International Journal of Contemporary Pediatrics
Mugadza G et al. Int J Contemp Pediatr. 2018 Jan;5(1):1-5
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20175564

Original Research Article

Early breastfeeding initiation and incidence of neonatal sepsis in Chipinge District Zimbabwe

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Received: 20 September 2017
Accepted: 27 October 2017

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ABSTRACT

Background: Neonatal sepsis is one of the leading causes of neonatal morbidity and mortality during the neonatal period especially in the first week of life. The objectives of this study were to determine early breastfeeding initiation (EBFI) and the incidence of neonatal sepsis in in the first week of life in Chipinge District, Zimbabwe.
Methods: After obtaining approval from the ethical institutional review board and Medical research council of Zimbabwe, a total of 200 healthy term neonates were recruited into a prospective cohort study within 24 hours of birth after the mothers had given an informed consent. Mother and baby pair was followed up at day 3 and day 7 to assess presence of infection using clinical checklist and physical examination.
Results: The Pearson correlation was significant at 0.01 level (2 tailed) at day 3 and day 7. The findings revealed a significant association between EBFI and neonatal sepsis in the first week of life.
Conclusions: Neonatal sepsis is one of the leading causes of death during the neonatal period especially in the first week of life. Findings of the study revealed a significant Pearson correlation at 0.01 levels (2 tailed) at day 3 and day 7. Delayed initiation of breastfeeding increases the risk of neonatal sepsis and about 33 % neonatal deaths can be averted if breastfeeding is initiated within an hour of birth.

Keywords: Early breastfeeding initiation, Incidence, Neonatal sepsis

INTRODUCTION

Early breastfeeding initiation (EBFI) refers to the actual provision of the first breastmilk colostrum in the first hour of birth.[1] Several studies have proven the protective effect of colostrum against varied pathogenic micro-organisms that have detrimental effects to the survival of the newborn baby especially during the immediate post - partum period.[2,3]

Delayed breastfeeding is consequently associated with high neonatal morbidity and mortality especially during the first week of life.[2] In one multicentre study conducted in Ghana, India, Nepal and Tanzania, EBFI was found curb risk of neonatal deaths by 33 % if commenced within an hour of birth. On the contrary, delay in initiating breastfeeding beyond 24 hours of birth is associated with 85 % risk of dying.[3] It also reported in the same study that only 50% of the world infants initiate breastfeeding within an hour thus leaving a 50 % practice gap.

The risk of neonatal mortality due to sepsis increases with increased delay in initiating breastfeeding. Initiating breastfeeding beyond 24 hours to a week post birth has a 2.6 fold risk of neonatal deaths.[3] Neonatal sepsis refers to a clinical syndrome in a baby aged 28 days of life or less.[4]

Determinants of neonatal sepsis

Neonatal sepsis is a result of several factors that include immature immunity, exposure to pathogens at birth and use of prelacteal feeds. The new born baby has an immature immunity and the baby has to depend on its mother for protection against such infections. Antibodies are conferred to the new born baby through colostrum which is the first breastmilk. While in utero, the baby resides in a more sterile environment covered by amniotic fluid. The sterile environment is disrupted at birth with breakage of the water sac and expulsion of the baby into a highly colonised environment.[2] At birth, the newborn baby's immune system is overwhelmed by such pathogens like rota virus, streptococcal pneumoniae, Staphylococcus aureus, clostridium tetanii and Shigella toxins.[4] Colostrum has a gut ceiling effect that prevents the gut from contamination or any allergic reactions from such infections.[2,5] In one study which evaluated the characteristics of pathogens causing neonatal sepsis in the new born, Coagulase negative Staphylococci was the most dominant pathogen followed by *Klebsiella pneumonia*. Out of the 344 neonates enrolled in the same study, 152 (44.2%) had sepsis within the first three days of life while 192 (55.8%) had it after 72 hours.[6]

In another un matched case control study conducted in Ethiopia, the risk of neonatal sepsis was a result both maternal and neonatal causes like urinary tract infection, prolonged rupture of membranes and low Apgar score of <7.[7]

Apart from ingestion of colostrum by the newborn to conferrer protection, attributes of EBFI which are maintenance of early skin to skin contact (ESSC) and rooming in play a significant role in reducing neonatal sepsis. Drying of the newborn and maintenance of skin to skin contact not only enhances EBFI but it also allows colonization of the newborn skin with maternal flora thus facilitating olfactory learning and enhances intake of colostrum. On the same note, the vernix Casiosa acts as a barrier against Escherichia coli and facilitates the breast craw reflex for early initiation of breastfeeding.[8]

The effects of neonatal sepsis

Neonatal sepsis results in numerous outcomes that range from manageable to fatal complications depending on the severity of the isolated pathogen. Clinical features will range from inability to suckle, hypothermia, respiratory distress, fever, jittery to more complex symptoms that involve the meninges, seizures due to increased intracranial pressure and septic shock.[8]

METHODS

After obtaining approval from the ethical institutional review board and Medical research council of Zimbabwe, a total of 200 healthy term neonates were recruited into a prospective cohort study within 24 hours of birth after the mothers had given an informed consent. Prior participant recruitment, 7 research nurses to assist in the study were trained. Training material content included explaining purpose of the study to obtain an informed consent, comprehensive examination of the newborn at time of recruitment and at day 3 and 7 follow up to screen presence of sepsis.

