Medico Research Chronicles
ISSN NO. 2394-3971
DOI No. 10.26838/MEDRECH.2024.11.5.732
Contents available at www.medrech.com

Incidence and Risk Factors for Pneumonia and Diarrhea in Children under 5 in a Secondary Care Hospital

[1]Dr. Mohammad Ismail Hossain, [2]Dr. Md Nasiruzzaman, [3]Dr. A. K. M. Abu Syed, [4] Dr. Md. Jainul Abedin

1. Jr. Consultant, Upazila health complex Matlab Uttar, Chandpur, Bangladesh
2. Senior Consultant, Department of Pediatric, OSD (Additional) Directorate General of Health Services (DGHS), Dhaka, Bangladesh.
3. Matlab (Uttar) Upazila Health Complex, Chandpur, Bangladesh
4. BDS (Dhaka Dental College), BCS(Health), MCPS (Dental Surgery), FCPS(Oral and Maxillofacial Surgery), Junior Consultant, Matlab (Uttar) Upazila Health Complex, Chandpur, Bangladesh

ARTICLE INFO

Article History
Received: July 2024
Accepted: October2024
Key Words:
Prehabilitation; Joint Arthroplasty; Physiotherapy; Postoperative Complications; Functional Outcomes; Patient Recovery

ABSTRACT

ORIGINAL RESEARCH ARTICLE

Background: Pneumonia and diarrhoea are two of the leading causes of morbidity and mortality, particularly in children under five years of age, especially in low- and middle-income countries. Both conditions are preventable and treatable, yet they remain significant health issues globally.
Objectives: The aim of the study was to evaluate the incidence and risk factors for pneumonia and diarrhea in children under 5 in a secondary care hospital.
Methods: This cross-sectional study was carried out in the Upazila health complex Matlab Uttar, Chandpur, Bangladesh, during January 2023 to December 2023. A total of 150 patients were participated in the study. Among them 60 were pneumonia patients (Group-A) and 90 were patients with diarrhea (Group-B). Statistical analyses of the results were be obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-24).
Results: The age distribution of the study population revealed that (53.33%) of patients in group A were between the ages of one month to one year, while (53.33%) in group B. In addition, 6.66% of the patients in group A were between the ages of 3 and 4 years old, while 10% were in group B. In group A, the bulk of the patients were male (63.33%), while group B had 51 (56.66%). There was no statistically significant difference ($p>0.05$) between the groups.
Conclusion: The need for targeted interventions to improve vaccination coverage, nutritional support, and sanitation practices to reduce the burden of pneumonia and diarrhoea in young children. Strengthening

Corresponding author
M. I. Hossain*

primary healthcare systems to provide early detection and management of these conditions is also essential in mitigating their impact.

2024, www.medrech.com

INTRODUCTION

Pneumonia remains the greatest preventable cause of mortality for children under the age of five worldwide. In 2016, the disease killed around 880,000 children, accounting for 16% of total mortality among children under the age of five. [1] Although pneumonia affects children in all regions, low and middle-income countries have the greatest pneumonia-related death rates. The majority (82%) of these deaths occur in Sub-Saharan Africa and South Asia, an increase from 77% in 2000. [2] Previous research has found a link between pneumonia and poverty-related factors such as indoor air pollution, household congestion, malnutrition, vitamin A deficiency, zinc deficiency, birth order, and the mother's educational level. [3] As a result, the greater risk of pneumonia fatality among children in low- and middle-income countries is not surprising. Other predictors of childhood pneumonia, such as a lack of exclusive breastfeeding, low birth weight, HIV infection, and insufficient immunization, have been found to be widespread in LMICs.

Childhood pneumonia continues to be a prominent cause of death in underdeveloped nations, accounting for up to 21% of all fatalities among children under the age of five. In most poor nations, the mortality rate for children under the age of five is between 60 and 100 per 1000 live births, with pneumonia accounting for one-fifth of these deaths. [4] Each year, pneumonia kills an estimated 1.9 million children. African children under the age of five account for half of all pneumonia deaths worldwide. In Sub-Saharan Africa, pneumonia is estimated to be responsible for 17-26% of all child deaths under the age of five. [5] Kenya is currently rated among the 15 countries with the greatest estimated number of deaths from clinical pneumonia, with a mortality rate of 50.3 per 10,000 under-fives each year. In Kenya, pneumonia is the second largest cause of mortality among children under the age of five, accounting for 16% of all deaths in that age range. In 2008, the country had 6,185,800 children under the age of five, of whom 111,000 were expected to have died, with pneumonia accounting for 16% (n=30,000). [6] In Kenya, pneumonia in children under the age of five is now diagnosed using Integrated Management of Childhood Illness (IMCI) criteria at public health institutions.

