Recurrent Pneumonia in Children at a Tertiary–Pediatric Hospital in Baghdad

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ABSTRACT:

BACKGROUND:

There are many children suffering from Recurrent Pneumonia (RP). Children with RP may present a difficult diagnostic challenge.

OBJECTIVE:

This study was performed to evaluate the frequency levels and underlying causes of RP in Children Welfare Teaching Hospital (CWTH)/Medical City/Baghdad.

PATIENTS AND METHODS:

In this prospective hospital-based cross-sectional study, 107 children admitted with RP in CWTH in the period from March to July 2014. Children were included in this study if they had at least 2 times pneumonia per year or three ever in life proved by radiographic confirmation during hospital admission. Children were classified according to underlying diseases associated with Pneumonia.

RESULTS:

Based on the clinical features and the results of the investigations, the underlying disease could be identified in 92/107 (86%) children. Aspiration pneumonia was diagnosed in 25 (23.4%) children, followed by congenital heart disease (CHD) in 22(20.6%) children, Asthma in 21 (19.6%), these three diseases were the most frequent with a relatively small difference between them. TB was reported in 9 (9.3%) children, Cystic fibrosis (CF) in 9(8.3%), Fibrosing alveolitis and immune deficiency were found in 2 (1.9%) children for each and the least frequent disease was congenital cystic adenomatoid malformation (CCAM) in one (0.9%) child. On the other hand, 15 (14%) children were reported with unknown diagnosis at the time of data collection.

CONCLUSION:

Most children with RP had an underlying disease for each, which was demonstrated. Aspiration syndrome, CHD, and asthma were the most common underlying diseases that result in RP in children. Early diagnosis is essential to ensure optimal treatment and to minimize irreversible lung damage.

KEYWORDS: recurrent, pneumonia, children, cwth, Baghdad.

INTRODUCTION:

It is important to discriminate between children with simply managed cause for their symptoms like recurrent viral infections or asthma, from others with more serious diseases such as bronchiectasis or immune dysfunction. Different diseases may present this way, including cystic fibrosis, immunodeficiency syndromes, congenital anomalies of the respiratory tract, but in some children, lung damage could follow a single severe pneumonia or can be the consequence of the inhalation of a foreign body. [1] The role of physicians has expanded from merely treating the disease to implementing measures aimed at health maintenance and disease prevention. [2] RP is a common reason for children to be seen by their general practitioner or a pediatrician. A recurrent or a persistent cough may be the only symptom, but often there is also a history of wheeze, breathlessness, sputum production or general ill health. An underlying cause was identified in more than 80% of children, with large differences between studies. Chronic aspiration

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is the most common cause of RP in childhood. Aspiration pneumonia arises after inhalation of oropharyngeal contents into the lungs. It may be an acute event or occurring on a chronic recurrent basis. [3-4] Certain conditions put children at risk for higher incidence, relapse, and chronicity of GERD symptoms. These include children with chronic neurologic impairment, repaired esophageal atresia, hiatal hernia, and chronic respiratory diseases like cystic fibrosis (CF). GERD should always be considered a possible cause of RP when children complain of typical symptoms (i.e. heartburn, regurgitation, and dysphagia. [5] Recurrent or persistent chest infections are often the presenting feature of congenital abnormalities of the airways, lung parenchyma and pulmonary vasculature. For example, repeated episodes of pneumonia are often the presenting feature of lobar sequestration, bronchial stenosis and bronchomalacia, and cystic adenomatoid malformations of the lung. Such an abnormality should be suspected if one lobe is repeatedly infected or if there is incomplete resolution after treatment.

OBJECTIVE:

This study was performed to evaluate the frequency levels and underlying causes of RP in Children Welfare Teaching Hospital (CWTH)/Medical City/Baghdad.

PATIENTS AND METHODS:

