Original Article

DOI: https://doi.org/10.47648/jswmc2022v12-02-50

Risk Factors for the Development of Pneumonia Below 2 Years of Age

*Khan HJ[1], Hasan SD[2], Azad T[3], Dev A[4], Das AC[5], Chowdhury TJ[6]

Abstract:

Acute respiratory tract illness is the leading cause of death in the developing countries. This case control study was endeavored with an aim to assess the factors that can increase the risk of pneumonia in children.

Methodology: This Case-Control study was carried out at the Paediatrics Department of Jalalabad Ragib-Rabeya Medical College Hospital (JRRMCH) in Sylhet from January 2018 to July 2018.This study involved 200 children of 6 to 24 months age, among them 100 children who was hospitalized in JRRMCH for pneumonia during the study period as case. The control group included 100 children who was selected purposively came for immunization at JRRMCH EPI centre and at OPD for other problem but free from pneumonia. Sample were selected according to the inclusion & exclusion criteria. A case definition for pneumonia as outlined by the WHO(2014) was used as the criteria for case inclusion. Children with history of low birth weight, congenital cardiovascular or respiratory malformation, chromosomal abnormalities, recurrent wheeze, were excluded from the study. Data were collected by interviews of the parents using a structured questionnaire. Pneumonia (a child with cough or difficult breathing and fast breathing and or chest in-drawing with recently developed radiological pulmonary shadowing)[1] affected 100 children included in case group and 100 children free of pneumonia included in control group. SPSS version 22 were used to analyze the data. Independent sample't' test and Chi (x^2) square test were done.

Results: Residential area, socio-economic status, maternal education, H/A score, formula feeding, types of complimentary feeding, passive smoking, birth order >2, family member, crowding index and birth spacing are significantly associated with development of pneumonia.

Conclusion: Children belonged to rural area, poor maternal education, low socio-economic status, stunting height for age, formula feeding, types of complimentary feeding, exposure to passive smoking, birth order>2, birth spacing, family member and crowding index were significantly ($p<0.05$) associated with pneumonia.

Keywords: Risk factors, pneumonia, formula feeding, breast feeding, passive smoking.

JSWMC 2022 [12(02)] P: 38-45

Introduction:

About 11.5% under five children in Bangladesh are suffering from pneumonia.[2]

1. Dr. Habiba Jamila Khan, Register, Dept. of Paediatrics, Jalalabad Ragib-Rabeya Medical College, Sylhet
2. Dr. Syed Dider Hasan, Lecturer, Department of anatomy, Sylhet M. A. G. Osmani Medical College, Sylhet
3. Dr. Tarek Azad, Professor, Dept. of Paediatrics, Jalalabad Ragib-Rabeya Medical College, Sylhet
4. Dr. Archana Dev, Associate Professor, Dept. of Paediatrics, Jalalabad Ragib-Rabeya Medical College, Sylhet
5. Dr. Ashith Chandra Das, Associate Professor, Dept. of Paediatrics, Jalalabad Ragib-Rabeya Medical College, Sylhet
6. Dr. Tahmina Jahan Chowdhury, Associate Professor, Dept. of Paediatrics, Jalalabad Ragib-Rabeya Medical College, Sylhet

Corresponding author: Dr. Habiba Jamila Khan,
Register, Dept. of Paediatrics, Jalalabad Ragib-Rabeya Medical College, Sylhet
Email: habibasorin@gmail.com

In developing countries, illness and death due to pneumonia among the poorest children are marked by substantial wealth gap.[3]Breastfeeding interventions provides survival benefits during new born, infants and early childhood.[4]

Human milk provides essentials nutrition to the newborn and infants[5]. Besides,It provides immunological protections against several infections.[6]

Several risk factors are associated with pneumonia. Researchers foundassociation of pneumonia with early weaning, use of pacifiers, low birth weight, exposure to passive smoking, severe history of respiratory tract disease, multi-parity and several other factors.[7,8,9,10]

Children dietary pattern, low maternal education and low socioeconomic status, weight-for-age, height-for-age, and weight-for-heighthave been postulated as risk factor of such conditionamong children.[11,12]

Inequality of income distributionalso has a worse effect on the health indicators, even in infant mortality and life expectancy.[13]

To identify high-risk groups, detailed understanding about the risk factors of pneumonia is requiredfor future prevention and management.