Diarrhoea is defined as the emission of soft or runny stool three or more times in 24 hours. Children under the age of three in impoverished nations have three episodes of diarrhoea on average each year. Diarrhoea is a leading cause of illness and mortality in children under the age of five in developing and low-income countries, with causes including dehydration, bloody diarrhoea (dysentery), and persistent diarrhoea with malnutrition. In each incidence of diarrhoea, the patient is more prone to become unwell. [7] According to WHO data from 2016, diarrhoea is the leading cause of under-five mortality, accounting for 8.4 per 1,000 live births. In Southeast Asia, diarrhoea ranks fifth, accounting for 8.8 per 1,000 births. [8] Every year, almost 1.7 billion children worldwide contract diarrhea, which kills approximately 525,000 children under the age of five. The majority of diarrhea deaths occur in children under the age of two in South Asia and sub-Saharan Africa. [9]

Diarrhea is one of the leading causes of mortality and morbidity in children, particularly in low- and middle-income countries (LMICs). In 2013, about half (3.2 million) of the 6.3 million children who died before the age of five died from infectious

illnesses, with diarrhea killing more than 500,000. By 2030, it is anticipated that 4.4 million children under the age of five will die each year from infectious illnesses, with Sub-Saharan Africa accounting for 60% of those deaths. [10] Diarrhoea is responsible for an estimated 3.6% of the worldwide illness burden, measured in disability-adjusted life years (DALYs). Although global diarrhoea mortality has decreased significantly over the last 25 years, diarrhoea morbidity in Sub-Saharan Africa has not, as risk factors such as inadequate water, sanitation, and hygiene (WASH), insufficient breastfeeding promotion, and malnutrition remain unacceptable. The fast growth of African towns and the resulting overcrowding have been connected to diarrhea outbreaks, with children under the age of five being the most vulnerable. [11]

METHODOLOGY

This cross-sectional study was carried out in the Upazila health complex Matlab Uttar, Chandpur, Bangladesh, during January 2023 to December 2023. A total of 150 patients were participated in the study. Among them 60 were pneumonia patients (Group-A) and 90 were patients with diarrhea (Group-B). Patients aged under 5 years both male and female, clinically diagnosed with pneumonia and diarrhea for at least 1 year was included in the study. After taking consent and matching eligibility criteria, data were collected from patients on variables of interest using the predesigned structured questionnaire by interview, observation. Statistical analyses of the results were be obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-24).

RESULTS

Table-1: Age distribution of children under five years of age.

Age	Group-A (n=60)	Group-B (n=90)	P value
1mo – 1 year	32 (53.33%)	48 (53.33%)	
>1 year – 2 year	14 (23.33%)	18 (20%)	
>2 year – 3 year	8 (13.33%)	12 (13.33%)	0.518
> 3 year – 4 year	4 (6.66%)	9 (10%)	
>4 year – 5 year	2 (3.33%)	3 (3.34%)	

Table-1 shows age distribution of the study population, it was observed that (53.33%) patients were belonged to age 1month – 1 year in group A and (53.33%) in group B. And (6.66%) patients were belonged to age >3 year – 4 year in group A and (10%) in group B.

Table -2 Sex distribution of children under five years of age.

Gender	Group-A (n=60)	Group-B (n=90)	P value
Male	38 (63.33%)	51 (56.66%)	0.210
Female	22 (36.66%)	39 (43.33%)	

Table 2 shows sex distribution of the study population, it was observed that majority 38(63.33%) patients were male in group A and 51(56.66%) in group B. The difference was not statistically significant (p>0.05) between two groups.

Table -3 Demographic characteristics of children under five years of age.

Child weight (kg)	Group-A (n=60)	Group-B (n=90)	P value
Father's education			
None	14 (23.33%)	24 (26.66%)	0.842
Some primary	17 (28.34%)	28 (31.11%)	
Some secondary	19 (31.66%)	20 (22.23%)	
Higher than secondary	10 (16.67%)	18 (20%)	
Mother's education			
None	21 (35%)	33 (36.66%)	0.245
Some primary	18 (30%)	27 (30%)	
Some secondary	13 (21.66%)	17 (18.89%)	
Higher than secondary	8 (13.33%)	13 (14.45%)	

Table 3. shows demographic characteristics of children under five years of age, it was observed that 17(28.34%) patients' fathers had primary education in group A and 28(31.11%) in group B. Followed by 19 (31.66%) patients' fathers had secondary education in group A and 18.94% in group B and 20% service holder in group A and 21.05% in group B. Whereas, 18(30%) patients' mothers had primary education in group A and 27(30%) in group B. Followed by 13(21.66%) patients' mothers had secondary education in group A and 17(18.89%) in group B. The difference was not statistically significant (p>0.05) between two groups.

