

Causes of Recurrent Pneumonia among the Children Visiting a Tertiary Care Hospital

Shahzeb Ahmed, Muhammad Irfan Bhatti and Shifa

ABSTRACT

Objective: The aim of this study was to determine the relative frequency of various causes of recurrent pneumonia.

Study Design: Observational / descriptive study

Place and Duration of Study: This study was conducted at the BV Hospital Bahawalpur, from March 2015 to December 31, 2015.

Materials and Methods: Total 300 patients visiting the pediatric department and diagnosed with recurrent pneumonia were included in this study.

Results: Total 300 patients diagnosed with recurrent pneumonia. 180(60%) were males and 120(40%) were females. Underlying cause was identified in 285 (95%) cases, and in 15 (5%) cases, the underlying cause could not be identified. Children with potential neurodevelopmental disorders suffering from recurrent pneumonia, mostly (90%) suffering from cerebral palsy, while 63% of the patients were with age under 1 year of age, 27% were 1-5 years old, 10 % were more than 5 years of old.

25 patients with underlying cause congenital heart disease, there were 10 patients with ventricular septal defect. Respiratory tract and gastrointestinal system anomalies in patients, Out of 10 cases, 4 cases had cleft palate, 3 cases had laryngomalacia/tracheomalacia, and 1 case had tracheoesophageal fistula, congenital cystic adenomatoid malformation and pulmonary sequestration.

Conclusion: Recurrent pneumonia as a recurrent respiratory tract infection is more common in our country. Common underlying diseases include neurodevelopmental disorders, recurrent bronchiolitis with aspiration pneumonia, congenital heart disease, Down syndrome, bronchiectasis, bronchial asthma, respiratory abnormalities, and cleft palate.

Key Words: Recurrent pneumonia; Neurodevelopmental disorder; Congenital heart defects; Aspiration pneumonia; Children.

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INTRODUCTION

Respiratory tract infections are still the main cause of morbidity and mortality in children, especially children under the age of 5 years.¹ On average, 6 to 10 respiratory infections episodes per year occur in a child.²

These are benign and self-limiting infections; however, sometimes children may suffer from potentially life-threatening infections such as epiglottitis, bacterial bronchitis, bronchiolitis and pneumonia. Where pneumonia is the most common infection and is the main cause of children under the five year of age worldwide. Although even a single pneumonia episode can be fatal, but in some children it may be repeatedly occur, which causes difficult to diagnose and treatment challenges for clinicians.³

Department of Pediatric Medicine, Bahawal Victoria Hospital, Bahawalpur.

Correspondence: Dr. Shahzeb Ahmed, Pediatric Unit 1 BVH Bahawalpur.

Contact No: 0342 6417280

Email: shahzeb.sadiq@gmail.com

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There are many reasons for the recurrence of pneumonia. Many of them are benign and simple to manage, such as recurrent viral respiratory infections or bronchial asthma, however, in other cases; there may be more serious pathological causes such as neuro developmental disorder, congenital heart disease, cardiovascular events, bronchiectasis and congenital structural anomalies of respiratory tract. Early and accurate diagnosis has become an important factor in distinguishing between relatively benign and more serious underlying causes in order to achieve optimal management, thereby minimizing the risk of progressive or irreversible lung disease.⁴

There are some general risk factors that cause children to suffer from recurrent respiratory infections. Lower respiratory tract infections are more common in male than girls,⁵ Peak incidence is 6-12 months of life, acute bronchiolitis occurs almost entirely in the first two years of life, two-thirds of children died because of respiratory infections also occurred in infancy.⁶ Premature babies, especially those who develop lung disease after ventilation, often require admission for the respiratory tract infections in infancy and early life. The only immune protective effect of breastfeeding, the only natural way of infants feeding against recurrent

