Original Article

Pneumonia in children admitted with lower respiratory tract infections… A hospital based study

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Summary:

Background: Pneumonia is a common form of lower respiratory tract infection (LRTI) in children under five years of age and it is the leading cause of morbidity and mortality in this age group. Early management is important in decreasing its complications and mortality.

Methods: A cross sectional study of 100 patients, their ages ranged from 2 months to 5 years. They were admitted to Children Welfare Teaching Hospital Medical City–Baghdad in a period from 7th of November 2010 to 5th of May 2011, suffering from Lower Respiratory Tract Infections (fever, cough and tachypnea) and classified into two groups according to chest radiograph (CXR) findings, those with a patch (pneumonia) and others with normal or hyper inflated CXR. The possibility of various demographic and clinical symptoms and signs to predict the presence or absence of the patch were evaluated.

Results: From a total of 100 patients enrolled in this study, 42%had a patch and 58% had normal or hyperinflated CXR. Older age, male gender, longer duration of hospitalization, high level of paternal education and family history of same disease are significantly associated with the presence of patch. Signs and symptoms like deterioration in the level of consciousness, lung crepitation and decrease in air entry and convulsion are significantly associated with the presence of the patch.

Conclusion: Pneumonia is frequent in children with LRTI. Presence of convulsions, deterioration in the level of consciousness, lung crepitation and decrease in air entry in a child with LRTI may raise the suspicion of having pneumonia. Factors like older age, male gender, and high level of paternal education were associated with increase the susceptibility to have pneumonia in children with LRTI.

Key word: children; predictors; pneumonia.

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Introduction:

There is no strict and fast definition of acute lower respiratory tract infection (ALRTI) that is universally agreed upon. Essentially, it is inflammation of the airways/ pulmonary tissue, due to viral or bacterial infection, below the level of the larynx [1]. Lower respiratory tract infection —an inclusive terminology for pneumonia (both typical and atypical), bronchitis, bronchiolitis, remains a global pediatric health problem [2].

A clinical diagnosis of ALRTI is based on the three signs of fever, cough and rapid breathing. Other signs, such as grunting, indrawing of the chest, bronchial breathing, auscultatory crackles, etc.., may or may not be present [3]. ALTRI is a leading cause of morbidity and mortality among children in developing countries. [4]. In order to reduce mortality due to pneumonia in developing countries, the World Health Organization (WHO) has proposed the Integrated Management of Childhood Illness (IMCI) Strategy, which is a single and integrated approach to assess, classify and treat children at first level health facilities. [5] Factors that have been postulated to increase the risk of acute respiratory infections (ARI) among children in developing countries are low birth weight, failure to breast-feed, malnutrition, indoor air pollution, and socio-demographic factors such as large family size, short birth interval, low income, and low level of parental education, poor housing, and inappropriate child care practices [6]. In 50-60% of children, the causative agents in ALRTI are bacterial agents - the common bacteria are Haemophilus influenzae type b, Streptococcus pneumoniae and Staphylococci[7.Preventing children from developing pneumonia in the first place is essential for reducing child deaths. Key prevention measures include promoting adequate nutrition (including breast feeding and zinc intake), raising immunization rates and reducing indoor air pollution. Recent research also suggests that hand washing may play a role in reducing the incidence of pneumonia [8]. Wider availability of new immunizations particularly pneumococcal conjugate vaccine can substantially reduce pneumonia incidence [9].Aims of study:To determine the effect of the clinico-epidemiological factors on the occurrence of patch on CXR that diagnosed as pneumonia among children between two months to five years old.

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Patients and Methods:

A cross sectional study was carried out during the period from 7th November 2010 to 5th May 2011 in Children Welfare Teaching Hospital in Baghdad on admitted patients who were admitted to the emergency unit and respiratory unit in the ward in Children Welfare Teaching Hospital. Children aged from two months to five years suffering from fever, cough and tachypnea were included in this study .Some of them were referred from primary health centers, private clinics, other hospitals and the rest were admitted via the out patients clinic of the hospital . Children with congenital heart disease, cystic fibrosis and other congenital diseases, those with cerebral palsy, malignancy or taking cytotoxic and immune suppressant drugs, those with history of kerosene poisoning, foreign body aspiration and those with respiratory complaint but their CXR were bad and unfit for reading were excluded from the study. The information was taken via a questionnaire form through direct interviews with child's mother or relative who accompanied him or her in the ward which included the name, age, residency, date of admission, chief complaint which included history of cough whether dry or productive, shortness of breath, fast breathing, noisy breathing, fever and convulsion.

