

ASSOCIATION BETWEEN EARLY ESSENTIAL NEWBORN CARE AND NEURODEVELOPMENTAL OUTCOMES

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ABSTRACT

Objective: To determine the association between Early Essential Newborn Care and neurodevelopmental outcomes among newborns.

Study Design: Cross-sectional analytical study.

Place and Duration of Study: Department of Paediatrics/Neonatology, The Children's Hospital and Institute of Child Health Multan during November 2024 to May 2025.

Methodology: A total of 388 newborns were included in the study. The sample size was calculated using the WHO sample size formula. Data were collected using a structured questionnaire and clinical assessment. Early Essential Newborn Care practices including early drying, skin-to-skin contact, delayed cord clamping, early initiation of breastfeeding, and thermal care were recorded. Neurodevelopmental outcomes were assessed using age-appropriate early developmental scale items. Data were analyzed using SPSS version 25.0. Quantitative variables were expressed as mean \pm standard deviation, while qualitative variables were presented as frequency and percentage. Chi-square test was applied to determine the association between Early Essential Newborn Care and neurodevelopmental outcomes.

Results: Newborns receiving EENC had better neurodevelopmental outcomes than those who did not receive complete EENC. Early breastfeeding was significantly related and better skin-to-skin contact, and adequate thermal protection were significantly related to the motor, cognitive, and social developmental responses.

Conclusion: there is a positive association between Early Essential Newborn Care and neurodevelopmental outcomes. Improving practices around newborn care can help improve early child development and decrease future developmental delays.

KEYWORDS: Early Essential Newborn Care, newborn, neurodevelopment, breastfeeding, skin-to-skin contact, developmental outcomes.

INTRODUCTION

Early Essential Newborn Care – a series of simple, but vital care practices immediately after birth to safeguard the newborn and promote healthy development [1]. Immediate drying, skin to skin contact, delayed cord clamping, proper thermal care, clean cord care and initiation of breast feeding within 1 hour of birth are all such practices. The initial hours and days of neonates' life are extremely critical, due to the transition from intrauterine to extrauterine life [2]. Proper attention during this time can minimize complications, avoid infections, keep the body temperature stable and improve survival rates.

Newborn health is still an important public health problem, particularly in developing countries where neonatal morbidity and mortality is still high [3]. Birth asphyxia, hypothermia, infection, delayed breastfeeding and poor postnatal care are among the common easily preventable causes of many of the deaths in babies and many of the complications [4]. Early Essential Newborn Care can help minimize these risks by providing timely and effective care to the baby as soon as after birth [5]. For instance, skin to skin contact helps to keep the newborn warm, promotes bonding between mother and baby and facilitates early initiation of breastfeeding [6]. Colostrum is a nutrient and antibody rich substance that strengthens immunity and aids early growth during breastfeeding [7]. Neurodevelopmental outcomes are associated with the growth and function of the brain and nervous system, such as motor skills, thinking (cognitive), language, social interaction and emotional responses [8]. The neonatal period is crucial to future neurodevelopment as it is a period of rapid neuronal development. The development of the brain can be impaired, and developmental delay can be a possibility by any disturbance like lack of oxygen,

infection, poor nutrition or hypothermia [9]. Hence, any early care that is supportive to the physically and nutritionally well-being of the newborn should also have a positive impact on neurodevelopment .

Early breastfeeding is of special importance for neurodevelopment as breast milk contains nutrients, fatty acids and immune factors that are necessary for brain development. Likewise, late clamping leads to better blood volume and iron stores in babies and this may prevent iron-deficiency anaemia and promote neurological development. Other beneficial effects of skin to skin contact on newborn stability are heart rate, breathing, temperature and mother-infant attachment [10]. These factors can indirectly help the child's development to be better during infancy.

Early Essential Newborn Care (EENC) is a key component of newborn care but is not fully implemented in most health care facilities. Some newborns might not get skin to skin contact immediately, early breastfeeding may be delayed, or thermal care may not be maintained well [11]. The gaps may be because of either the lack of awareness, the workload of staff, traditional practices or inadequate training of healthcare providers [12]. This means that babies can be put at unnecessary risk at a vulnerable time of life.