respiratory tract infection, is the well-known reality in recent decades.⁷ The incidence of respiratory infections is more industrialized countries than non-industrialized countries.⁸ Large family size and parental smoking increase the risk of all respiratory diseases, especially lower respiratory tract infections. Pregnant mothers smoking and postnatal passive contact with smoking causes recurrent respiratory infections in children.^{8,9} In a small number of children with recurrent chest infections, complex immune system may be defective, often protecting the lungs from any hostile microbial environment and are used together to prevent ingress or ingestion of foreign substances from the lungs. These include physical defense such as coughing, sneezing and mucus clearance, resident cell defense such as lung macrophages, and a series of local body fluids or secretory mechanisms such as lysozyme and lactoferrin¹⁰⁻¹³. More specifically, in countries like Pakistan, large amounts of nutrients and micronutrient deficiencies (such as iron, vitamin A and D, zinc, etc.) and many other forms are ultimately associated with body defense against infections is one of the important causes of recurrent pneumonia. In fact, several of these defects may coexist and may interact with each other among the causes of recurrent infections.^{14,15} Surprisingly, despite a relatively common problem, the study of recurrent pneumonia is less and available in medical literature. The local data on this issue is more limited. The aim of this study was to determine the relative frequency of various causes of recurrent pneumonia.

MATERIALS AND METHODS

This descriptive study was conducted from March 2015 to December 31, 2015 at BV Hospital Bahawalpur. Total 300 patients diagnosed with recurrent pneumonia were included in this study.

Written consent was obtained from the parents, the research approved by Institutional Ethics Committee of the hospital. Recurrent pneumonia is defined as two episodes of radiologically diagnosed pneumonia in the same year, or three or more times during any time period, with complete resolution between clinical and radiological during acute episodes. In all suspected cases of recurrent pneumonia, detailed history of respiratory system and cardiovascular system (fever, cough, sweating too much, breathing difficulties, shortness of breath and wheezing, etc.) complaints, the history of birth, feeding history, development history and family history was taken. Perform detailed clinical examinations, including oral, respiratory, cardiovascular and central nervous system. After recovery from Pneumonia developmental and CNS examination must be performed.

CBC and chest x ray were performed in all cases while latest blood C / S, serum profile, ABG, ECG, echocardiography, barium swallowing, pulmonary function tests, laryngoscopy, bronchoscopy,

quantitative serum immunoglobulin , IgA and IgM) and CT chest and brain was carried out in selective cases for. Data analyzing was done by SPSS V 20..

RESULTS

Total 300 patients diagnosed with recurrent pneumonia. 180(60%) were males and 120(40%) were females. Underlying cause was identified in 285 (95%) cases, and in 15 (5%) cases, the underlying cause could not be identified. (Table-1) Children with potential neurodevelopmental disorders suffering from recurrent pneumonia, mostly (90%) suffering from cerebral palsy (Table 2), while 63% of the patients were with age under 1 year of age, 27% were 1-5 years old, 10 % were more than 5 years of old.

Table No.1: Frequency of underlying causes of recurrent pneumonias. (N = 300)

Cases	No	Percentage
Neurodevelopmental disability	182	64
Recurrent bronchiolitis with aspiration pneumonia	32	11
Congenital heart disease	23	8
Bronchiectasis	8	2.5
Bronchial asthma	8	2.5
Anomalies of the respiratory system	5	1.5
Cleft palate	5	1.5
Gastroesophageal reflux disease	4	1.3
Down syndrome without CHD	4	1.3
Severe malnutrition	3	1
Ciliallary dyskinesia	3	1
Foreign body	2	0.5
Thalassemia	2	0.6
Nutritional rickets	2	0.5
Immunodeficiency disorder	1	0.4
Sickle cell anemia	1	0.4
Undiagnosed	15	5
Total	300	

Table No. 2: Number of cases of recurrent pneumonia with type of underlying neurodevelopmental disability

Neurodevelopmental disability	No	Percentage
Cerebral palsy	164	90
Neurodegenerative brain disease	7	4
Werdnig Hoffman disease	6	3.5
Undiagnosed neuromuscular diseases	5	2.5

25 patients with underlying cause congenital heart disease, there were 10 patients with ventricular septal defect (Table 3). Respiratory tract and gastrointestinal system anomalies in patients, Out of 10 cases, 4 cases had cleft palate, 3 cases had laryngomalacia/tracheomalacia, and 1 case had tracheoesophageal fistula, congenital cystic adenomatoid malformation and pulmonary sequestration.