Children presented with ALRTI and admitted to CWTH were assessed by history, clinical examination and respiratory system examination by a pediatrician on admission and by the author later on. Vital signs include respiratory rate which was taken for one minute, heart rate, temperature which was axillary corrected. Auscultation of the chest for assessing the air entry, type of breathing and any added sound (wheeze, rhonchi and lung crepitation) were recorded. Chest x-ray was taken for each patient and all cases were classified into two groups according to the CXR findings. Some children had patch in one or more lobes and other had normal or hyperinflated CXR. The CXR were checked and verified by radiologist and pediatrician reading. Patients with pneumonic consolidation patch on CXR were considered as cases and were compared with those with ALRTI and did not show patch on CXR.

Statistical analysis was performed by statistical package for social sciences (SPSS) version 18 . Continuous variables presented as mean (M) and standard deviation (SD) and discrete variables presented as numbers and percentages. All tests were two sided and P value asymptotic. Findings with P value less than 0.05 was considered significant.

Results:

One hundred patients were included in this study, of them 42% had patch on CXR and 58% had hyperinflated or normal CXR.70%were males and 30% were females so males had significantly more patchs than had females. Their age ranged from 2 months to 5 years . the mean age was 9.9± 7.7 months and there is a significant association between older age and the presence of patch. 27% were from rural and 73% from urban areas. Their mean duration of hospitalization was 7±8.1 days and the longer hospitalization was significantly associated with the presence of patch as in table-1.The percentage of children who were non exclusively breast fed was higher for getting lower respiratory tract infections 58% as compared to 42%, the percentage of those who were exclusively breast fed. 52.3% of those with patch had completed vaccination for age and 47.6% not completed and 48.2% of those with no patch completed their vaccination against 51.7% were not completed the vaccination for their ages but statistically there is no significant association. There was significant association between the higher paternal education with the presence of patch (p0.047) but no such association with the maternal education (p0.101).Crowding index measured the number of members occupying the bed room; the higher percentage of all LRTI 98% in those with higher crowding index (≥3) and 2% of all LRTI had a crowding index <3. 45.8% of those with no patch had a positive family history of similar condition while only 17.1% of those with patch had a positive family history of the same condition and this association is significant (p0.003)as in table-2.

There was a significant association between rhinorrhea and sneezing with the absence of patch (p0.006, 0.029 respectively) while convulsion was more in those with patch (p0.019). The percentage of decrease in appetite and vomiting is higher in those with patch (69%, 56% respectively) than in others with no patch (51%, 37% respectively) but statistically it is not significant as in table-3. According to the finding of general examination, the study showed a significant association between deterioration in the level of consciousness and presence of patch (p. 0.039) Cyanosis was present in 4.9% in those with patch and 8.5% in those with no patch while the percentage of the flaring of alanazi was 24.4% in those with patch and 20.3% in those without patch. The mean of respiratory rate in group1 whom their ages v2 months 1 -year was 57.30±10.76 and was 58.24±9.32 in group 2 whose their ages from1-5years .In this study fever means temperature more than 38.2 and no significant association between the fever and the presence of patch .Hearing lung crepitation was significantly associated with the presence of pneumonic patch)p0.001 (and rhonchi with absence of it) p0.001 (also there was significant decrease in air entry in those with patch)p0.035 (while chest indrawing had nearly equal percentage in those with or without patch as in table .5-Complications were one case with plural effusion ,one case with empyema, two case of emphysema and one case of bronchiolitis obliterance ,their presence was significantly associated with the presence of patchas in table-6.

Table 1: Distribution of study sample according to demographic characteristic

	Patch		No Patch		Total		
Characteristic	N (42)	100.0%	N (58)	100.0%	N(100)	100.0%	P
Age (month), M ± SD	11.95 ± 9.08		8.33 ± 6.10		9.9 ± 7.7		0.019
Gender							
Male	34	80.9	36	62.06	70	70.0	0.042
Female	8	19.04	22	37.9	30	30.0	
Residence							
Rural	13	30.9	14	24.1	27	27.0	0.449
Urban	29	69.04	44	75.8	73	73.0	
Days of Hospitalization; M±SD	9.98 ±	10.49	4.86 ±	4.8	7.0 ±	8.1	0.001

Table 2: Distribution of study sample according to environmental and social history.