In this prospective hospital-based cross-sectional study, 107 children admitted with RP in CWTH in the period from March to July 2014 were studied. RP was defined as at least two episodes of pneumonia in one year or three episodes ever, with the inter-critical radiographic clearing of densities. [6] Children were included in this study if they had Pneumonia based on WHO criteria. [7] Children presented with a cough or difficulty breathing and fast breathing (aged 2–11 months: ≥50 breaths/minute, aged 1–4 years: ≥40 breaths/minute) or chest indrawing, were classified as having pneumonia. Those who had a diagnosis of pneumonia without radiographic confirmations were excluded from the study. [8] Children were classified according to underlying illnesses that had been associated with pneumonia; Aspiration pneumonia (including children with cerebral palsy and cricopharyngeal incoordination diagnosed by pediatric neurologist, child with cleft palate and gastroesophageal reflex diagnosed by barium swallow), congenital heart defect proved by echocardiography, immune disorder proved by immunoglobulin assay, WBC function tests and Compliment assay. Cystic fibrosis was suspected by suggestive history and proved by a sweat chloride test that was more than 60 meq/l on two occasions. TB was diagnosed by history, tuberculin test, sputum smear, culture, and Gene –Xpert test confirmed and registered in medical city TB center. Bronchial asthma which was diagnosed by a typical history of repeated attacks of a cough and dyspnea responded to bronchodilator diagnosed by consultant pediatric pulmonologist. X-ray and computerized tomography of the chest were done for all. Laryngoscopy, bronchoscopy was performed when indicated.

The child with secondary immune deficiency such as leukemia, lymphoma, chronic steroid usge, chronic renal failure, liver disease were excluded from this study. Data taken were age, sex, residence, feeding type, history of immunization, crowding index, age of the first admission, duration of the last admission, history of allergy , history of prematurity, asphyxia, cleft palate, GERD, hemoptysis, response to bronchodilator, need for oxygen supply, growth parameter plotted on appropriate growth chart, family history of chronic illness and siblings death. Hospital ethical committee approval was taken and consents were obtained from the parents of all children prior to participation in the study, and their data were not disclosed to unauthorized.

Statistical analysis:

Data were analyzed using SPSS program version 21. Chi-square was used as a test of significance for the qualitative data and t-test was used to compare the means of two continuous variables; P value < 0.05 was considered to be statistically significant.

RESULTS:

A total of 107 children with RP were enrolled in the study. Their mean age was 4.1 ± 0.4 years, ranging from1 month -14 years. Males were 63 (58.9%) and females 44 (41.1%) with a male to female ratio of 1.43:1. Males were younger than females; the mean age was 3.31 ± 0.41 vs. 5.15 ± 0.75, respectively,

(P=0.023) as shown in Table -1. Aspiration syndrome was reported in 25(23.4%) children followed by CHD in 22 (20.6%), asthma in 21 (19.6%), TB in 9(9.3%) CF in 9(8.3%) children, fibrosing alveolitis and immune deficiency in 2 (1.9%) children for each, congenital lung malformation in one (0.9%) and 15(14%) children with unknown diagnosis at the time of data collection as shown in Table -2. The distribution of the studied group according to the precedence of diagnosis in relation to pneumonia revealed that 33 (30.8%) children were diagnosed prior to pneumonia, 26 (24.3%) after first pneumonia and 48 (44.9%) after recurrent pneumonia. Eighteen (72%) children with aspiration syndrome, 12 (54.5%) of children with CHD, one with immune deficiency child (50%), and the one (100%) with congenital lung malformation were diagnosed after the first episode of Pneumonia. Other children were diagnosed after first pneumonia, while the majority (85.7%) of the 21 asthmatic children, all the 9 CF children and both diagnosed after recurrent pneumonia, as shown in table -3. No significant association was found the frequency of diseases and gender as in Table-4. CHD was significantly more prevalent in younger age group children, (P=0.04). In contrast, asthma was significantly more prevalent in children aged > 5 years than those aged 1–5 years (P=0.024) as in Table -5. Regarding neonatal history; 16 (15%) children were born prematurely, 11 (10.3%) had a history of low birth weight, 6 (5.6%) had a history of birth asphyxia and 2 (1.9%) children had congenital anomalies. According to the feeding history; 25 children (23.4%) were breastfed, 47 (43.9%) were bottle fed and 35(32.7%) children had a history of mixed feeding. Complete vaccination was reported in 70 (65.4%) children while 37 (34.6%) children didn't complete their vaccination. The mean age at first admission was 20 ± 3 months (ranging 1 day – 13 years). Fifty-one (47.6%) children were admitted to hospital 2-5 times, 56 (52.5%) admitted >5 times.

Table 1: Age and sex distribution of children with recurrent Pneumonia.

Age (Years)	Male		Female		Total		P value
	No.	%	No.	%	No.	%	
< 1	19	30.2	10	22.7	29	27.1	0.03
1 - 5	29	46.0	18	40.9	47	43.9	
> 5	15	23.8	16	36.4	31	29.0	
Total	63	58.9	44	41.1	107	100	
Mean ± SE	3.31 ± 0.41		5.15 ± 0.75		4.1 ± 0.40		0.02

Table 2: Characteristics of children admitted with recurrent pneumonia.