Given the high mortality rates among Bangladeshi infants, identifying the protective role of breastfeeding against the risk of pneumonia become very much decisive for the survival of Bangladeshi infants.

Therefore, this study were conducted to evaluate the relationship between breastfeeding and the risk of pneumonia to reduce the morbidity and mortality of such patients and cope with the worse prognosis of pneumonia.

Methods:

This is a case control study, carried out in the Department of Paediatrics, Jalalabad Ragib-Rabeya Medical College and Hospital (JRRMCH), Sylhet. Total 200 children were selected by purposive sampling. The age ranges of the children were 6 to 24 months. Out of 200 children, 100 were case suffering from pneumonia. Another 100 children were control but free of pneumonia. Case group children included in group I and control group children included in group II. The research received ethical approval from ethical committee of Jalalabad Ragib-Rabeya Medical College and Hospital (JRRMCH), Sylhet. Signed informed consent was obtained from the parents of all the participants. Before taking the consent, method of the study were clearly described to the parents. The methods of study, confidentiality, risk and benefits were informed in local language. Confidentiality of the data weremaintained. Anthropometric data were obtained to minimize the potential sampling error. Weight was recorded by conventional beam balance scale. When it was not possible, weight was calculated by subtracting the weight of mother from the combined weight of mother-child pair. Height/Length was measured by infantometer. For H/A we followed CDC growth chart & for W/H WHO/NCHS Normalized Reference chart.

All data in the questionnaire were coded and entered into Statistical Package for the Social Sciences (SPSS) version 22. Mean ± SD and percentage (%) were used for expression of data. Independent sample't' test and Chi (x^2) square test was done. p value of < 0.05 was considered as statistically significant.

Results:

All subjects were similar by age ($p>0.05$) (Table I). The sex difference between group-I and group-II did not show any significant difference ($\chi^2=0.081$; $p>0.05$) (Table I).

Frequency distribution of children lived in rural area and urban area showed difference. The result was statistically significant ($\chi2=16.362$; $p<0.05$) (Table I).

Mean age of the mother of both group showed so significant difference ($p>0.05$) (Frequency distribution of education of mother were statistically significant ($\chi2=11.241$; $p<0.05$) (Table I). But father's education showed no significant difference ($\chi^2=5.522$; $p>0.05$) (Table I).

Frequency distribution of working and non-working mother were similar ($\chi^2=0.157$; $p>0.05$) (Table I).

More children in control group belong to the urban area. The frequency distribution of residential area of the children showed significant difference ($\chi^2=13.772$; $p<0.05$) (Table I).

Table I).

Weight for height showed no significant difference between case and control (Table II). But height for age showed significant difference between case and control ($p<0.05$) (Table II).

Exclusive breastfeeding (EBF) were significantly lower in case group children. Where EBF practices is more in control group children ($\chi^2=42.473$; $p<0.05$) (Table III).Formula feeding in control group were significantly lower than case ($\chi^2=8.33$; $p<0.05$) (Table III).But the duration of breastfeeding showed so statistical significant difference ($p>0.05$) (Table III).The frequency distribution of use of complimentary food between group I and II showed significant difference ($p<0.05$) (Table III).

Children exposed to passive smoking showed significant difference between two groups ($\chi^2=4.32$; $p<0.05$) (Table IV). In case group, number of birth order >2 is more than the

control group (χ^2=6.71; p<0.05) (Table IV). The mean number of family member ware greater in case than control group (p<0.05) (Table IV). More than three-forth children were partially immunized (χ^2=4.91; p>0.05)(Table IV). Birth spacing between case and control group showed significant difference (χ^2=3.85; p<0.05) (Table IV). More children belong to control group were the single baby of their family (χ^2=5.54; p<0.05) (Table IV). Crowding index were significantly higher in case than control (χ^2=3.56; p<0.05) (Table IV).