	Patch		No Patch		Total		
	N (42)	100.0%	N (58)	100.0%	N (100)	100.0%	P
Feeding History							
Exclusive breast feeding	21	50	21	36.2	42	42	0.168
Non-exclusive breast feeding	21	50	37	63.7	58	58	
Vaccination History							
Complete for Age	22	52.3	28	48.2	50	50.0	0.685
Not Complete for Age	20	47.6	30	51.7	50	43.0	
Paternal Education							
Low Education	14	33.2	36	61.9	50	50.0	
Intermediate/Secondary School	18	42.8	11	18.9	29	29.0	0.011
Higher Education	10	23.7	11	18.9	21	21.0	
Maternal Education							
Low Education	26	61.9	31	53.3	57	57.0	
Intermediate/Secondary School	11	26.1	17	29.3	28	28.0	0.653
Higher Education	5	11.9	10	17.2	15	15.0	
Crowding Index							
< 3	0	0.0	2	3.4	2	2.0	0.224
≥ 3	42	100.0	56	96.5	98	98.0	
Family History of Similar Illness							
Presence	7	16.6	27	46.5	34	34.0	0.002
Absent	35	83.3	31	53.4	66	66.6	

Table 3: Distribution of study sample according to the symptoms

	Patch		No Patch		Total		
	N (42)	100.0%	N (58)	100.0%	N (100)	100.0%	P
Noisy breathing	19	46.3	38	64.4	57	57.0	0.073
Rhinorrhea	30	73.2	55	93.2	85	85.0	0.006
Sneezing	30	73.2	53	89.8	83	83.0	0.029
Convulsion	7	17.1	2	3.4	9	9.0	0.019
Cyanosis	17	40.4	27	46.5	44	44.0	0.546
Decrease in appetite	29	69.04	30	51.7	59	59.0	0.082
Vomiting	23	56.1	22	37.3	45	45.0	0.063

Table 4: Distribution of study sample according to findings of general examination.

	Patch		No Patch		Total		
	N (42)	100.0%	N (58)	100.0%	N (100)	100.0%	P
Levelof Consciousness							
Conscious	39	92.8	58	100.0	97	97.0	0.039
Confused	3	7.1	0	0.0	3	3.0	
Cyanosis	2	4.9	5	8.5	7	7.0	0.488
Flaring Ala Nazi	10	24.4	12	20.3	22	22.0	0.631
Respiratory Rate							
Group1* M±SD	N(27) 57.30±10.76		N(49) 58.24±9.32		N(76) 57.91±9.79		0.68
Group 2** M±SD	N(15) 48.60±6.23		N(9) 46.89±5.84		N(24) 47.96±6.02		0.51

Table 5: Distribution of study sample according to findings during chest examination.

	Patch		No Patch		Total		
	N (42)	100.0%	N (58)	100.0%	N (100)	100.0%	P
Chest-indrawing	41	97.6	54	93.1	95	95.0	0.306
Added Sounds							
None	4	9.5	10	17.2	14	14.0	0.272
Crepitation	27	64.2	17	29.3	44	44.0	0.001
Rhonchi	4	9.5	23	39.6	27	27.0	0.001
Crepitation & Rhonchi	7	16.6	8	13.7	15	15.0	0.158
Air Entry							
Good	28	66.6	51	87.9	79	79.0	0.010
Poor	14	33.2	7	11.9	21	21	0.010

Table 6: Distribution of study sample according to complications.

Complications							
None	37	88.09	58	100.0	95	95.0	0.007
complications	5	11.9	0	0	5	5.0	

Discussion:

Out of 100 children who were included in the study, 42% had patch on CXR, and 58% had no patch on CXR. In this study, all patients had fever, cough and tachypnea as an inclusion criteria, and this is similar to what was found by Rothrock et al [10], but differs from Graham et al that mentioned these symptom were referred to pneumonia and antibiotic should be started [11]. Regarding the demographic characteristics of the study, there is significant association between older age group and appearance of patch and this is compatible with Balfour-Lynn [12] and Mahabee- Gittens et al [13]. In a number of community-based studies in Brazil, boys appear more frequently affected by ALRI than girls, the possibility of gender bias in seeking care cannot be ruled out [14], and this is also found in this study, in which there were 70%males and 30% females, male: female ratio about (2.3:1) which is similar to Huong et al [15] but disagree with the study of Pedawi in 2007[16]. A study was done by Fatimi et al and other by Mahalanabis et al ,showed the incidence of pneumonia is likely to be higher in rural and remote area for reasons including poorer access to basic health care, less availability of antibiotics, lower immunization coverage, less community education and greater use of traditional medicines.[17,18] but in this study there is no significant association between resident area and occurrence of pneumonic patch this may be due to the difference in number of patient that came from rural and urban areas , as the study was carried out in one hospital, in Baghdad . There is a significant association between longer hospitalization and appearance of patch and this might be due to the cause that having pneumonia required longer hospitalization, which disagrees with Mahabee- Gittens et al opinion [13]. Regarding environmental and social factors: Although non-exclusive breast feeding increases the chance for getting lower respiratory tract infections in this study when compared to exclusive breast feeding but children whether they were exclusively breastfed or not have no significant association with appearance of patch and this is similar to what was found by Mahabee-Gittens 2005 [13] but against Niessen et al opinion in 2009[19]. Pertussis and measles immunization, as part of the global Expanded Program on Immunization (EPI), have significantly reduced childhood deaths in low and middle income countries [20,21] but the vaccination have no significant association with the frequency of pneumonia in this study sample and this may be due to small sample size. In a pneumonia case control study in Brazil [14], however, the respiratory infections in children fathers education was more significantly associated than the mothers educationand this is agreed with what is found in our study may be related to the fact that the well-educated parents have high index of suspicion about the clinical features of severe illness. Ballard et al showed no significant association was observed in his study when crowding was measured by the number of children sharing a bed room [22] and this is similar to what is found in this study and does not go with Victora et al [14ss] but more crowding leads to more lower respiratory tract infections in this study and this may be due to that the agents of such infections are readily transmitted, usually through air

by droplets or aerosols, in crowded and ill- ventilated rooms where people are sneezing, coughing or simply talking. There is a significant association between the family history of similar illness with the absence of patch and this may refer to the history of asthma in the family and the patient so any infection lead to exacerbation of the symptoms of asthma. Regarding the symptoms of the patients, No association between noisy breathing and occurrence of patch and this was also found by MahabeeGittens et al [13]. There is a significant association between convulsion and appearance of patch as the convulsion may occur due to, fever, electrolytes disturbance, meningitis, bacteremia or hypoxia and because the brain has no anaerobic metabolism and requires a continuous supply of oxygen in order to sustain normal function, so depletion of oxygen produces abnormal cerebral function which manifested as drowsiness, lassitude and seizure or even coma [23].Cyanosis is a specific sign for inadequate air exchange but occurs late, is uncommon, and indicates severe hypoxia [24] and this is in agreement with this study in which it represent 40% in those with pneumonic patch and 46% in those with non-pneumonic patch. Although the percentage of decreasing in appetite and vomiting in those with pneumonic patch is higher than in those with no patch and this is because of ability to feed is changed during respiratory illness [25, 26, 27] but statistically, it is not significant. Regarding the finding of general examination: There is only significant association between deterioration in the level of consciousness and presence of patch because the level of consciousness may change during respiratory illness [25, 26, 27].Cyanosis when it is seen in the examination, central or peripheral has no significant association with presence of patch.Flaring of alanasi has near percentage in both group and this is in agreement with the study of Pedawi[16] while against Mahabee- Gittens et al [13].A study done by Singhi et al found that age specific-respiratory rate (recommended by the World Health Organization) is a sensitive and specific indicator of pneumonia in almost all age groups [28] and this is disagreed with this study in which the patients were divided in to two group, those between 2month to 1 year and those between1 to 5 years old.

Regarding the finding of chest examination: This study shows a significant association between rhonchi with the absence of patch while lung crepitation and decrease in air entry with the presence of pneumonic patch which is compatible with a prospective study which was done by Lynch et al [29] and against Mahabee- Gittens et al [13], while no significant association between chest indrawing, with occurrence of patch as this occur also in Mahabee-Gittens et al [13] but differ from Pedawi study [16]. There is a significant association between the presence of complications and occurrence of patch and these complications include one case of plural effusion, one case of empyema, two cases of emphysema and one case of bronchiolitis obliterance and these are complications of pneumonia.

Conclusions:

1.Pneumonia is a common lower respiratory tract infection in under five years old children and it is a leading cause of morbidity and mortality in this age group, in this study it represent 42% among lower respiratory tract infections.

2. The older children with being male are more liable to diagnosed as pneumonia and may stay longer in the hospital.

3. Paternal education plays an important role in early detection of pneumonia as the higher education, the more awareness about the risk features of illness and bringing the child to nearest health facility.

4. Fever, cough and tachypnea are not enough symptoms for diagnosis of pneumonia, presence of other symptoms like convulsion may rise up the suspicion of having severe respiratory illness like pneumonia, with these, many signs like deterioration in the level of consciousness, crepitation, and decrease in air entry help in diagnosis of pneumonia.

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