Characteristics	No.	%
Weight <3rd centile	22	20.6
Height <3rd centile	24	22.4
OFC <3rd centile	24	22.4
Crowding Index ≤3	68	63.6
Crowding Index >3	39	36.4
Consanguineous parents	35	32.7
Family Smoking	57	53.3

Table 3: Frequency distribution of diseases among children with Recurrent Pneumonia.

Diagnosis	Total	
	No.	%
Aspiration syndrome	25	23.4
CHD	22	20.6
Asthma	21	19.6
TB	10	9.3
CF	9	8.4
Fibrosing alveolitis	2	1.9
Immune deficiency	2	1.9
Congenital lung malformation	1	0.9
Unknown	15	14.0
Total	107	100.0

Table 4: The association between age and diagnosis in children with Recurrent Pneumonia.

Diagnosis	< 1 year		1 - 5		> 5 years		P value
	No.	%	No.	%	No.	%	
Aspiration syndrome	8	27.6	11	23.4	6	19.4	0.47
CHD	11	37.9	9	19.1	2	6.5	0.04
Asthma	0	0.0	10	21.3	11	35.5	0.02
TB	1	3.4	3	6.4	6	19.4	0.15
CF	4	13.8	3	6.4	2	6.5	0.72
Fibrosing alveolitis	0	0.0	1	2.1	1	3.2	1.0
Immune deficiency	1	3.4	1	2.1	0	0.0	1.0
Congenital lung malformation	0	0.0	1	2.1	0	0.0	-
Unknown	4	13.8	8	17.0	3	9.7	0.25
Total	29	100.0	47	100.0	31	100.0	

Table 5: The association between sex and diagnosis in children with recurrent pneumonia.

Diagnosis	Male		Female		Total		P value
	No.	%	No.	%	No.	%	
Aspiration syndrome	14	22.2	11	25.0	25	23.4	0.54
CHD	15	23.8	7	15.9	22	20.6	0.09
Asthma	14	22.2	7	15.9	21	19.6	0.13
TB	3	4.8	7	15.9	10	9.3	0.20
CF	5	7.9	4	9.1	9	8.4	0.74
Fibrosing alveolitis	0	0.0	2	4.5	2	1.9	-
Immune deficiency	2	3.2	0	0.0	2	1.9	-
Congenital lung malformation	0	0.0	1	2.3	1	0.9	-
Unknown	10	15.9	5	11.4	15	14.0	0.19
Total	63	100.0	44	100.0	107	100.0	

Table 6: Comparison of precedence of diagnosis in different diseases children with Recurrent Pneumonia.

Diagnosis	Prior to Pneumonia		After 1st Pneumonia		After RP	
	No.	%	No.	%	No.	%
Aspiration syndrome	18	72.0	7	28.0	0	0.0
CHD	13	59.1	9	40.9	0	0.0
Asthma	0	0.0	3	14.3	18	85.7
TB	1	10.0	6	60.0	3	30.0
CF	0	0.0	0	0.0	9	100.0
Fibrosing alveolitis	0	0.0	0	0.0	2	100.0
Immune deficiency	1	50.0	0	0.0	1	50.0
Congenital lung malformation	0	0.0	1	100.0	0	0.0
Unknown	0	0.0	0	0.0	15	100.0
Total	33	30.8%	26	23.3	48	44.9

Table 7: Etiologic studies of children with recurrent pneumonia.

Characteristic	Canada	India	Turkey	Spain	Current study
Recurrent Pneumonia	238	70	62	106	107
Underling disease (%)	92.5	84.3	90.32	86.8	86
Aspiration syndrome (%)	47.9	24.3	8.06	23.6	23.4
Bronchial asthma (%)	8	12.8	30.64	26.4	19.6
CHD (%)	9.2	8.6	11.29	25.5	20.6
Immune deficiency (%)	5.5	15.7	17.75	8.5	1.9
Congenital lung malformation (%)	10.1	8.6	4.84	1.9	0.9
Unknown (%)	7.20	15.7	9.68	13.2	14
Reference	13	12	8	11	–

DISCUSSION:

Results on children with RP enrolled in the study revealed that males acquired RP more frequently than females with a male/female ratio of 1.43:1. Male predominance was also noted by Khaled S. et al study in Egypt with a male /female ratio of 1.89:1. [9]

The mean age of RP in this study was 4.1±0.4 years (range 1 month-14 years) slightly higher than the mean age in Abdullah F. et al study in Toronto which was 3.7 years (range, 2.5 months-15.6 years). [10]The underlying disease for RP in 86% of studied children was demonstrated. Unknown etiology of children with RP was found 14%. This result is close to Abdullah F. study where the demonstrated underlying disease for RP was 90.32%, and this difference might be attributed to the inadequacy of some diagnostic facilities.