Table I: Distribution of study population by demographic variable (N=200)

Demographic profile	Group-I Case (n=100)	Frequency (%)	Group-II Control (n=100)	Frequency (%)	Odds ratio	P-value
Age						
Months	10.395 ±4.037 (6-24)		10.935 ± 4.26 (6-22)			0.25^{ns}
Sex						
Male	57	57	45	45	0.922 (0.527-1.612)	0.776 ^{ns}
Female	43	43	55	55		
Residential Area						
Rural	47	47	20	20	3.547 (1.893-6.646)	0.000***
Urban	53	53	80	80		
Maternal age						
Years	26.14±4.96 (18-36)		25.72±4.24 (19-36)			0.521^{ns}
Maternal Education						
No education	16	16	5	5		
Primary	24	24	27	27		0.01***
Secondary	52	52	48	48		
Higher	8	8	20	20		
Working mother						
Yes	14	14	16	16	1.170 (0.538-2.547)	0.692^{ns}
No	86	86	84	84		
Father's education						
No education	8	8	5	5		
Primary	25	25	26	26		0.137^{ns}
Secondary	54	54	44	44		
Higher	13	13	25	25		
Socioeconomic status						
Low	37	37	15	15		
Middle	56	56	70	70		0.001***
High	7	7	15	15		

n= number of subjects in each group; N= total number of subjects; ***p- highly significant; ns- non significant.

Table II: Distribution of study population by W/H score and H/A score (N=200)

Score	Group-I Case (n=100)	Frequency (%)	Group-II Control (n=100)	Frequency (%)	P-value
W/H score					
Acceptable	77	77	82	82	
Moderate wasting	21	21	17	17	0.634^{ns}
Severe wasting	2	2	1	1	
H/A score					
Acceptable	76	76	87	87	0.044*
Moderate stunting	20	20	13	13	
Severe stunting	4	4	0	0	

n= number of subjects in each group; N= total number of subjects; ***p- highly significant; *p-significant;ns- non significant.

Table III: Distribution of study population depending upon their feeding practice (N=200)

Variables	Group-I Case (n=100)	Frequency (%)	Group-II Control (n=100)	Frequency (%)	Odds ratio (95% CI)	P-value
EBF						
Yes	24	24	70	70	7.389 (3.946-13.836)	0.000***
No	76	76	30	30		
Formula feeding						0.004***
Yes	50	50	30	30	0.429 (0.24-0.766)	
No	50	50	70	70		
Duration of breast feeding						
Months	9.9± 4.82 (2-24)		10.31± 4.78 (0-22)			0.547^{ns}
Complimentary feeding						
Yes	99	99	96	96	0.242 (0.27-2.208)	0.174^{ns}
No	50	50	70	70		
Types of complimentary feeding						
Kichuri	48	48	65	65		
Rice paste	47	47	21	21		0.000***
Smashed banana	2	2	2	2		
Others	3	3	12	12		

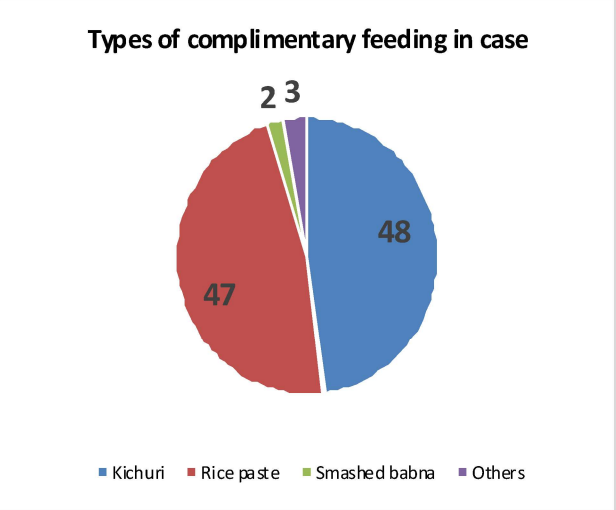
n= number of subjects in each group; N= total number of subjects; ***p- highly significant; ns- non significant.

