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MODE OF DELIVERY AFFECTING BREAST-FEEDING PRACTICES IN AN NICU OF A TERTIARY CARE HOSPITAL

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Abstract

OBJECTIVES: *To determine the risk of difficulty in breast-feeding due to mode of delivery and its associated factors in neonates.*

STUDY DESIGN: *Case-control study.*

SETTING/DURATION OF STUDY: *Department of Paediatrics, Combined Military Hospital, Kharian, Jul 2022 to Mar 2023.*

METHODOLOGY: *This study was conducted on 384 mothers and their neonates admitted to the NICU for any indication. Mothers who had a history of breast surgery or irradiation, had a medical contraindication to breastfeeding or neonates who had anatomical facial defects such as cleft lip/palate or those died during admission were excluded. Enrolled participants underwent documentation for maternal, pregnancy, birth and neonatal characteristics while the adequacy of breast-feeding was assessed using the Infant Breast-Feeding Assessment Tool (IBFAT) which was performed at 24-hours of life.*

RESULTS: *Our study showed that premature birth (aOR: 5.9, CI 95% 3.4 – 10.5, p<0.001), birth-weight <2500 g (aOR: 12.1, CI 95% 3.3 – 44.1, p<0.001), maternal body mass index (BMI) >29.9 kg/m^2 (aOR: 3.9, CI 95% 2.0 – 7.6, p<0.001), previous history of inadequate breast-feeding (aOR: 7.4, CI 95% 3.2 – 17.1, p<0.001), and APGAR score of <7 at ten minutes post-birth (aOR: 8.7, CI 95% 2.7 – 27.2, p<0.001) where associated with an increased odds of not being able to provide adequate breast-feed to neonates.*

CONCLUSION: *Factors associated with prematurity are associated with poor breast-feeding in neonates.*

INTRODUCTION

A large proportion of neonates are admitted to neonatal intensive care units (NICUs) within the first hour of life in Pakistan.[1] The World Health Organization (WHO) recommends that breast-feeding be initiated as early as possible, preferably within the first hour of birth.[2] Early breast-feeding is a crucial aspect of newborn care, providing numerous benefits to both the mother and infant.[3] However, breastfeeding practices in the critical-care settings, such as NICUs, can be challenging due to various factors that impact the initiation and continuation of breastfeeding in such specialized intensive care units, some of which include lack of facilities for expression and provision of breast milk, absence of support for maternal presence in NICUs and the use of formula feeding, among others.[4]

Mode of delivery, whether vaginal or caesarean section (C-section), is another factor that can affect breastfeeding practices. C-section deliveries have been postulated to be associated with a delay in lactogenesis and reduced early breast-feeding initiation rates.[5] Additionally, infants born via C-section are more likely to experience complications that may require admission to a NICU, further complicating breastfeeding practices in these critical care unit.[6,7] Moreover, mothers who are delivered via C-section have delayed mobility which may be associated with delays in adequate breast-feeding.[8]

Other factors may also come into play such as the primary indication for admission in the NICU, neonatal gender, previous maternal history of breast feeding and parity.[9,10]

In this study, we aimed to identify the factors that impacted breastfeeding practices in the critical-care setting i.e., NICUs, including the mode of delivery, as well as other maternal and foetal factors. Understanding the impact of these factors on early initiation of breast-feeding in this setting will determine whether they require correction and our findings could inform the development of targeted interventions to promote and support breastfeeding in such seriously ill newborns, particularly for mothers who deliver via C-section. This will help to improve breastfeeding practices for already vulnerable neonates which will help improve health outcomes.

METHODOLOGY

This case-control study was conducted between Jul 2022 and Mar 2023 in the Department of Paediatrics, Combined Military Hospital, Kharian on 384 mothers and their neonates who had just been delivered and admitted in the NICU, after receiving informed, written consent from them for inclusion in the study. The participants were selected via non-probability, consecutive sampling. The WHO sample size calculator was used to calculate the sample size keeping a confidence level (1-α) of 95%, an absolute precision (d) of 0.05, and an anticipated population proportion (P) of 0.514, which was the proportion of neonates who received adequate breast-feeding during admission in the NICU, from Sokou et al.[11]

Inclusion Criteria: All newborns of both genders, and their mothers, who were admitted to the NICU for any indication were included.