Managing potential confounders

At time of recruitment, maternal history of pregnancy up to the time of delivery was obtained to exclude pre-existing maternal infections that could interfere with neonatal outcomes. The babies were examined for maturity, Apgar score and any present illnesses to exclude potential confounders. All low birth weight, low Apgar score and ill babies were excluded from the study as well as multiple births.

Maternal demographics were also obtained including initiation time of breastfeeding to determine difference in exposure as either early or late initiators. Mother and baby pair was followed up at day 3 and 7 to check on breastfeeding pattern and any presence of infection. Screening of infection at day 3 and 7 was done using a checklist. The checklist assessed presence of fever as evidenced by any body temperature above 375 degrees, respiratory infection, omphalitis, discharging eyes and hypothermia temperature below 365. Body temperature was assessed using infrared thermometers that take core body temperature.

The nurse working in the postnatal ward was blinded from the activities of the follow- up nurse in the maternal child health unit to curb bias and initial examination form was matched with the follow up entry form using codes.

Statistical analysis

Data was analysed using the Stata software version 20.0 to calculate cumulative incidence, relative risk or risk ratio and the risk difference. The cumulative incidence calculated the proportion of the infants having neonatal sepsis obtained by summation of new cases of neonatal sepsis among early and late initiators. The relative risk ratio was computed among the exposed (late initiators) and the non -exposed (those who had initiated breastfeeding within an hour of birth.

RESULTS

The infants enrolled into the study had been delivered normally with an Apgar score of above 8 and were healthy and term at time of birth and had 5 been delivered normally with weight of 2500 grams and above. The percentage of girl infants to boy infants was 49 to 51 in the early initiation group and 56 to 44 in the late initiation group. The ratio of early initiators to late initiators was 1:1.

Table 1: Demographics characteristics n=200.

Variable	Early (n=100)	Late (n =100)
Gestation at birth >37 weeks	100 (50 %)	100 (50%)
Age within 24 hours	100 (50 %)	100 (50%)
Normal vertex delivery	100 (50 %)	100 (50%)
Boys	51 (51%)	44 (44%)
Girls	49 (49%)	56 (56%)
Apgar score >8	100 (50 %)	100 (50%)
Birth Weight >2500 grams	100 (50 %)	100 (50%)
Breastfeeding initiation within an hour	100 (50%)	0 (0%)
Breastfeeding initiation after an hour	100 (50)	0 (0%)
Birth Injuries	0 (0%)	0 (0%)

Following recruitment, 200 infants were monitored on day 3 and 7 after delivery to assess presence of infection using a clinical checklist and infrared thermometer. The table reflect a comparison in the occurrence of neonatal sepsis among the infants who had initiated breastfeeding early to those who had initiated breastfeeding late.

Table 2: Initiation of breastfeeding: incidence of neonatal sepsis, risk ratio, risk difference and attributable risk (n = 200).

	Neonatal Sepsis at day 3		
	Present	**Not present**	**Totals**
Early initiators of breastfeeding	1	99	100
Late initiators of breastfeeding	44	56	100
Totals	45	155	200

Incidence of neonatal sepsis was high among late initiators of breastfeeding than early initiators. A total of 44 (44%) of infants who initiated breastfeeding late presented with neonatal sepsis compared to 1 (1%) of the infants who initiated breastfeeding early. At day 7, 45 (45 %) infants in the category of late initiation had neonatal sepsis compared to 2 (2%) infants in the category of early initiation of breastfeeding.

Table 3: Initiation of breastfeeding: incidence of neonatal sepsis, risk ratio, risk difference and attributable risk (n = 200).

	Neonatal Sepsis at day 7		
	Present	**Not present**	**Totals**
Early initiators of breastfeeding	2	98	100
Late initiators of breastfeeding	45	55	100
Totals	47	153	200

The risk ratio was 1: 44 among infants who initiated breastfeeding to those who initiated breastfeeding late at day 3 and 1:23 for the same population at day 7. The risk difference among late initiators to early initiators was 0.43 at both day 3 entailing that 43% of the infants who had sepsis was a result of delayed initiation of breastfeeding.

Pearson correlation

The Pearson correlation was significant at 0.01 level (2 tailed) at day 3 and day 7 among early and late initiators of breastfeeding respectively. The findings revealed a significant association between EBFI and neonatal sepsis in the first week of life.

