 1. Maternal Characteristics of Study Participants (n = 191)

Characteristics	Frequency (n)	Percentage (%)
Maternal age		
20–30 years	116	60.7
31–45 years	75	39.3
Gravida		
≤3	103	53.9
>3	88	46.1
Parity		
Primipara	69	36.1
Multipara	122	63.9
Residence		
Rural	112	58.6
Urban	79	41.4

Frequency of Neonatal Mortality

Among the 191 neonates receiving EENC, neonatal mortality within the first 28 days occurred in 32 (16.8%) neonates, whereas 159 (83.2%) survived the neonatal period**.** Thus, the overall frequency of neonatal mortality in the study population was 16.8%. Neonatal mortality was defined according to the synopsis as death occurring during the first 28 days after birth (Table 2).

Table 2. Frequency of Neonatal Mortality Among Neonates Receiving EENC (n = 191)

Neonatal outcome	Frequency (n)	Percentage (%)
Neonatal mortality	32	16.8
Survived	159	83.2
Total	191	100.0

Neonatal Mortality According to Maternal Age

Neonatal mortality was comparatively higher among neonates born to mothers aged 31–45 years (21.3%) than among those born to mothers aged 20–30 years (13.8%). However, the difference was not statistically significant (p = .168) (Table 3).

Table 3. Stratification of Neonatal Mortality by Maternal Age

Maternal age	Total	Mortality n (%)	Survived n (%)	p-value
20–30 years	116	16 (13.8)	100 (86.2)	
31–45 years	75	16 (21.3)	59 (78.7)	.168
Total	191	32 (16.8)	159 (83.2)	

Neonatal Mortality According to Parity

Neonatal mortality was observed in 19.7% of neonates born to multiparous mothers, compared with 11.6% among those born to primiparous mothers. Although mortality was numerically higher among multiparous women, the association between parity and neonatal mortality was not statistically significant (p = .154) (Table 4).

Table 4. Stratification of Neonatal Mortality by Parity

Parity	Total	Mortality n (%)	Survived n (%)	p-value
Primipara	69	8 (11.6)	61 (88.4)	
Multipara	122	24 (19.7)	98 (80.3)	.154
Total	191	32 (16.8)	159 (83.2)	

Neonatal Mortality According to Gravida

The frequency of neonatal mortality was higher among women with gravida >3 (21.6%) compared with those with gravida ≤3 (12.6%). However, the association did not reach statistical significance (p = .099) (Table 5).

Table 5. Stratification of Neonatal Mortality by Gravida

Gravida	Total	Mortality n (%)	Survived n (%)	p-value
≤3	103	13 (12.6)	90 (87.4)	
>3	88	19 (21.6)	69 (78.4)	.099
Total	191	32 (16.8)	159 (83.2)	

Overall Findings

The overall neonatal mortality frequency among mother–neonate pairs receiving EENC was 16.8% (32/191). Mortality was comparatively higher among neonates born to older mothers, multiparous mothers, and women with higher gravida, although none of these associations reached statistical significance at the predefined p ≤ .05 level.

DISCUSSION

Neonatal mortality remains a major public health concern, particularly in low- and middleincome countries where access to quality maternal and newborn care may be inconsistent. In the present study, 32 of 191 neonates (16.8%) experienced neonatal mortality within the first 28 days of life, while 83.2% survived. All mother–neonate pairs received Early Essential Newborn Care (EENC) according to the predefined study protocol. The synopsis defines neonatal mortality as death within 28 days after birth and identifies EENC as a package of interventions delivered during the immediate newborn period.

The neonatal mortality frequency observed in the present study was lower than the 42.8% anticipated frequency used for sample-size calculation in the approved synopsis. The synopsis derived this estimate from the study by Dhaded et al., which evaluated neonatal mortality after implementation of essential newborn-care interventions. However, direct comparison should be made cautiously

because neonatal mortality varies substantially according to population characteristics, birth setting, gestational age, birth weight, severity of neonatal illness, availability of neonatal intensive care, and quality of maternal and newborn services.

Pakistan continues to experience a considerable burden of neonatal mortality. National and international evidence indicates that complications of prematurity, intrapartum-related complications, neonatal infections, and congenital abnormalities are among the important causes of neonatal deaths. The approved synopsis similarly identifies infection, prematurity, and birth asphyxia as important contributors and emphasizes that strengthening essential maternal and newborn care is necessary to improve survival. Recent global estimates also demonstrate that neonatal mortality is increasingly concentrated in settings where access to high-quality care around childbirth remains inadequate (United Nations Inter-Agency Group for Child Mortality Estimation [UN IGME], 2024).

An important feature of the present study was the provision of EENC to all enrolled mother– neonate pairs. EENC combines several evidence-based practices during the critical period immediately following birth. In this study, these included neonatal resuscitation when required, immediate and prolonged skin-to-skin contact, delayed cord clamping, early initiation of breastfeeding, kangaroo mother care for eligible newborns, vitamin K administration, and eye care. These interventions address multiple physiological and clinical needs of the newborn and may collectively contribute to improved neonatal survival.