Exclusion Criteria: Mothers who had a history of breast surgery, breast irradiation, or who had a medical contraindication to breastfeeding (such as viral infections), or neonates who had anatomical facial defects such as cleft lip/palate or those died during admission were excluded.

Once enrolled in the study, all patients underwent documentation for maternal, pregnancy, birth and neonatal characteristics. Neonates' breast feeding was assessed using the Infant Breast-Feeding Assessment Tool (IBFAT) and a score of 12 was determined to be indicative of adequate breast-feeding.[12] This assessment was performed at 24-hours of life. Patients who had inadequate feeding were considered cases, while those with adequate feeding were grouped into controls. Appropriate skin-to-skin contact was defined as the placement of the dried, naked neonate prone on the mother's bare chest, with a blanket covering, till the completion of first breast-feed.[13]

Data was analyzed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows version 26, IBM Corp; Armonk, USA). Mean/standard deviation or median/interquartile range was calculated for quantitative variables specifically gestational age at birth, birth-weight, current maternal age, parity and body mass index (BMI), APGAR score at birth and ten minutes post-birth. Qualitative variables like gender, mode of delivery, whether the neonate was born pre-term, indication for admission in NICU, whether breast-feeding was adequate or not, whether mother had previously had adequate breast-feeding were recorded in terms of frequency and percentage. Adjusted odds ratios were calculated to determine the odds of various variables with occurrence of adequate breast-feeding, with logistic regression.

RESULTS

Our study sample was composed of 384 mothers and their newborn children who had a mean gestational age at birth of 36.03 ± 2.10 weeks. A total number of 181 (47.1%) neonates were born before the completion of term in our sample. Males formed a slight majority in our study sample: 226 (58.9%). A majority of 273 (71.1%) were delivered per vaginum, while 111 (28.9%) required caesarean sections. The mean weight at birth was 3099.07 ± 422.96 g. The mothers in our study sample had a mean age of 28.24 ± 5.59 years, their mean BMI was 28.37 ± 2.42 kg/m^2, while their mean parity was 1.91 ± 0.79. A total of 208 (54.2%) mothers had a past history of adequate breast feeding, 46 (12.0%) had documented issue during previous births while breast feeding, while 130 (33.8%) did not have any history as it was their first pregnancy with a live birth. The mean APGAR score at birth was 7.17 ± 1.28, which improved to 8.29 ± 1.35 at ten minutes post-birth. The majority of patients were admitted for sepsis: 193 (50.3%), followed respiratory distress syndrome: 88 (22.9%), while a total of 58 (15.1%) suffered from birth asphyxia, and prematurity and meconium aspiration syndrome accounted for 40 (10.4%) and 5 (1.3%), respectively. A total of 187

(48.7%) women had adequate breast-feeding in our study. Table-I shows the patient characteristics and study results, distributed according to neonatal gender.

Table-I. Patient characteristics/study results according to neonatal gender (n=384)

