

The Effect of Exclusive Breastfeeding Up to 6 Months in Children in Terms of Mortality Due to Pneumonia: An Observational Study

Ashwani Kumar Mishra¹, Rakesh Ranjan Kumar², Jiteshwar Prasad Mandal³, Gopal Shankar Sahni⁴

¹Specialist Medical Officer, Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India

²Assistant Professor, Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur Bihar India

³Associate Professor, Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur Bihar India

⁴Head of Department, Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur Bihar India

Received: 28-11-2022 / Revised: 25-12-2022 / Accepted: 25-01-2023

Corresponding author: Dr. Gopal Shankar Sahni

Conflict of interest: Nil

Abstract

Aim: The Aim Of The Present Study Was To Observe The Effect Of Exclusive Breastfeeding Up To 6 Months In Children In Terms Of Mortality Due To Pneumonia.

Methods: The Study Was Conducted In Department Of Pediatrics A Sri Krishna Medical College And Hospital, Muzaffarpur, Bihar, India For Eight Months. A Total 200 Children Of Both Sex With WHO Defined Severe And Very Severe Pneumonia Were Enrolled In The Study. The Age Group Was 2 Months To 5 Years.

Results: In Our Study 140 Children Were Male (70%), 60 Were Female (30%), 110 Patients Were Below 1 Year Of Age (55%), 50 Were Between 1-2 Years (25%) And 56 Were Between 2-5 Years (20%). Out Of 200 Patients, 98 Were Having Severe Pneumonia (49%) And 102 Were Having Very Severe Pneumonia (51%). Among These 200 Patients, 140 (70%) Received Exclusive Breast Milk Up To 6 Months. Among The Children Who Were Breast Fed Up To 6 Months, 42.85% Were Having Very Severe Pneumonia Which Was Significantly 75% Of The Children Who Were Not Breast Fed Up To 6 Months (P<0.001). So, Children Who Were Not Breast Fed Up To 6 Months Were 4.1 Times More Likely To Be Suffering From Very Severe Pneumonia (Vs Severe Pneumonia) Than Those Who Were Breast Fed Up To 6 Months (P<0.05). 2.85% Of The Children Who Were Breast Fed Up To 6 Months Died Whereas 25% Of Those Who Were Not Breast Fed Up To 6 Months Died (P<0.001). Those Who Were Not Breast Fed Up To 6 Months Were Significantly 83% (OR=0.17) Less Likely To Survive As Compared To Those Who Were Breast Fed Up To 6 Months(P<0.05). 19 (9.5%) Patients Expired In The Present Study.

Conclusion: Children Who Do Not Receive Exclusive Breastfeeding Up To 6 Months Are More Prone To Have More Severe Pneumonia And Relatively Higher Chance Of Mortality.

Keywords: Exclusive Breastfeeding, Pneumonia, Mortality

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Globally, around 5.6 million children died before reaching their fifth birthday, of those, 2.6 million (or 46%) died in the first 30 days of life. [1] Approximately 7000 newborns died every day, most of which occurred within first 7 days after birth, with about 1 million dying on the first day and close to 1 million dying within the next 6 days in 2016. [2] Over the past 25 years, the age under-five mortality rate dropped from 93 deaths per 1000 live births in 1990 to 41 in 2016. In India, in the year 2015, infant mortality accounts for 37 infant deaths per 1000 live births, of which 67.8% infants (25 per 1000 live births) died in the first month of births. [3] In 2013, India recorded the highest absolute number of neonatal deaths of any country, nearly 0.75 million. [4] Despite a significant change in neonatal mortality over the years, progress has been inadequate towards achieving Millennium Development Goal 4 (MDG-4). [5] In 2015, the Sustainable Development Goals (SDGs) have been introduced, seeking to achieve all the goals by 2030. Goal 3 of the Sustainable Development (SDG 3) is focused on promoting MDG-4 to reduce the under-five mortality by two thirds, between 1990 and 2015 and will continue beyond 2015, until neonatal mortality is at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births. [6]

Various factors can effectively reduce neonatal mortality to greater levels, early initiation of breastfeeding is one of them and it has benefits for survival and beyond. The World Health Organization (WHO) has recommended that all neonates to be breastfed within 1 h of birth. The deleterious effects of infections related infant deaths can be prevented by early initiation of breastfeeding (or human milk feeding) and exclusive breastfeeding which is the easiest, cost-effective and life-saving intervention for the health of a newborn. [7] Early initiation of

breastfeeding and exclusive breastfeeding for the first 6 months of life prevents around 20% newborn deaths and 13% under-five deaths. [8] It can also reduce mortality due to neonatal infections (sepsis, pneumonia, tetanus, and diarrhea) [9] which contribute 36% in neonatal deaths from all causes, and preterm birth an additional 27%. [10]