Table -4 Weight distribution of children under five years of age.

Child weight (kg)	Group-A (n=60)	Group-B (n=90)	P value
1.00 - 5.99	31 (51.66%)	44 (48.89%)	0.087
6.00 - 10.99	20 (33.34%)	31 (34.45%)	
11.00 - 15.99	6 (10%)	10 (11.11%)	
16.00 - 20.99	3 (5%)	5 (5.55%)	

Table 4 shows weight distribution of children under five years of age, it was observed that the majority 31(51.66%) patients had 1.00 – 5.99 weight in group A and 44(48.89%) in group B. The difference was not statistically significant (p>0.05) between two groups.

Table -5 Household characteristics distribution of children under five years of age.

Household characteristics	Group-A n=60	Group-B n=90	P value
Number of household members			
< 5 members	20 (33.33%)	31 (34.44%)	<0.001
5–7 members	17 (28.33%)	25 (27.77%)	
8–10 members	15 (25%)	23 (25.55%)	
≥ 11 members	8 (13.33%)	11 (12.22%)	
Number of children			
< 2	15 (25%)	20 (22.22%)	<0.001
2 to 3	25 (41.67%)	38 (42.22%)	
4+	20 (33.33%)	32 (35.55%)	
Type of home			
Pukka	24 (40%)	38 (42.22%)	<0.001
Kuccha	36 (60%)	52 (57.78)	
Drinking water sources			
Tap water in the house	18 (30%)	25 (27.77%)	<0.001
Public tap	22 (36.67%)	32 (35.55%)	
Well water	12 (20%)	19 (21.11%)	
Others	8 (13.33%)	14 (15.55%)	
Indoor air pollution			
Yes	41 (68.33%)	57 (63.33%)	<0.001
No	19 (31.66%)	33 (36.66%)	
Toilet availability			
Yes	36 (60%)	42 (46.66%)	<0.001
No	24 (40%)	48 (53.34%)	
Smoking at home			
Yes	34 (56.66%)	54 (60%)	<0.001
No	26 (43.33%)	36 (40%)	

Table 4 shows household characteristics distribution of children under five years of age, it was observed that the majority 20(33.33%) patients had < 5 household members in in group A and 31(34.44%) in group B. Followed by Drinking water sources 22(36.67%) had public tap in group A and 32(35.55%) had public tap in group A. And 36(60%) had toilet in group A and 42(46.66%) had toilet in group B. On the other hand, 24(40%) hadn't any toilet in group A and 48(53.34%) hadn't any toilet in group B.

DISCUSSION

This cross-sectional study was carried out in the Upazila health complex Matlab Uttar, Chandpur, Bangladesh, Dhaka during January 2023 to December 2023. A total of 150 patients were participated in the study. Among them 60 were pneumonia patients (Group-A) and 90 were patients with diarrhoea (Group-B).

In this study, we compared diarrhoea and pneumonia prevalence and risk factors among children under the age of five in Upazila health complex Matlab Uttar, Chandpur. We found that (53.33%) patients were belonged to age 1months – 1year and

(6.66%) patients were belonged to age >3 year – 4 year of diarrhoea children under 5 years, which is slightly above the rate reported for the same age group in the 2014 Senegalese DHS (19%). [12] A study conducted in Burkina Faso during the cold, dry season found a rotavirus prevalence of 63.8% among children under the age of five. The same study showed that up to 90% of all diarrhoea cases in this population group were related to rotavirus. [13]

The findings of this study showed that majority 38(63.33%) male patients were pneumonia and 51(56.66%) male patients were diarrhoea. The gender distribution indicated that pneumonia and diarrhoea was more prevalent in male children than in female children, which revealed that a relation existed between gender. This finding agrees with the study of Almirall, et al., who found that pneumonia occurs more commonly in males than females. [14] In several community-based studies, boys appear to be more frequently affected by pneumonia than girls. [15]

According to the weight distribution of children under the age of five, the majority of 31 (51.66%) patients had a weight between 1.00 and 5.99 in the pneumonia group and 44 (48.89%) in the diarrhoeal group. Most children were wasted, with their weight for age scores below the mean for age. Diarrhea and pneumonia have major effects on the nutrition of the child, with loss of nutrients as the main pathopysiologic mechanism. [16] Also, most mothers tend to withhold feeds during episodes of diarrhea thinking that will reduce the stool bulk, and hence stop the disease. Besides, the diarrhea episode, which usually results from infection places a metabolic demand on the child and if it is recurrent, it will affect the growth and development of the child with consequent malnutrition setting in, which thus brings in a cascade of vicious cycle. [17]