Variable	Male (n=226)	Female (n=158)
Gender	226 (58.9%)	158 (41.1%)
Gestational Age at Birth (weeks)	36.04 ± 2.18	36.01 ± 1.98
Premature Births	106 (46.9%)	75 (47.5%)
Mode of Delivery		
Per Vaginum	161 (71.2%)	112 (70.9%)
Caesarean Section	65 (28.8%)	46 (29.1%)
Birth-Weight (g)	3096.32 ± 434.21	3103.01 ± 407.66
Maternal Age (years)	25.16 ± 4.84	32.65 ± 3.08
Maternal Body Mass Index (kg/m^2)	27.34 ± 2.41	29.85 ± 1.49
Parity	1.79 ± 0.85	2.08 ± 0.66
Previous History of Adequate Breast Feeding		
Yes	96 (42.5%)	112 (70.9%)
No	29 (12.8%)	17 (10.8%)
Not applicable	101 (44.7%)	29 (18.3%)
APGAR score at Birth	7.22 ± 1.29	7.09 ± 1.27
APGAR score at Ten Minutes Post-Birth	8.32 ± 1.34	8.24 ± 1.37
Indication for Admission in Neonatal Intensive Care Unit		
Prematurity	25 (11.1%)	15 (9.4%)
Respiratory Distress Syndrome	53 (23.4%)	35 (22.2%)
Sepsis	113 (50.0%)	80 (50.6%)
Birth Asphyxia	32 (14.2%)	26 (16.5%)
Meconium Aspiration Syndrome	3 (1.3%)	2 (1.3%)
Adequate Breast-Feeding	100 (44.2%)	87 (55.1%)

Table-II showed the adjusted odds ratios for various factors in the development of poor adequacy of breast-feeding. Our study showed that premature birth, low birth-weight, maternal obesity, previous history of inadequate breast-feeding and APGAR score of less than seven at ten minutes post-birth were associated with an increased odds of not being able to provide adequate breast-feed to neonates, while male neonatal gender, caesarean section, maternal age less than 30 years, a parity of less than two and an APGAR at birth of less than seven did not appear to have any effect on adequacy of breast-feeding.

Table-II. Adjusted odds ratios for various factors with adequacy of breast-feeding

Variable	Adjusted Odds Ratio	*p*-value
Premature Birth	5.9 (CI 95% 3.4 – 10.5)	<0.001
Male Gender	0.9 (CI 95% 0.5 – 1.8)	0.841
Caesarean Section	0.9 (CI 95% 0.5 – 1.6)	0.705
Birth-Weight <2500 g	12.1 (CI 95% 3.3 – 44.1)	<0.001
Maternal Age <30 years	1.7 (CI 95% 0.8 – 3.4)	0.176

Maternal BMI >29.9 kg/m^2	3.9 (CI 95% 2.0 – 7.6)	<0.001
Parity <2	0.9 (CI 95% 0.4 – 2.2)	0.902
History of inadequate Breast-Feeding	7.4 (CI 95% 3.2 – 17.1)	<0.001
APGAR at Birth <7	0.9 (CI 95% 0.5 – 1.5)	0.584
APGAR at Ten Minutes <7	8.7 (CI 95% 2.7 – 27.2)	<0.001

DISCUSSION

This study aimed to investigate the impact of mode of delivery and other maternal and neonatal factors on breastfeeding outcomes in a NICU setting, and our study determined that a number of different maternal and neonatal factors are associated with inadequacy of breast-feeding, which are hitherto described in some detail.

Approximately half of our study sample was born before the completion of term, with birth before completion of thirty-seven weeks of gestation associated with an increased risk for occurrence of inadequate breast-feeding, (aOR: 5.9, CI 95% 3.4 – 10.5, p<0.001). This is in keeping with existing studies on the subject such as Hackman et al, who reported that Full-term neonates had a higher chance of having adequate breast-feeding compared to late preterm newborns (OR: 0.4, CI 95% 0.2 – 0.6; p<0.001), as well as early term neonates (OR: 0.7, CI 95% 0.6 – 0.9, p=0.038).[15] This finding was also seen in Zukova et al, who noted that the more premature the neonate the higher the risk of occurrence of inadequate breast-feeding.[16]

There did not appear to be a difference between male and female neonatal gender in terms of adequacy of breast-feeding, with males having an aOR of 0.9 (CI 95% 0.5 – 1.8, p=0.841) in the current study. Ikonen et al reported that while male neonatal gender was associated with late expression of breast milk, there was no association with inadequacy, which was in agreement with our study.[17] Conversely, Goyal et al reported that female neonates tended to have a higher risk for the development of inadequate breasting feeding in their study sample.[18] We believe this was likely due to cultural and social circumstances related to the birth of females in the society in which the latter study was carried out rather than a true reflection of the effect of neonatal gender on breast-feeding.