DISCUSSION

Scientific evidence through research has reported the protective effect of colostrum, the first breast milk against neonatal infections.[3] Colostrum has a gut ceiling effect that prevents penetration of pathogenic microorganisms like Shigella and Escherichia coli that result in necrotising enterocolitis.[2]

The study purpose was to determine the incidence of EBFI and neonatal sepsis in Chipinge District, Zimbabwe. Despite the recognised benefits of EBFI, Chipinge EBFI rates are at 52% against the 90% advocated by Wold Health Organisation. Low rates of EBFI have been also recorded in South East Asia and Western Nepal where one in four babies receive breast milk within the first hour of birth.[9] Similar findings od delayed breastfeeding initiation were recorded in North Central Province of Sri-Lanka, Pakistan, India with initiation rates ranging from 29 to 45%.[10]

Findings of the study revealed a significant Pearson Correlation between EBFI and neonatal sepsis at 0.01 levels (2 tailed) at day 3 and day 7. The strong association portrayed in this study between EBFI and neonatal sepsis could be an indicator to the increasing neonatal mortality rate of 29/ 1000 live births with decreased breast feeding initiation rate of 52% in Chipinge district.[11] Neonatal morbidity due to sepsis is attributed to pathogens like viruses, Escherichia coli, Shigella, fungal infections leading to such infections like pneumonia, meningitis, diarrhoea and neonatal sepsis.[10]

The findings of the study are consistent with results of a multi- centre study that was conducted in Ghana, Nepal, India and Tanzania which showed a significant association between EBFI and risk of neonatal mortality. In the same study the risk of neonatal deaths was 85% for newborn babies that delayed to initiate breastfeeding beyond 24 hours.[12] In yet another study, increased neonatal deaths was in proportion with delayed breastfeeding initiation.[13] Though neonatal deaths were not recorded in this study, the risk of morbidity and

mortality could be similar to previous studies if no intervention is rendered.

It is important to take note that the risk of neonatal sepsis can be a result of such factors like maternal pre-existing infections as well as intra-partum care invasive procedures as in the case of repeated vaginal examination and prolonged rupture of membranes as postulated by several studies.[8]

Despite the proven causes of neonatal sepsis, scientific evidence still attribute delayed breastfeeding initiation ton infection occurrence in the first 7 to 28 days of life.[3] Immediate newborn care which encompasses early initiation of breastfeeding has been reported to be a major non cost effective intervention in averting neonatal morbidity related to infections, hypothermia neonatal dehydration.[14]

Colostrum has high levels of immunoglobulins and lymphocytes that stimulate the immune response of the newborn in fighting early infections.[2] In view of this, prelacteal feeds have no additional benefit of protecting the new born from infectious microbes. On the same note, prelacteal feeds have been proven to be vehicles that drive infection to the newborn gut thus enhancing penetration of pathogens leading to necrotising enterocolitis.

Delay in EBFI has a 2.4 fold risk of neonatal deaths.[15] In the context of this study, the most prevailing forms of neonatal infections were ophthalmia neonatorum (discharging eyes), fever, skin rashes and omphalitis. At birth, the newborn baby is highly colonised by pathogens within the environment it is born.[16] The skin to skin contact maintained at birth to enhance EBFI has a double effect as it also facilitates colonization of the newborn skin with maternal flora thus facilitating olfactory stimulation and favours intake of colostrum. On the same note, the vernix Casiosa acts as a barrier against Escherichia coli and facilitates the breast craw reflex for early initiation of breastfeeding.[17,18]

The study employed rigorous strategies to ensure integrity and validity of the study. However, assessment of neonatal sepsis was limited to clinical approach. Study results would have revealed more at risk babies if blood culture had been used as a screening methodology for the same variable. The study was performed in one district; nevertheless, the sample size used was good enough to infer the findings to similar situations if the same variables are studied.

CONCLUSION

Neonatal sepsis is one of the leading causes of death during the neonatal period especially in the first week of life. Findings of the study revealed a significant 2 tailed at (P = 0.01) at 95% CI and significant 2 tailed (P= 0.01) at 95% CI among early and late initiators of breastfeeding respectively. Delayed initiation of breastfeeding increases the risk of neonatal sepsis and about 33% neonatal deaths can be averted if breastfeeding is initiated within an hour of birth.

ACKNOWLEDGEMENTS

Authors would like to thank the Medical Research Council of Zimbabwe for approving this study and to the participants in Chipinge District for consenting to participate in the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Mugadza G, Zvinavashe M, Gumbo FZ, Pedersen BS. Early breastfeeding initiation and incidence of neonatal sepsis in Chipinge District Zimbabwe. Int J Contemp Pediatr 2018;5:1-5.