Table No. 3: Types of Congenital heart defects leading to recurrent pneumonia. (n = 25)

Ventricular Septal Defects	10
Patent Ductus Arterioses	3
Atrio Ventricular Septal Defects	4
Complex congenital heart defects	7
Atrial Septal Defects	1

DISCUSSION

The incidence of pneumonia may reach 10 per 100 children per year in developing countries¹⁷⁻¹⁹ Subgroup of children with recurrent pneumonia, which is often caused by defects in local lung / systemic host defense system or from a potential disease that changes lung defense mechanism.²⁰

In our study, a neurodevelopmental disorder was the most common cause of recurrent pneumonia and was present in 182(64%) patients. The Mean age at the time of diagnosis was 9 months. In Abdullah F study 114(48%) cases while in Rakesh L study 10.5% cases of pneumonia were reported.²¹ Neurodevelopmental disorders in children with respiratory complications are multiple factorials; several of these factors are coexisting, and may affect each other to damage the quality of life of these disabled children. These factors include repeated aspiration, dysfunctional mucus enhancers, Invalid cough reflex, lack of muscle, lack of exercise / physical activity, malnutrition and recurrent infections, in addition to the respiratory system, these people are prone to .^{22,23} Direct aspiration which occurs directly from the mouth, including feed / food material (liquid solids) as well as oral and upper respiratory tract secretions into the lower respiratory tract due to poor neuromuscular coordination and inadequate protective reflex.

In 32(11%) cases there was recurrent bronchiolitis with recurrent pneumonia with the mean age of 06 months of diagnosis. Although it is not well documented in the literature, according to our experience, breathing difficulties lead to the inhalation of milk and other liquid feeds due to "taking turn" failure between swallowing and breathing, the need for admission may be the most common complication of bronchiolitis. This may lead to secondary bacterial pneumonia. Cycle In the first two years of life, bronchiolitis is more common. As a baby is hospitalized, children with bronchiolitis have a higher incidence of asthma, but it is

not clear whether children with asthma are more likely to be hospitalized with bronchiolitis.²⁴

23 (8%) patients had congenital heart defects. 4 cases were Down's syndrome. The Mean age of the diagnosis was 13 months. Abdullah F et al reported 22 cases (9.2%).³ The cardiac and lung pathophysiology were closely related. Direct pulmonary complications of chronic heart disease causes atelectasis and secondary infection, and also causes abnormal pathophysiological mechanism resulting in increased pulmonary fluid abnormalities, difficulty in breathing caused by inhalation. The severity of the disease is due to malnutrition, anorexia, reduced intake, repeated CCF and frequent infection.²⁵

Eight patients (2.5%) developed bronchiectasis. In 2 cases Past history of measles and tuberculosis was present, and 3 patients had no predisposing factors. Eight patients (2.5%) had bronchial asthma. Because of the multiple episodes of airway obstruction that responded to asthma treatment, these cases were clinically diagnosed with bronchial asthma. Pulmonary function tests also support the diagnosis of wherever it was applied. Other investigations were normal. The Mean age of the diagnosis was 4.5 years. In the Indian study, Rakesh L et al reported 26% of bronchial asthma cases, leading to recurrent pneumonia, which is very high, compared to our study.

Cleft Palate was the next common cause of recurrent pneumonia in 5 (1.5%) cases. Recurrent aspiration due to structural defects and coordination disorders is very well known complication of cleft palate. In our study, the other two components of Pierre Robin's syndrome, micrognathia, and glossoptosis also exist in all cases. It should be noted that in the presence of micrognathia, and glossoptosis, the chance of inspiration increases.