Our study showed that neonates delivered via caesarean section did not appear to have an increased risk for the development of problems during breast-feeding, (aOR: 0.9, CI 95% 0.5 – 1.6, p=0.705). Our results were in keeping with existing studies on the subject such as Martin et al, who reported that there was no difference in breast-feeding outcomes between mothers who were delivered vaginally and those who were delivered by caesarean section, both in the short- and long-term, a conclusion shared by Zanardo et al.[19,20] Conversely, Hoang-Nguyen et al reported that mothers who had received caesarean sections had lower rates of initiation of breast-feeds, and were more likely to problems breast-feeding in the long-term.[21] We believe this discrepancy may have risen secondary to differences in racial characteristics between the various populations studied, which has been previously documented to have an effect on the adequacy of breast-feeding.[22]

In the current study, neonates who weighed less than 2500 g at birth had a higher risk of developing inadequate breast-feeding, (aOR: 12.1, CI 95% 3.3 – 44.1, p<0.001), in the intensive care setting. Campbell et al also reported that patients who had low birth-weights had a lower frequency of initiating early breast-feeding, of ever initiating breast-feeding and of maintaining long-term breast-feeding compared to their normal birth-weight counterparts.[23]

Our study showed that obese mothers appeared to have a higher risk for the development of inadequate breast-feeding in the current study (aOR: 3.9, CI 95% 2.0 – 7.6, p<0.001). Perez et al reported that obese mothers were more likely to not be exclusively breast-feeding their neonate at the time of discharge, with a common complaint being a difficult for the neonate to latch properly in obese mother compared to non-obese ones, (OR: 2.8, CI 95% 1.3 – 6.1),[24] which was in keeping with our study.

Lastly, a low APGAR score at birth did not appear to be associated with an increase in risk of development of inadequate breast-feeding (aOR: 0.9, CI 95% 0.5 – 1.5, p=0.584), however, a persistently low score at ten minutes was associated with this risk , (aOR: 8.7, CI 95% 2.7 – 27.2, p<0.001), in the current study. Heidarzadeh et al also reported that low early APGAR scores did not appear to have any effect on the adequacy of breast-feeding in their study, which was in accordance with our results,[25] while Lau et al so reported that an APGAR score of greater than 7 was associated with better outcomes in terms of breast-feeding in their study sample, (p=0.024).

STUDY LIMITATIONS

Our study sample was selected via consecutive, non-probability sampling, which may have resulted in bias during selection. Secondly, our study did not take into account maternal willingness or preference for breast-feeding, which may have produced confounding in our results. Moreover, our list variables was not exhaustive; additional factors such as maternal diet, genetics, and environmental factors may be present that could be associated with an effect on breast-milk production which were not included in our research and may have affected our results. The findings of this study may not be generalizable to other populations as we looked at neonates that were nursed in the NICU in a single tertiary care hospital, which drew its study sample from the wards of military personnel. Lastly, while our study established association between certain factors and the occurrence of inadequate breast-feeding, further research is required to determine causality.

CONCLUSION

Maternal factors such as obesity and a past history of being unable to establish adequate breast-feeding and neonatal factors such as premature birth, low birth-weight, and a low APGAR score have a positive association with the inability to develop adequate breast feeding in the neonatal intensive care unit in our study. Identifying such cases in advance and instituting preventive measures, or initiating alternative modes of feeding may prove paramount in improving the outcomes of such cases in terms of morbidity and mortality, and such interventions should be the subject of future research.

TYPE OF ARTICLE

Original article.

ETHICAL COMMITTEE APPROVAL

Ethical committee of Combined Military Hospital, Kharian gave the approval for this study.

CONFLICTS OF INTEREST

None.