Table IV: Distribution of study population depending upon passive smoking, birth order >2, Family member, immunization history, Birth spacing and crowding index (N=200)

Variables	Group-I Case (n=100)	Frequency (%)	Group-II Control (n=100)	Frequency (%)	Odds ratio (95% CI)	P-value
Passive smoking						
Yes	40	40	38	38	0.919 (0.521-1.623)	0.02*
No	60	60	62	62		
Birth order >2						
Yes	55	55	24	24	0.258 (0.141-0.473)	0.000***
No	45	45	76	76		
Family member						
Number	6.62±3.27 (3-20)		5.35±2.27 (3-13)			0.002***
Immunization history						
Complete	24	24	23	23		0.067
Partial	72	72	73	73		
Not immunized	4	4	4	4		
Birth spacing (Years)						
>2	39	39	34	34		0.000***
2	20	20	5	5		
<1	9	9	0	0		
	32	32	61	61		
Single baby Crowding index (Higher)						
Yes	54	54	22	22	0.24 (0.132-0.445)	0.000***
No	46	46	78	78		

n= number of subjects in each group; N= total number of subjects; ***p- highly significant; ns- non significant.

ISSN: 2708-2857 (P), 2710-0405 (O)
2022 July; Volume 12; Issue 02



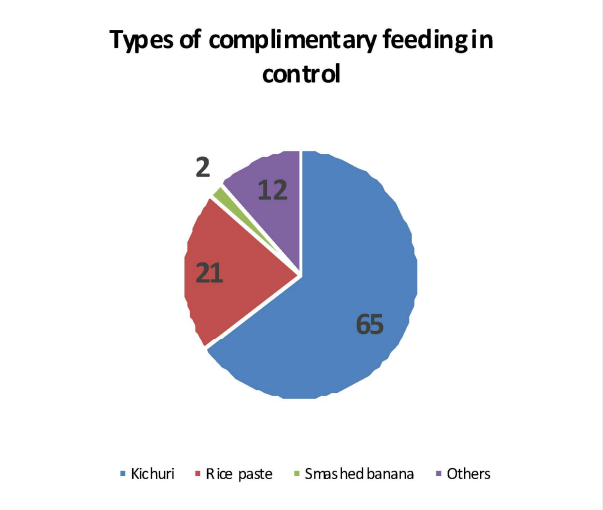


Figure: Types of complimentary feeding in both groups

Discussion:

6% hospitalization of children occur every year due to respiratory tract disease especially lower respiratory tract infection.[14]Several risk factors are described by researchers that are closely associated with development of pneumonia in early life.[15,16] Most importantly children's dietary pattern and breastfeeding practice. Low weight at the time of birth, parity, BCG vaccination, parent's education, social class difference, overcrowding, unfavorable house condition, and exposure of passive smoking also described as vulnerable factors for pneumonia.[16,17]

The mean age and gender difference of both case and control group did not show any significant difference in our study. Almost similar age ranged were also observed by Chistiet al.[18]

Majority of children who are free of this deadly disease in our study were living in the urban area.

Maternal age had no effect on the development of pneumonia in children.

Poor maternal education and low socioeconomic status were significantly associated with pneumonia.

But we did not find relationship between father's educations and working status of mother with the development of pneumonia.

We observed weight for height (W/H) score and height for age (H/A) score in both the groups. There were no significant difference found weight for height in two groups. But height for age showed significant difference between two groups. Pneumonia affected children had chronic malnutrition compared with the control group children.

Feeding practice of both the groups were different.76% children who were suffering from pneumonia did not endure EBF. Most of the children in control group did not undergo formula feeding. On the other hand 50 pneumonia affected children were taking formula feed at the time of admission. The result was significant.