According to WHO, pneumonia is responsible for 20% of death in the under-fives and 3 million deaths every year. 2 Two- third of these deaths occur under 1 year of age and more than 90% occur in developing countries. [11,12] The estimated clinical pneumonia incidence expressed as events per child year is highest in South East Asia (0.36), then Africa (0.33), followed by Eastern Mediterranean (0.28). [13] Breastfeeding may be effective in reducing hospitalizations for acute lower respiratory infections in the first years of life. [14,15] A systematic review published in 2002, assessed the optimal duration of breastfeeding for reduction of respiratory illness and mortality and supported the global recommendation for exclusive breastfeeding during the first 6 months of life. [16]

The aim of the present study was to observe the effect of exclusive breastfeeding up to 6 months in children in terms of mortality due to pneumonia.

Materials and Methods

The study was conducted in Department of Pediatrics a Sri Krishna medical college and Hospital, Muzaffarpur, Bihar, India for eight months. A total 200 children of both sex with WHO defined severe and very severe pneumonia were enrolled in the study. [15] The age group was 2 months to 5 years. Children who had other co-morbid conditions like Severe malnutrition, Congenital malformations, Congenital heart disease, Severe anemia (Hemoglobin

below 7gm% as per WHO cut-offs for age based value of hemoglobin for severe anemia [16], Chronic respiratory disease (eg. asthma, cystic fibrosis, bronchopulmonary dysplasia, previously diagnosed case of tuberculosis) and Pulmonary Koch's were excluded.

After taking informed consent from parents/guardian details of personal, demographic profile, signs and symptoms, relevant past and family history were enquired and recorded. Details of breast feeding and addition of top feeds were recorded. After that a detailed patient examination was done and findings were noted in pre- designed proforma. Chest radiographs were performed in all patients. Results of the investigations including complete blood count, chest x-ray, blood culture, serum electrolytes and arterial blood gas analysis were recorded. The treatment given and progress notes were

recorded at 48 hours, 5th day or as required. Patients were observed till the day of discharge or death. Treatment was started as per WHO standard protocol and antibiotics were changed if there was no improvement or worsening of symptoms within 48 hours of admission. Patients were discharged when respiratory rate reduced below the age specific cut off, with absence of hypoxemia, chest in-drawing and fever for at least 24 hours.

Association of severity of pneumonia and mortality due to pneumonia in exclusively breastfed children and non-exclusive breastfed children was assessed through Chi-square test. The association was considered statistically significant at 5% level of significance (i.e., p 0.05). SPSS software version 17.0 was used for all the statistical analyses.

Results

Table 1: Patient details

Gender	N%
Male	140 (70)
Female	60 (30)
Age groups	
Below 1 year	110 (55)
1-2 years	50 (25)
2-5 years	40 (20)
Pneumonia	
Severe Pneumonia	98 (49)
Very Severe Pneumonia	102 (51)

In our study 140 children were male (70%), 60 were female (30%), 110 patients were below 1 year of age (55%), 50 were between 1-2 years (25%) and 56 were between 2-5 years (20%). Out of 200

patients, 98 were having severe pneumonia (49%) and 102 were having very severe pneumonia (51%). Among these 200 patients, 140 (70%) received exclusive breast milk up to 6 months.

Table 2: Association between severity of pneumonia with type of feeding (p<0.05)

	Severe pneumonia	Very severe pneumonia	P value
Exclusive breastfeeding up to 6 months	80 (57.15)	60 (42.85)	<0.001%
Others	15 (25)	45 (75)	

Among the children who were breast fed up to 6 months, 42.85% were having very

severe pneumonia which was significantly 75% of the children who were not breast

fed up to 6 months ($p < 0.001$). So, children who were not breast fed up to 6 months were 4.1 times more likely to be suffering

from very severe pneumonia (vs severe pneumonia) than those who were breast fed up to 6 months ($p < 0.05$).

Table 3: Association between exclusive breastfeeding and outcome due to pneumonia

	Discharged	Death	P value
Exclusive breastfeeding upto 6 months	136 (97.15)	4 (2.85)	<0.001%
Others	45 (75)	15 (25)	

2.85% of the children who were breast fed up to 6 months died whereas 25% of those who were not breast fed up to 6 months died ($p < 0.001$). Those who were not breast fed up to 6 months were significantly 83% (OR=0.17) less likely to survive as compared to those who were breast fed up to 6 months ($p < 0.05$). 19 (9.5%) patients expired in the present study.