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REFERENCES

Rahim F, Jan A, Mohummad J, Iqbal H. Pattern and outcome of admissions to neonatal unit of Khyber Teaching Hospital, Peshawar. Pak J Med Sci. 2007 Apr;23(2):249-253.

Karim F, Billah SM, Chowdhury MA, Zaka N, Manu A, Arifeen SE, et al. Initiation of breastfeeding within one hour of birth and its determinants among normal vaginal deliveries at primary and secondary health facilities in Bangladesh: A case-observation study. PLoS One. 2018 Aug 16;13(8):e0202508. doi: 10.1371/journal.pone.0202508.

Borg B, Gribble K, Courtney-Haag K, Parajuli KR, Mihrshahi S. Association between early initiation of breastfeeding and reduced risk of respiratory infection: Implications for nonseparation of infant and mother in the COVID-19 context. Matern Child Nutr. 2022 Jul;18(3):e13328. doi: 10.1111/mcn.13328.

Abugov H, Ochoa-Marín SC, Semenic S, Arroyave IC. Barriers and facilitators to breastfeeding support practices in a neonatal intensive care unit in Colombia. Invest Educ Enferm. 2021 Feb;39(1):e11. doi: 10.17533/udea.iee.v39n1e11.

Li L, Wan W, Zhu C. Breastfeeding after a cesarean section: A literature review. Midwifery. 2021 Dec;103(1):103117. doi: 10.1016/j.midw.2021.103117.

Yang X, Meng T. Admission of full-term infants to the neonatal intensive care unit: a 9.5-year review in a tertiary teaching hospital. J Matern Fetal Neonatal Med. 2020 Sep;33(17):3003-3009. doi: 10.1080/14767058.2019.1566901.

Khasawneh W, Obeidat N, Yusef D, Alsulaiman JW. The impact of cesarean section on neonatal outcomes at a university-based tertiary hospital in Jordan. BMC Pregnancy Childbirth. 2020 Jun 1;20(1):335. doi: 10.1186/s12884-020-03027-2.

Ganer-Herman H, Ben-Zvi M, Tairy D, Kleiner I, Gonen N, Kuper-Sason L, et al. Enhancing patient mobility following cesarean-delivery - the efficacy of an improved postpartum protocol assessed with pedometers. BMC Pregnancy Childbirth. 2020 Jun 9;20(1):353. doi: 10.1186/s12884-020-03046-z.

Briere CE, McGrath J, Cong X, Cusson R. An integrative review of factors that influence breastfeeding duration for premature infants after NICU hospitalization. J Obstet Gynecol Neonatal Nurs. 2014 May-Jun;43(3):272-81. doi: 10.1111/1552-6909.12297.

Gertz B, DeFranco E. Predictors of breastfeeding non-initiation in the NICU. Matern Child Nutr. 2019 Jul;15(3):e12797. doi: 10.1111/mcn.12797.

Sokou R, Parastatidou S, Ioakeimidis G, Tavoulari EF, Makrogianni A, Isaakidou E, et al. Breastfeeding in Neonates Admitted to an NICU: 18-Month Follow-Up. Nutrients. 2022 Sep 16;14(18):3841. doi: 10.3390/nu14183841.

Altuntas N, Turkyilmaz C, Yildiz H, Kulali F, Hirfanoglu I, Onal E, et al. Validity and reliability of the infant breastfeeding assessment tool, the mother baby assessment tool, and the LATCH scoring system. Breastfeed Med. 2014 May;9(4):191-5. doi: 10.1089/bfm.2014.0018.

Moore ER, Bergman N, Anderson GC, Medley N. Early skin-to-skin contact for mothers and their healthy newborn infants. Cochrane Database Syst Rev. 2016 Nov 25;11(11):CD003519. doi: 10.1002/14651858.CD003519.pub4.