The mean duration of breastfeeding was similar in both groups. Human breast milk has unique properties against respiratory infection.[19]

Types of complimentary food were different in both groups. Majority of the children who were suffering from pneumonia, were taking rice paste. On the other hand, more control group children were taking kichuri. The result was significant.

In our study we observed the significant effect of passive smoking on the development of pneumonia. Majority of children in control group were free from the exposure of passive smoking.

In our study the family where there is more family member and the birth order is more than >2, their children were significantly suffering from pneumonia.

Birth spacing > 2 years was significantly more common in case group children. On the other hand majority children in control group were single baby of their family.

The difference of immunization history was not significant.

The pneumonia affected children belonged to overcrowded family in our study. Family member and crowding index were significantly higher in pneumonia affected children.

Our study demonstrated that formula feeding children were more susceptible to pneumonia than breastfeeding children.This observation is analogous with Sarah et al. They described that, formula feeding infant has less developed immunity as it hinders development of beneficial bacteria.[19]

Maternal level of education and what type of occupation she involves are associated with socio-economic status of a family. Several studies emphasized the relationship of mother's education with children's health.[20,21]As mothers are the primary caregiver, their education has an impact on child's quality of life, affecting rate of pneumonia in the developing countries.[21]Christiono et al. found association of maternal low education and maternal smoking habit with the development of pneumonia below 1 year children.[16] They also found that rate of hospitalization for pneumonia can be minimize by exclusive breastfeeding below 6 months of age and regular breastfeeding up to 1 year[22]. Not only tobacco smoking, household smoke are also responsible for passive smoking to children.[24]Christiono et al. found negative correlation between development of pneumonia with income inequality and smoking prevalence in their study.[16]

Studies found that, children who exposed to the passive smoking had less phagocytic function and decreased cilliary activity. Suppression of such activity leads to more adherence of bacteria to the respiratory tract, favors their colonization.[23]

Silvio et al. conducted a cross-sectional study over 775 children and concluded that children who exposed to smoking at the time of pregnancy, present smoking habit of mother, low socio-economic status, poor maternal education and unfavorable home environment were more prone to develop pneumonia.[17] Their finding supported the result of our study.

Conclusion:

In conclusion, our study suggests that residential are, socio-economic status, maternal education, H/A score, formula feeding, types of complimentary feeding, passive smoking, birth order >2, family member, crowding index and birth spacing are the potential risk factors for the development of pneumonia below 2 years of children. The risk of pneumonia in children can be minimize by focusing the improvement of the lifestyle modification, proper family education and focusing children dietary pattern.

Reference:

1. World Health Organization.The management of acute respiratory infections in children:practical guidelines for outpatient care.Geneva:WHO;2014
2. Kabir AL, Amin MR, Mollah MA, Khanam S, Mridha AA, Ahmed S, Rokonuddin K, Chisti MJ. Respiratory disorders in under-five children attending different hospitals of Bangladesh: A cross sectional survey. Journal of Respiratory Medicine Research and Treatment. 2016;11(10.5171):2016-183615.
3. Gupta GR. Tackling pneumonia and diarrhoea: the deadliest diseases for the world's poorest children. Lancet (London, England). 2012;379(9832):2123-4.
4. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. World Health Organization; 2009.
5. Lawrence RA, Lawrence RM. Breastfeeding e-book: a guide for the medical professional. Elsevier Health Sciences; 2021.
6. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. Evidence report/technology assessment. 2007;153:1-86.
7. Caetano JD, Bordin IA, Puccini RF, Peres CD. Factors associated to hospitalization of children under five years of age, Brazil. Revista de saudepublica. 2002;36(3):285-91.