The importance of studying the association of Early Essential Newborn Care and neurodevelopmental outcomes is that it enables us to better understand if there is an association between appropriate newborn care and optimal developmental progress. The results of these studies can inform health professionals, government policy makers and hospital managers to improve newborn care. It may also help to raise awareness for mothers and families about the significance of early care after birth.

The purpose of this study is to evaluate the relationship between Early Essential Newborn Care and neurodevelopmental outcome of the newborns. The results could potentially lead to better provision of neonatal care services and to better long-term development health in children.

Objective

To test the relationship between Early Essential Newborn Care practices and neurodevelopmental outcomes of newborns, and early breastfeeding, thermal care, skin-to-skin contact and delayed cord clamping on child developmental progress.

METHODOLOGY

A cross-sectional analytical study was carried out in department of paediatrics/neonatology of The Children's Hospital and Institute of Child Health Multan during November 2024 to May 2025. The total sample size was 388 newborns (using the formula for sample size in WHO). Non-probability consecutive sampling was used to select the participants. All newborns born in the hospital with informed consent of the parents were included with exclusion of newborns with major congenital anomalies or those with severe birth complications. Structured proforma was used to gather data. Immediate drying, skin to skin contact, delayed cord clamping, early initiation of breastfeeding, clean cord care and thermal protection were observed. Developmental outcomes were evaluated based on early development scale items that were appropriate to the child's age. SPSS was used to enter and analyse data. Frequency, percentage, mean and standard deviation were computed. Association was determined using a chi-square test with the criteria of p-value ≤ 0.05 .

Inclusion and Exclusion Criteria

Inclusion Criteria

Informed consent was obtained and the infants who were born at the selected hospital during the study period were selected. Male and female newborns with stable clinical condition and complete newborn care records were deemed eligible to participate.

Exclusion Criteria

Newborns with major congenital anomalies, severe birth asphyxia, neurological disorders or critical medical conditions that required intensive care were excluded from the study. Newborns whose parents did not sign the paperwork, or who had missing medical information were also not included.

Data Collection

Ethical approval from the institutional review board and informed consent from parents/guardians of the newborns were obtained and data were collected. Data about demographic characteristics and EENC practices were collected using a structured and pretested questionnaire. Data on immediate drying, skin-to-skin contact, delayed cord clamping, thermal protection, clean cord care, and first hour of breastfeeding were collected via medical records and/or observation as applicable. Neurodevelopmental outcomes were evaluated using developmental measures that were age appropriate and podiatric evaluations. Accurate data collection was performed by trained healthcare workers to obtain a consistent data. The participants' confidentiality was ensured in the study by using coded identification numbers rather than personal information. All collected data were thoroughly examined for completeness and then put in SPSS software for statistical analysis.

RESULTS

There were 388 babies who were newly born enrolled in the research. Most infants who were treated with full EENC showed a better neurodevelopmental outcome than infants treated with incomplete EENC. Breastfeeding practices that occurred early and skin-to-skin contact were significantly correlated with better Motor and cognitive development. Good thermal care and the delay in cord clamping were also correlated with more favourable social and behavioural responses in infants. There was a significant relationship between EENC practices and positive outcomes of neurodevelopment ($p \leq 0.05$) when analyzed statistically. Of course, the developmental delay indicators were higher in the newborns who were not provided with sufficient early care in the follow-up evaluation.

Table 1: Demographic Characteristics of Newborns

Variables	n	%
Male	205	52.8
Female	183	47.2
Term birth	332	85.6
Preterm birth	56	14.4
Normal vaginal delivery	246	63.4
Cesarean section	142	36.6

Thirty eighty-eight newborns had basic characteristics as shown in. The majority of these were male, term babies, delivered by normal vaginal delivery.

Table 2: Early Essential Newborn Care Practices

Practices	Yes n (%)	No n (%)
Immediate drying	356 (91.8)	32 (8.2)
Skin-to-skin contact	298 (76.8)	90 (23.2)
Delayed cord clamping	272 (70.1)	116 (29.9)
Breastfeeding within 1 hour	310 (79.9)	78 (20.1)
Proper thermal care	340 (87.6)	48 (12.4)

The results of Early Essential Newborn Care practices are shown in. Immediate drying and thermal care were provided more often, and delayed cord clamping less often.