5 patients (1.5%) had congenital respiratory abnormalities. 2 cases of the Laryngomalacia / tracheomalacia were present in our study. One case of tracheoesophageal fistula, congenital cystic adenomatous malformations and pulmonary sequestration each was present in our study. Compared with study conducted by Abdullah F et al., the numbers of cases were less than that of congenital anomalies 18 patients with recurrent pneumonia were present in his study.²⁶

Four patients (1.3%) had recurrent gastrointestinal disease in patients with recurrent pneumonia. In these patients, it was reported that there was a significant association between respiratory and subsequent vomiting leading to respiratory symptoms.²⁷ All of these children were neurologically normal on both history and clinical examinations. The mean age of diagnosis was 7 months. The Four patients (1.3%) had recurrent pneumonia with Down's syndrome, without chronic heart disease. The rate of infections particularly pneumonia is 12 times more in Down syndromic children as compared with general population.^{28,29}

primary ciliary muscle dyskinesia 3(1%) cases with recurrent pneumonia were present. The diagnosis was basically made on clinically based on the presence of situs inversus and recurrent respiratory tract infections. The Mean age of diagnosis was 2 years old. As a diagnostic test for mucus clearance, such as a saccharin test and a nitric oxide test is not available in our setup, we might have missed a few cases of primary ciliary dyskinesia.³⁰

03 (1%) cases had severe malnutrition. In these cases, all other etiological investigations were normal except the presence of severe malnutrition. In severe malnutrition, the incidence of all types of infection is generally higher, especially pneumonia. In these children, not only pneumonia is more fatal, and clinical diagnosis is also difficult. WHO-recommended clinical signs (age-specific rapid breathing and chest wall ablation) are less sensitive to predictors of radiographic pneumonia. A foreign body in the lungs with recurrent pneumonia was present in 2(0.5%) cases. Although there is no history of foreign body inhalation, however, the presence of recurrent pneumonia associated with the same valve in the right lung requires rigid bronchoscopy in both cases, foreign body from the middle of the right lung was recovered. 5% of recurrent pneumonia cases were due to the presence of foreign bodies in an Indian study. The Mean diagnosis age was 13 months. The 2(0.6%) cases had recurrent pneumonia with thalassemia. Recent prospective studies in Thailand had shown that patients with thalassemia have a higher frequency of mild and severe infection.³¹ In general, fluid overload and overloaded pulmonary circulation, especially due to chronic anemia, can lead to recurrent pneumonia among thalassemia children.³²

2 (0.5%) cases had nutritional rickets with recurrent pneumonia. Rickets was confirmed from biochemistry and radiological. In a study in Ethiopia, 210 cases out of 500 cases of pneumonia had ricket.³³ In addition, another study was conducted in Ethiopia, and similar observations were made between the nutritional diseases with pneumonia in children.³⁴ One patients (0.4%) with recurrent pneumonia had sickle cell anemia. It has long been recognized that even with penicillin prophylaxis, homozygous sickle cell anemia was also associated with an increased risk of pneumonia in children.³⁵⁻³⁷

Since video fluoroscopy swallowing studies (VFSS) are not available, direct demonstration of the respiratory tract is not possible, so the evidence of aspiration was indirect, ie clinical plus radiological. In addition, due to different financial and geographical barriers, cannot carry out certain tests, such as sweat chloride test and complete immunological workup. Therefore, we may have missed several fundamental causes of recurrent pneumonia. On the other hand, the radiological diagnosis of pneumonia in our study is susceptible to bias because the differentiation between atelectasis and

the lung consolidation is not always possible, so the diagnosis of pneumonia may be overestimated.

CONCLUSION

Recurrent pneumonia as a recurrent respiratory tract infection is more common in our country. Common underlying diseases include neuro-developmental disorders, recurrent bronchiolitis with Aspiration pneumonia, congenital heart disease, Down syndrome, bronchiectasis, bronchial asthma, respiratory abnormalities, and cleft palate.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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