Discussion

Pneumonia, the leading cause of child mortality, was responsible for approximately 1.4 million deaths among children < 5 years of age in 2010. [17] Pneumonia is also a major cause of global morbidity with an estimated 156 million episodes and 14.9 million hospitalizations per year. [18,19] The incidence of pneumonia illness and deaths is marked by a substantial wealth gap, with the majority of morbidity and mortality occurring in developing countries and among the poorest children. [20] Studies suggest that optimal breastfeeding practices, including exclusive breastfeeding during the first six months of life and continued breastfeeding until 24 months of age, are critical for reducing the burden of pneumonia among infants and young children. [20-22]

We conducted this prospective observation study for observing the effect of exclusive breast feeding on childhood mortality due to pneumonia. The mortality rate was 9.5% in our study which compares with the reported case fatality rate of 9.8%, 10.5% and 10.45% in similar settings. [11,23,24] As age increases, severity of childhood pneumonia decreases. In the study, 55% of the children in the age group <1 years were very having very severe pneumonia

whereas 25% children in the age group of 1-2 years and 20% in the age group of 2-5 years were having very severe pneumonia, ($p = 0.033$). This can be explained by the fact that as the age increases the respiratory passage become wider and respiratory defense mechanism becomes more mature.

Children who were not breast fed up to 6 months were 4.1 times more likely to be suffering from very severe pneumonia (vs severe Pneumonia) than those who were breast fed up to 6 months, $p < 0.05$ in the study. Lack of breast feeding has been also reported to be associated with increased risk of development of severe pneumonia by 1.5 to 2.6 times. [25,26] Though, mechanism by which breast feeding protects against respiratory infection are incompletely understood. Breast milk seems to have effect on infant's systemic immune system via multiple mechanisms including maturational, anti-inflammatory, immuno-modulatory and antimicrobial action. [27] Changes in immune phenotype after exposure to maternal milk, including increase in post-vaccination interferon- α levels and in natural killer cell numbers could result in prolonged protection against respiratory infections. [28,29] In addition, there is experimental evidence in animals that maternal milk lymphocytes cross the infant's intestinal wall and enter the circulation. [30] It is postulated that these cells activate the infant's immune system. Anti-inflammatory cytokines such as interleukin-10 and transforming growth factor β are also present in maternal milk and taken up by neonatal tissues, in which they are associated with a decrease in inflammatory immune responses [31] and

augmented secretory immunoglobulin A synthesis. [32,33,34]

Conclusion

Exclusive breast fed children are more healthy and breast feeding provides protection against many infections and reduces its severity, so by increasing awareness of breast feeding in mothers is a simple and effective way to reduce mortality from pneumonia.

References

1. UNICEF: Levels & Trends in Child Mortality, Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. New York: UNICEF; 2017.
2. World Health Organization (WHO). Global Health Observatory (GHO) data on Child mortality and causes of death; 2017.
3. Registrar General of India (RGI). Sample Registration System Statistical Report 2015.
4. Wardlaw T, Amouzou A, Velez L, Dwivedi A, Hug L. Committing to child survival: a promise renewed. Progress Report. 2014.
5. UNICEF: Levels & Trends in Child Mortality, Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. New York: UNICEF; 2015.
6. United Nations. The UN Millennium Development Goals. 2015.
7. World Health Organization (WHO). Early Initiation of breastfeeding: the key to survival and beyond: WHO Secretariat; 2010. p. 1–7.
8. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. Bellagio child survival study group. How many child deaths can we prevent this year? *Lancet*. 2003; 362:65–71.
9. Mullany LC, Katz J, Li YM, Khatry SK, LeClerq SC, Darmstadt GL, Tielsch JM. Breast-feeding patterns, time to initiation, and mortality risk among newborns in southern Nepal. *J Nutr*. 2008; 138:599–603.
10. Lawn J, Shibuya K, Stein C. No cry at birth: global estimates of intrapartum stillbirths and intrapartum-related neonatal deaths. *Bull World Health Organ*. 2005; 83:409–17.
11. Sehgal V, Sethi GR, Sachdev HP, Satyanarayana L. Predictors of mortality in subjects hospitalized with acute lower respiratory tract infections. *Indian Pediatr*. 1997;34(3):213–9.
12. Agrawal PB, Shendumikar N, Shastri NJ. Host factors and pneumonia in hospitalized children. *J Indian Med Assoc*. 1995;93(7):271–2.
13. Mulholland K. Global burden of acute respiratory infections in children: implications for interventions. *Pediatr Pulmonol*. 2003;36(6):469–74.
14. Macedo SE, Menezes AM, Albernaz E, Post P, Knorst M. Fatores de risco para internação por doença respiratória aguda em crianças até um ano de idade. *Rev Saude Publica*. 2007;41(3):351–9.
15. Jelly P, Sharma K, Saxena V, Sharma R. Exploration of Breastfeeding Practices in India: A Systematic Review. *J Holist Nurs Midwifery*. 2022;32(1):58–68.
16. Kramer MS, Kakuma R. The optimal duration of exclusive breastfeeding. *Cochrane Database Syst Rev*. 2012; 2012(8):3517.
17. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE, Rudan I, Campbell H, Cibulskis R, Li M, et al: Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *Lancet* 2012, 379(9832): 2151-2161.
18. Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H: Epidemiology and etiology of childhood pneumonia. *Bull World Health Organ* 2008, 86(5):408-416.
19. Nair H, Simoes E, Rudan I, Gessner B, Azziz-Baumgartner E, Zhang JS Feikin D, Mackenzie G, Moisi J, Roca A, et