In this study, the most frequent underlying disease was aspiration syndrome which was found in 25(23.4%) children in agreement with Cabezuelo H .et al in Spain where the frequencies of aspiration syndrome were 23.6%. [11] Congenital Heart Disease (CHD) in 22 (20.6%) children with the isolated left to right shunts, including atrial and ventricular septal defects, as well as patent ductus arteriosus. Cabezuelo H. et al in Spain reported a frequency of CHD of 25.5 %. [11] A left-to-right shunt can adversely affect lung function, and superimposed Pneumonia cause additional compromise and might lead to respiratory failure. In this study bronchial asthma was reported in 21(19.6%) children while the frequency of asthma in Osman et al in Turkey was 30.64% and 26.4 % in Cabezuelo H. et al study. [8, 11] This difference may be due to environmental factors and there is no agreed clinical definition or test for childhood asthma and making the diagnosis difficult, particularly in children younger than 3 years. Bronchial asthma is an important underlying illness for RP in children. Despite recent advances in health care, many children referred with RP are shown to have undiagnosed asthma. [12]

Tuberculosis was found in 9(9.3%) children. TB is one of the most common infectious diseases among children in the world. TB is suspected when an ill child has a history of chronic illness of usually more than 3 weeks duration that includes a cough, fever, weight loss or failure to thrive, history of contact with an adult case of pulmonary TB and a non-response of symptoms to potent antibiotics. A considerable number of TB cases were not admitted to CWTH hospital but, consulted and registered in the TB center of Baghdad medical complex. Cystic fibrosis was reported in 9(8.3%) children in this study and this may be attributed to the high frequency of consanguineous marriage in Iraq as it is an autosomal recessive disease, also CF was found as an underlying cause in 6.45% in Osman O. et al study in Turkey. [8] Immune deficiency was found in only 2(1.9%) children which were the less frequent than other studies this low percentage may be attributed to the rarity and high cost of the investigations for the diagnosis of immune deficiency in Iraq. Immune deficiency should be suspected in children with infections that are especially severe and recurrent, that reis caused by unusual organisms, or that involve multiple sites in addition to the lungs. [1] Forty-eight (44.9%) children were diagnosed only after recurrence Pneumonia while in Abdullah F. O. et al study only 7.7% were diagnosed after recurrence. Of the underlying diagnoses discovered after recurrent Pneumonia;

cystic fibrosis and fibrosing alveolitis were the most common, followed by asthma. This may be attributed to lack of routine neonatal screening for cystic fibrosis. Prior to their asthma diagnosis, children with asthma presented with episodes of Pneumonia but were otherwise healthy. Thirty-three (30.8%) children were diagnosed with an underlying illness before the first episode Pneumonia while in Abdullah F.et al study [10] (42)80.9% were diagnosed with an underlying illness before the first of episode pneumonia. Of the underlying illness diagnoses before the first episode lower respiratory tract infection, aspiration syndrome was the most common, followed by CHD. This might be attributed to the fact that the majority of aspiration syndrome was due to oropharyngeal incoordination mostly due to cerebral palsy and usually recurrent aspiration preceded their non-progressive permanent disorder of motor and or posture.

CONCLUSION: AND RECOMMENDATIONS:

Most of the children with recurrent pneumonia had an underlying disease, which was demonstrated. Aspiration syndrome was the most common underlying illnesses for recurrent pneumonia in children followed by CHD. CHD was found to be responsible for most cases of pneumonia below 1 year of age and asthma for most cases above 5 years of age. The study recommends a special emphasis on the high index of suspicion among pediatricians and general practitioners for early diagnosis of oropharyngeal incoordination as an early sign of cerebral palsy and GERD in addition to routine screening for CF and primary immune deficiency diseases. As early and accurate diagnosis is essential to ensure that optimal treatment is given and to minimize the risk of progressive or irreversible lung damage.

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