Hackman NM, Alligood-Percoco N, Martin A, Zhu J, Kjerulff KH. Reduced Breastfeeding Rates in Firstborn Late Preterm and Early Term Infants. Breastfeed Med. 2016 Apr;11(3):119-25. doi: 10.1089/bfm.2015.0122.

Hackman NM, Alligood-Percoco N, Martin A, Zhu J, Kjerulff KH. Reduced Breastfeeding Rates in Firstborn Late Preterm and Early Term Infants. Breastfeed Med. 2016 Apr;11(3):119-25. doi: 10.1089/bfm.2015.0122.

Zukova S, Krumina V, Buceniece J. Breastfeeding preterm born infant: Chance and challenge. Int J Pediatr Adolesc Med. 2021 Jun;8(2):94-97. doi: 10.1016/j.ijpam.2020.02.003.

Ikonen R, Paavilainen E, Helminen M, Kaunonen M. Preterm infants' mothers' initiation and frequency of breast milk expression and exclusive use of mother's breast milk in neonatal intensive care units. J Clin Nurs. 2018 Feb;27(3-4):e551-e558. doi: 10.1111/jocn.14093.

Goyal K, Purbiya P, Lal SN, Kaur J, Anthwal P, Puliyel JM. Correlation of Infant Gender with Postpartum Maternal and Paternal Depression and Exclusive Breastfeeding Rates. Breastfeed Med. 2017 Jun;12(1):279-282. doi: 10.1089/bfm.2017.0024.

Martin M, Keith M, Olmedo S, Edwards D, Barrientes A, Pan A, et al. Cesarean section and breastfeeding outcomes in an Indigenous Qom community with high breastfeeding support. Evol Med Public Health. 2022 Jan 4;10(1):36-46. doi: 10.1093/emph/eoab045.

Zanardo V, Svegliado G, Cavallin F, Giustardi A, Cosmi E, Litta P, et al. Elective cesarean delivery: does it have a negative effect on breastfeeding? Birth. 2010 Dec;37(4):275-9. doi: 10.1111/j.1523-536X.2010.00421.x.

Hoang-Nguyen PT, Binns CW, Vo-Van-Ha A, Nguyen CL, Khac-Chu T, Duong DV, et al. Caesarean delivery associated with adverse breastfeeding practices: a prospective cohort study. J Obstet Gynaecol. 2020 Jul;40(5):644-648. doi: 10.1080/01443615.2019.1647519.

Chiang KV, Li R, Anstey EH, Perrine CG. Racial and Ethnic Disparities in Breastfeeding Initiation — United States, 2019. MMWR Morb Mortal Wkly Rep. 2021 May 28;70(21):769-774. doi: 10.15585/mmwr.mm7021a1.

Campbell AG, Miranda PY. Breastfeeding Trends Among Very Low Birth Weight, Low Birth Weight, and Normal Birth Weight Infants. J Pediatr. 2018 Sep;200(1):71-78. doi: 10.1016/j.jpeds.2018.04.039.

Perez MR, de Castro LS, Chang YS, Sañudo A, Marcacine KO, Amir LH, et al. Breastfeeding Practices and Problems Among Obese Women Compared with Nonobese Women in a Brazilian Hospital. Womens Health Rep (New Rochelle). 2021 Jun 29;2(1):219-226. doi: 10.1089/whr.2021.0021.

Heidarzadeh M, Hosseini MB, Ershadmanesh M, Gholamitabar-Tabari M, Khazaee S. The Effect of Kangaroo Mother Care (KMC) on Breast Feeding at the Time of NICU Discharge. Iran Red Crescent Med J. 2013 Apr;15(4):302-6. doi: 10.5812/ircmj.2160.

Lau Y, Tha PH, Ho-Lim SS, Wong LY, Lim PI, Citra-Nurfarah BZ, et al. An analysis of the effects of intrapartum factors, neonatal characteristics, and skin-to-skin contact on early breastfeeding initiation. Matern Child Nutr. 2018 Jan;14(1):e12492. doi: 10.1111/mcn.12492.