Table 3: Neurodevelopmental Outcomes

Outcome	n	%
Normal development	315	81.2
Mild developmental delay	52	13.4
Moderate developmental delay	17	4.4
Severe developmental delay	4	1.0

Neurodevelopmental outcomes are shown in. Most newborns developed normally, and a few developed mild, moderate and severe developmental delay.

Table 4: Association Between EENC and Neurodevelopmental Outcomes

EENC Status	Normal n (%)	Delayed n (%)	p-value
Complete EENC	248 (88.6)	32 (11.4)	0.001
Incomplete EENC	67 (62.0)	41 (38.0)	

The overall association between complete EENC vs. normal neurodevelopmental outcome was significant ($p = 0.001$) (Table 4).

Table 5: Association of Individual EENC Practices with Normal Development

EENC Practice	Normal Development n (%)	p-value
Skin-to-skin contact	258 (86.6)	0.003
Early breastfeeding	267 (86.1)	0.002
Delayed cord clamping	235 (86.4)	0.010
Proper thermal care	289 (85.0)	0.004
Immediate drying	296 (83.1)	0.021

presents the results of regression analysis of significant factors associated with normal development and shows that skin to skin contact, early breastfeeding, delayed cord clamping, thermal care and immediate drying were statistically significant.

DISCUSSION

The current study revealed that Early Essential Newborn Care was positively correlated with good neurodevelopmental outcomes among newborns [13]. Most complete-care babies were developing normally, and developmental delay was more prevalent in incomplete-care babies. This discovery suggests that the first hours after birth are critical in the survival, growth and brain development of newborns.

Hypothermia is a frequent complication in newborns which can be prevented by immediate drying and adequate thermal care. Hypothermia may affect the baby's breathing, feeding, blood-sugar level and overall stability [14]. If the newborn survives to the outside and is warm and stable, the organism can adjust to the outside environment better and this may favor healthy neurological development [15].

There was also a significant association between normal development and skin to skin contact [16]. This helps to establish breastfeeding, regulate temperature, heartbeat and breathing, and strengthens the mother-baby bond. It also helps to decrease newborn stress and emotional security. These benefits can help to promote social and behavioural development in infancy [17].

Early initiation of breastfeeding was also an important factor associated with better neurodevelopmental outcomes. Breast milk provides the brain with essential nutrients, antibodies and fatty acids to help with immunity. The first milk (colostrum) is a powerful defence against infection and can enhance the nutrition of the newborn. Improved early-life nutrition has been shown to be strongly associated with cognitive and motor development [18].

It was also found that delayed clamping of the umbilical cord was also linked to better outcomes. Expands blood volume and enhances iron stores in newborns. Brain development, motor function, cognition and adequate iron are all related [19]. Delayed cord clamping could increase the risk of anaemia in newborns and lead to a negative impact later in development. The results also indicate that low completion of newborn care could be a risk factor for developmental delay. Avoidable problems can arise during birth because there is no skin-to-skin contact, delayed breastfeeding, inadequate thermal care and early cord clamping [20]. Such problems can impact physical stability and can indirectly impact brain development.

Based on this study, the overall conclusion is strengthening of the Early Essential Newborn Care practices in hospitals is important [21]. Healthcare providers need to be educated in standard newborn care procedures as soon as they are born. Educating mothers is also important about early breastfeeding, skin to skin contact and thermal protection. These practices can be beneficial in promoting the health of newborns and decreasing the developmental delay burden when properly implemented [22].

Hence, early essential newborn care needs to be integrated as an integral component of maternal and child health services [23]. Its regular use may help to improve the long-term neurodevelopmental outcomes in addition to neonatal survival.

CONCLUSION

The results of this study indicated that Early Essential Newborn Care has a strong positive correlation with neurodevelopmental outcome of the newborns. Immediate drying, skin to skin contact, delayed cord clamping, early initiation of breastfeeding and appropriate thermal care were associated with better motor, cognitive and social skills development. The infants who were treated fully were less likely to have developmental delays than were the infants who were treated incompletely. Improving the quality of care that is provided to infants in health care facilities will have a positive effect on newborn survival, healthy brain development and future developmental complications. To achieve good implementation, healthcare providers need to be constantly trained, and mothers need to be aware.

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