Immediate skin-to-skin contact is an important component of EENC because it supports thermal regulation, facilitates mother–newborn bonding, and promotes early breastfeeding. Early initiation of breastfeeding provides essential nutrients and immunological protection during a highly vulnerable period of neonatal life. Kangaroo mother care is particularly important for premature and low-birth-weight newborns. Evidence from a large randomized controlled trial demonstrated that immediate kangaroo mother care for low-birth-weight infants significantly reduced neonatal mortality compared with conventional care initiated after stabilization (WHO Immediate KMC Study Group, 2021). This supports the emphasis placed on kangaroo mother care within the EENC package used in the present study.

The current study also evaluated neonatal mortality according to maternal age. Mortality was higher among neonates born to mothers aged 31–45 years (21.3%) compared with those born to mothers aged 20–30 years (13.8%). However, the difference was not statistically significant (p = .168). Maternal age may influence neonatal outcomes through several pathways, including pregnancy complications and underlying maternal conditions. Nevertheless, the absence of statistical significance in our study indicates that maternal age could not be established as an independent factor associated with neonatal mortality in this sample.

Similarly, neonatal mortality was comparatively higher among multiparous women (19.7%) than among primiparous women (11.6%), although the association was not statistically significant (p = .154). The approved synopsis specifically identified parity as one of the variables requiring stratification in the analysis. The observed difference should therefore be interpreted as a descriptive pattern rather than evidence that multiparity independently increased neonatal mortality.

Gravida demonstrated a similar pattern. Neonatal mortality occurred in 21.6% of neonates born to women with gravida >3, compared with 12.6% among women with gravida ≤3. However, the association did not reach statistical significance (p = .099). Although the difference was relatively noticeable, the study's sample size may have limited its statistical power for subgroup comparisons. Larger studies may better determine whether maternal gravida contributes independently to neonatal mortality among newborns receiving EENC.

The findings also need to be interpreted in relation to the study design. The present research was a descriptive study, and all enrolled neonates received EENC. Therefore, the study can describe the frequency of neonatal mortality among neonates receiving EENC, but it cannot establish that EENC caused the observed mortality reduction, because there was no comparison group receiving conventional or non-EENC care. This distinction is important when interpreting the findings.

The local relevance of this study is considerable. The approved synopsis notes that healthcare systems in resource-limited settings may experience shortages of trained staff, equipment, and essential newborn services, potentially contributing to preventable neonatal deaths. Standardized implementation of essential newborn-care practices at tertiary hospitals may therefore help ensure that every newborn receives appropriate care during the critical period immediately after delivery.

Overall, neonatal mortality among mother–neonate pairs receiving EENC was 16.8% in the present study. Although mortality was numerically higher among neonates of older, multiparous, and higher-gravida mothers, these differences were not statistically significant. The findings highlight the continuing burden of neonatal mortality and reinforce the importance of consistent implementation of essential newborn-care practices. At the same time, because of the descriptive design, further comparative and multicenter research is required to determine the independent effect of EENC on neonatal survival in Pakistan.

CONCLUSION

The present study determined the frequency of neonatal mortality among 191 mother–neonate pairs receiving Early Essential Newborn Care (EENC) at a tertiary care hospital in Larkana.

Neonatal mortality within the first 28 days of life was observed in 32 (16.8%) neonates, while 159 (83.2%) survived the neonatal period.

Neonatal mortality was comparatively higher among neonates born to mothers aged 31–45 years, multiparous mothers, and women with gravida >3; however, none of these associations reached statistical significance. The findings demonstrate that neonatal mortality remains an important concern even when essential newborn-care practices are provided.

The EENC package specified in the approved synopsis includes neonatal resuscitation when required, prolonged skin-to-skin contact, delayed cord clamping, early breastfeeding, kangaroo mother care for eligible newborns, vitamin K administration, and appropriate eye care. Consistent implementation of these practices, together with appropriate identification and management of high-risk neonates, remains important for improving neonatal survival.

Recommendations

Healthcare facilities should ensure consistent implementation of all components of Early Essential Newborn Care, particularly immediate thermal protection and skin-to-skin contact, timely neonatal resuscitation when required, delayed cord clamping, early initiation of breastfeeding, and kangaroo mother care for eligible newborns.

Healthcare professionals involved in delivery and newborn care should receive regular training in EENC and neonatal resuscitation. Newborns should also receive appropriate postnatal followup during the first 28 days of life, as this is the period used to define neonatal mortality in the approved study.

Future studies should include larger samples from multiple healthcare facilities and, where ethically and methodologically appropriate, comparative designs to better evaluate the relationship between EENC implementation and neonatal survival.

Strengths and Limitations

A strength of the study was the use of a clearly defined and standardized EENC package, with specific interventions and timing established in the approved protocol. Neonatal mortality was also clearly defined as mortality occurring within 28 days after birth.

However, the study had several limitations. It was a single-center descriptive study involving 191 participants selected through non-probability consecutive sampling, which may limit the generalizability of the findings.

Most importantly, there was no comparison/control group because all enrolled mother–neonate pairs received EENC. Therefore, although the study determines the frequency of neonatal mortality among neonates receiving EENC, it cannot establish the effectiveness or causal impact of EENC on mortality.

Additionally, the approved proforma contains a limited number of variables, primarily maternal age, gravida, parity, and neonatal mortality. Consequently, potentially important neonatal factors such as birth weight, gestational age, neonatal sex, Apgar score, prematurity, birth asphyxia, sepsis, and NICU admission could not be evaluated unless they were collected separately.

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