In this study it was observed that, in group A, 17 (28.34%) of the patients' fathers had a primary education, but in group B, 28 (31.11%) did. In group A, 18 (30%) of the patients' mothers had a primary education, while in group B, 27 (30%) did. The risk of having diarrhea was also found to be higher in children whose mothers had no formal education. This is similar to reports by Dikassa in Congo and Ekanem in Lagos, Nigeria. Both studies were demonstrated a strong association between the risk of having diarrhea and low or no education in mothers. [18, 19] Education is a vital tool in enlightening mothers and also changing their healthcare seeking behavior and practice. This knowledge is said to affect their behavior, especially as it relates to child rearing practices and healthcare. For example, Ahmed in Sudan found that illiterate mothers in rural areas were more likely to stop breastfeeding their child who developed diarrhea and resort to traditional remedies such as gum cautery in an attempt to stop teething. [20]

The majority of household residences in this study are living in cities. The results of multivariate analysis showed that dwellings have a relationship with the incidence of diarrhoea where households living in rural areas are more likely to incur incidence of diarrhoea in infants compared to those living in the cities. [21] Residents living in urban areas have better access to clean water, sanitation facilities, and care facilities. Urban populations tend to be of higher economic conditions which will have an impact on hygiene practices. [21] This is line with Nworie and Aluh stating that place of residence is a strong predictor of diarrhoea in infants. Those living in the countryside will tend to experience diarrhoea compared to those who live in the cities. [22] Living in the countryside will pose more risk of diarrhoea in infants compared to living in the cities. In general, people who live in urban areas will tend to have easier access to information about the diarrhoea prevention and handling, and to proper sanitation facilities and clean water

sources. [23] In urban areas, people also rarely keep livestock, where as in rural areas animal manure can also pollute drinking water sources and household environment. The management of municipal waste water in urban areas is also better because of ease of access in the construction of household waterways and safe disposal of faeces. Similarly, waste management in urban areas is more organized and safer than in rural areas, where waste tends to not be managed properly, and thus will cause the breeding of germs and flies which are spreading vectors of diarrhoeal diseases.

According to the World Health Organization (WHO), pneumonia is the leading cause of death among children under five worldwide. It accounts for approximately 14% of all deaths of children in this age group, and globally, around 120 million cases of childhood pneumonia are reported annually. Diarrheal diseases are another leading cause of morbidity and mortality in young children. Around 1.7 billion cases of childhood diarrhea are reported every year globally, and it contributes to approximately 9% of all deaths in children under five. In a secondary care setting, the incidence of pneumonia and diarrhea is often seen at the higher end of the spectrum due to the severity of cases that require referral from primary healthcare. In resource-limited settings, the incidence may be even higher due to delayed presentations and limited access to preventive healthcare.

Limitations of the study

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

CONCLUSION

The incidence of pneumonia and diarrhea in children under five is high due to the severity of cases referred to these centers. Risk factors like malnutrition, poor hygiene, lack of immunization, and environmental conditions play a crucial role in increasing vulnerability. Efforts to prevent and manage these diseases focus on vaccination, improving nutritional status, promoting good hygiene, and timely medical intervention.

RECOMMENDATION

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

ACKNOWLEDGEMENTS

The wide range of disciplines involved in the incidence and risk factors for pneumonia and diarrhea in children under 5 in secondary care hospital research means that editors need much assistance from references in the evaluation of papers submitted for publication. I would also like to be grateful to my colleagues and family who supported me and offered deep insight into the study.

REFERENCE

1. Jullien S, Pradhan D, Bassat Q. Pneumonia in Bhutanese children: what we know, and what we need to know. Pneumonia. 2020 Dec; 12:1-0.
2. Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. Epidemiology and etiology of childhood pneumonia. Bulletin of the world health organization. 2008; 86:408-16B.
3. Kilabuko JH, Nakai S. Effects of cooking fuels on acute respiratory infections in children in Tanzania. International journal of environmental research and public health. 2007 Dec;4(4):283-8.
4. Thiam S, Diène AN, Fuhrimann S, Winkler MS, Sy I, Ndione JA, Schindler C, Vounatsou P, Utzinger J, Faye O, Cissé G. Prevalence of diarrhoea and risk factors among children under five years old in Mbour, Senegal: a cross-sectional study. Infectious diseases of poverty. 2017 Aug 1;6(04):43-54.
5. ANSD I. Sénégal: Enquête Démographique et de Santé"" Continue.