8. CARVALHO L, Pereira ED. Respiratory morbidity among passive smoking children.Jornal de Pneumologia. 2002;28(1):8-14.
9. Fonseca W, Kirkwood BR, Victora CG, Fuchs SR, Flores JA, Misago C, et al. Risk factors for childhood pneumonia among the urban poor in Fortaleza, Brazil: a case--control study. Bulletin of the World Health Organization. 1996;74(2):199.
10. Shah N, Ramankutty V, Premila PG, Sathy N. Risk factors for severe pneumonia in children in south Kerala: a hospital-based case-control study. Journal of tropical pediatrics. 1994;40(4):201-6.
11. César JA, Victora CG, Barros FC, Santos IS, Flores JA. Impact of breast feeding on admission for pneumonia during postneonatal period in Brazil: nested case-control study. Bmj. 1999;318(7194):1316-20.
12. Cesar JA, Victora CG, Santos IS, Barros FC, Albernaz EP, Oliveira LM, Flores JA, Horta BL, Weiderpass E, Halpern R. Hospitalization due to pneumonia: the influence of socioeconomic and pregnancy factors in a cohort of children in Southern Brazil. Revista de saudepublica. 1997;31(1):53-61.
13. Szwarcwald CL, Bastos FI, Esteves MA, Andrade CL, Paez MS, Medici EV, Derrico M. Income inequality and health: the case of Rio de Janeiro. Cadernos de SaúdePública. 1999;15(1):15-28.
14. Bachrach VR, Schwarz E, Bachrach LR. Breastfeeding and the risk of hospitalization for respiratory disease in infancy: a meta-analysis. Archives of pediatrics & adolescent medicine. 2003;157(3):237-43.
15. Hanieh S, Ha TT, Simpson JA, Thuy TT, Khuong NC, Thoang DD, Tran TD, Tuan T, Fisher J, Biggs BA. Exclusive breast feeding in early infancy reduces the risk of inpatient admission for diarrhea and suspected pneumonia in rural Vietnam: a prospective cohort study. BMC Public Health. 2015;15(1):1-0.
16. Boccolini CS, Carvalho ML, Oliveira MI, Boccolini PD. Breastfeeding can prevent hospitalization for pneumonia among children under 1 year old. Jornal de pediatria. 2011;87:399-404.
17. Silvio OP, Gilberto BF, Juraci AC, Alisson RF, Halid M, Tissyanna HF, LeopoldoAS.Acute lower airway disease in children under five years of age: influence of home environment and maternal smoking. Jornal de pediatria. 78 (5) 2002:78 (5):512-518
18. Chisti MJ, Salam MA, Smith JH, Ahmed T, Ashraf H, Bardhan PK, Pietroni MA. Impact of lack of breast feeding during neonatal age on the development of clinical signs of pneumonia and hypoxemia in young infants with diarrhea. Plos one. 2011;6(10):e25817.
19. Hanieh S, Ha TT, Simpson JA, Thuy TT, Khuong NC, Thoang DD, Tran TD, Tuan T, Fisher J, Biggs BA. Exclusive breast feeding in early infancy reduces the risk of inpatient admission for diarrhea and suspected pneumonia in rural Vietnam: a prospective cohort study. BMC Public Health. 2015;15(1):1-0.
20. de Souza AT, Peterson KE, Andrade FM, Gardner J, Ascherio A. Circumstances of post-neonatal deaths in Ceara, Northeast Brazil: mothers' health care-seeking behaviors during their infants' fatal illness. Social science & medicine. 2000;51(11):1675-93.
21. Parker L, Lamont DW. Mothering skills and health in infancy: the Thousand Families study revisited. The Lancet. 1999;353(9159):1151-2.
22. Boccolini CS, Carvalho ML, Oliveira MI, Boccolini PD. Breastfeeding can prevent hospitalization for pneumonia among children under 1 year old. Jornal de pediatria. 2011;87:399-404.
23. Ramezani M, Aemmi SZ, EmamiMoghadam Z. Factors affecting the rate of pediatric pneumonia in developing countries: a review and literature study. International Journal of Pediatrics. 2015;3(6.2):1173-81.
24. US Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. Atlanta, GA, USA: CDC, 2006.