- al: Global and regional estimates of hospitalised severe acute lower respiratory infections in young children in 2010: a systematic review and meta-analysis. *Lancet* 2013,381(9875):1380-1390.
20. Gupta GR: Tackling pneumonia and diarrhoea: the deadliest diseases for the world's poorest children. *Lancet* 2012, 379(9832):2123-2124.
 21. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, Mathers C, Rivera J: Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet* 2008,371(9608):243-260.
 22. Kramer MS, Kakuma R: The optimal duration of exclusive breastfeeding. *Cochrane Database Syst Rev* 2012, 8:CD003517.
 23. Tiewsoh K, Lodha R, Ravidra M, Pandey S, Broor M, et al. Factors determining the outcome of children hospitalized with severe pneumonia. *BMC Pediatr.* 2009; 9–15.
 24. Banajeh SM, al Sunbali NN, al Sanahani SH. Clinical characteristics and outcome of children aged under 5 years hospitalized with severe pneumonia in Yemen. *Ann Trop Paediatr.* 1997;17(4):321–6.
 25. Broor S, Pandey RM, Ghosh M, Maitreyi RS, Lodha R, Singhal T, et al. Risk factors for severe acute lower respiratory tract infection in under five children. *Indian Pediatr.* 2001;38(12): 1361–9.
 26. Victora CG, Fuchs SC, Flores JA, Fonseca W, Kirkwood B. Risk factors for pneumonia among children in a Brazilian metropolitan area. *Pediatrics.* 1994;93(6 Pt 1):977–85.
 27. Kelly D, Coutts A. Early nutrition and the development of immune function in the neonate. *Proc Nutr Soc.* 2000; 59(2):177–85.
 28. Pabst HF, Spady DW, Pilarski LM, Beeler JA, Krezolek M. Differential modulation of the immune response by breast or formula feeding of infants. *Acta Paediatr.* 1997;86(12):1291–1297.
 29. Hawkes JS, Neumann MA, Gibson RA. The effect of breast feeding on lymphocyte subpopulations in healthy term infants at 6 months of age. *Pediatr Res.* 1999;45(5 Pt 1):648–651.
 30. Jain L, Vidyasagar D, Xanthou M, Ghai V, Shimada S, Blend M. In vivo distribution of human milk leukocytes after ingestion by newborn baboons. *Arch Dis Child.* 1989;64(7 Spec No):930–3.
 31. Letterio JJ, Geiser AG, Kulkarni AB, Roche NS, Sporn MB, Roberts AB, et al. Maternal rescue of transforming growth-beta 1 null mice. *Science.* 1994;264(5167):1936–8.
 32. Rousset F, Garcia E, Defrance T, Péronne C, Vezzio N, Hsu DH, et al. Interleukin 10 is a potent growth and differentiation factor for activated human B lymphocytes. *Proc Natl Acad Sci.* 1992;89(5):1890–3..
 33. Ogawa J, Sasahara A, Yoshida T, Sira MM, Futatani T, Kanegane H, et al. Role of transforming growth factor-beta in breast milk for initiation of IgA production in newborn infants. *Early Hum Dev.* 2004;77(1-2):67–75.
 34. IJ O., BU O., & SO, N. Prevalence of Post-Operative Anaemia and its Complications among Obstetric and Gynaecological Patients in Enugu. *Journal of Medical Research and Health Sciences,* 2022; 5(9): 2250–2255.