Rockville: Agence Natl la Stat la Démographie ICF Int. 2015;2015.
6. Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. Epidemiology and etiology of childhood pneumonia. Bulletin of the world health organization. 2008; 86:408-16B.
7. Pahmi L, Endah WC. HOUSEHOLD Risk Factors on the Event of Diarrhea Disease: In Children Under Five Years Old in Indonesia (Secondary Data Analysis' 2017 Idhs). Jurnal Ilmu Kesehatan Masyarakat. 2019 Apr 8;10(1):50-8.
8. Ugboko HU, Nwinyi OC, Oranusi SU, Oyewale JO. Childhood diarrhoeal diseases in developing countries. Heliyon. 2020 Apr 1;6(4).
9. Aditianti A, Raswanti I, Sudikno S, Izwardy D, Irianto SE. Prevalensi Dan Faktor Risiko Stunting Pada Balita 24-59 Bulan Di Indonesia: Analisis Data Riset Kesehatan Dasar 2018 [Prevalence and Stunting Risk Factors in Children 24-59 Months in Indonesia: Analysis Of Basic Health Research Data 2018].
10. Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE, Cousens S, Mathers C, Black RE. Global, regional, and national causes of child mortality in 2000–13, with projections to inform post-2015 priorities: an updated systematic analysis. The lancet. 2015 Jan 31;385(9966):430-40.
11. Okeke IN. Diarrheagenic Escherichia coli in sub-Saharan Africa: status, uncertainties and necessities. The journal of infection in developing countries. 2009 Nov 27;3(11):817-42.
12. Agence Nationale de la Statistique et de la Démographie (ANSD)[Sénégal], ICF International. Enquête Démographique et de Santé à Indicateurs Multiples au Sénégal (EDS-MICS) 2010-2011.
13. Nitiema LW, Nordgren J, Ouermi D, Dianou D, Traore AS, Svensson L, Simpore J. Burden of rotavirus and other enteropathogens among children with diarrhea in Burkina Faso. International Journal of Infectious Diseases. 2011 Sep 1;15(9): e646-52.
14. Almirall J, Bolibar I, Balanzo X, Gonzalez CA. Risk factors for community-acquired pneumonia in adults: a population-based case-control study. European Respiratory Journal. 1999 Feb 1;13(2):349-55.
15. Mahalanabis D, Gupta S, Paul D, Gupta A, Lahiri M, Khaled MA. Risk factors for pneumonia in infants and young children and the role of solid fuel for cooking: a case-control study. Epidemiology & Infection. 2002 Aug;129(1):65-71.
16. Brown KH. Diarrhea and malnutrition. The Journal of nutrition. 2003 Jan 1;133(1):328S-32S.
17. Tomkins A. Nutritional status and severity of diarrhoea among pre-school children in rural Nigeria. The lancet. 1981 Apr 18;317(8225):860-2.
18. Dikassa L, Mock N, Magnani R, Rice J, Abdoh A, Mercer D, Bertrand W. Maternal behavioural risk factors for severe childhood diarrhoeal disease in Kinshasa, Zaire. International journal of epidemiology. 1993 Apr 1;22(2):327-33.
19. Ekanem EE, Akitoye CO, Adedeji OT. Food Hygiene Behaviour and Childhood Diarrhoea in Lagos, Nigeria: a Case—Control Study. Journal of diarrhoeal diseases research. 1991 Sep 1:219-26.
20. Ahmed IS, Eltom AR, Karrar ZA, Gibril AR. Knowledge, attitudes and practices of mothers regarding diarrhoea among children in a Sudanese rural community. East African medical journal. 1994 Nov 1;71(11):716-9.
21. Cronin AA, Sebayang SK, Torlesse H, Nandy R. Association of safe disposal of child feces and reported diarrhea in Indonesia: need for stronger focus on a neglected risk. International journal of environmental research and public health. 2016 Mar;13(3):310.

22. Nworie KM, Aluh DO, Aluh DO. Determinants of diarrhea and optimal childcare among Under-Five children in Nigeria: insights from the 2013 demographic and health survey. Fam Med Med Sci Res. 2018;7(2):1-7.

23. Hasan MM, Richardson A. What a sustainable household environment and knowledge of healthy practices relate to childhood morbidity in South Asia: analysis of survey data from Bangladesh, Nepal and Pakistan. BMJ open. 2017 Jun 1;7(6): e015019.