Original Article

Pneumonia in Children

Frequency of Radiologically Confirmed Pneumonia in Children with First Time Wheezing at Pediatric Emergency Department, Liaquat University Hospital Hyderabad

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ABSTRACT

Objective: To assess the frequency of radiologically confirmed pneumonia in children with first time wheezing at pediatric emergency department, Liaquat University Hospital Hyderabad.

Study Design: Descriptive Cross Sectional Study

Place and Duration of Study: This study was conducted at the at Department of Pediatric Liaquat University Hospital, Hyderabad from January to June 2017.

Materials and Methods: A Descriptive Cross Sectional Study was conducted at Department of Pediatric Liaquat University Hospital, Hyderabad, total six months' duration from 1st January to 30 June 2017. The child who came first time with wheeze with signs of fast breathing and chest in drawing as per operational definition were nebulized with rapid acting inhaled bronchodilator i.e. Ventolin solution upto three times 20 minutes apart. According to standard/IMNCI protocol soon after three times nebulization, they were reassessed for persistence of fast breathing and chest indrawing and reclassified as Pneumonia if fast breathing and/or chest indrawing persisted. The chest radiography was done in all of the children to confirm the radiological finding suggestive of pneumonia.

Results: Mean ± SD of age was 21.13±12.06 with C.I (19.02-23.24) months. Mean ± SD of duration of symptoms was 2.34±1.11 with C.I (2.15-2.54) days. Out of 128 patients 67 (52.3%) were male and 61 (47.7%) were female. Radiologically proven Pneumonia was present in 54 (42.2%) patients.

Conclusion: Our study shows that out of 128 children who presented with first time wheeze; 42.2% had radiologically proven pneumonia while 57.8% did not have radiological findings of pneumonia. Boys had higher proportion of pneumonia than girls. Based on our study findings, it is suggested that all children who present first time with wheeze and signs of fast breathing and chest indrawing should be screened for pneumonia.

Key Words: Fast breathing, Children, Chest indrawing, Chest Radiography, Ventolin Nebulization

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INTRODUCTION

Pneumonia cause lot of morbidity and mortality in children younger than the 5 years of age worldwide. [1] Globally there are about 120 million cases of pneumonia annually, resulting in 1.3 million deaths.

The prevalence of Childhood Pneumonia in India is about 36%.[2]

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In Pakistan prevalence of Pneumonia in children is 20% and it is a primary cause of under-five mortality.[3]

The presentation of Pneumonia is non-specific, including cough, fever, fast breathing and breathing difficulties. Though no isolated physical examination finding can accurately diagnose pneumonia but Chest auscultation for crepitations/rhonchi can aid in diagnosis. [4] Although there are no clear guidelines for performing chest x-ray for the diagnosis of Pneumonia in children but the chest x-ray can be helpful in the diagnosis of pneumonia [5]

Wheezing is a common problem in children. About 25% to 50% children have the history of atleast one wheezing episode by the age of 5 years. Other than the Pneumonia the cause of wheezing may be; Reactive Airway Disease, gastro esophageal reflux disease, and bronchiolitis. In an American study 20.4% patients had radiographic evidence of Pneumonia with wheeze.[6] While an Indian study showed that 8.7% children had radiological evidence for pneumonia in children having wheeze.[7]

In 1980 World Health Organization developed a Pneumonia control strategy for developing countries with limited resources. Simple signs (respiratory rate and chest indrawing) were included for the identification of Pneumonia in settings with little or no access to diagnostic technology. According to revised classification (WHO 2012) children who has chest indrawing with or without fast breathing are classified as having "pneumonia". For last 30 years, many countries have implemented these WHO case management protocols, after that there is reduction in the mortality in these developing countries. Neonatal mortality decreased from 42% to 27%, infantile mortality decreased from 36% to 20% and among children mortality decreased from 36% to 24%. [8] However, there is the possibility of virus induced wheezing illness or asthma, rather than pneumonia. That's why a careful review of the existing evidence about management of wheezing illness in children is needed. Children having the history of recurrent wheezing episodes or a single episode of wheezing that not responding to bronchodilators should undergo chest radiography. [9]

The rationale of this study is that as, history and clinical examination findings in wheezy children may not distinguish pneumonia from those without pneumonia and there is limited data exist regarding importance of wheezing in children without pneumonia. Keeping this possibility, we conducted a study to see the frequency of radiologically proven Pneumonia in children who admitted with clinical diagnosis of pneumonia according to IMNCI strategy. By knowing the frequency of wheezing in pneumonia the results of the study will help the pediatrician in efficiently diagnosing the pneumonia clinically by observing wheezing & other sign and symptoms and hence the patients care will be improved**.**

MATERIALS AND METHODS

Pneumonia According to IMNCI It is defined as fast breathing and/or chest indrawing with age specific cut off values for increased respiratory rate (≥50/min if age 2-11 months and ≥40 if age 12-59 months).

Chest indrawing: It is the inward movement of lower chest wall when the child breaths in.

Wheeze: It is the whistling or rattling sound on chest auscultation. Radiologically confirmed pneumonia: It is defined as if air bronchogram or diffuse infiltrate or lobar consolidation seen on chest x-ray.

A Descriptive Cross-sectional study was done by Non-Probability Consecutive Sampling technique at Department of Pediatrics, Liaquat University Hospital Hyderabad from 1st January to 30th June 2017 (total 6 months' duration). By using W.H.O sample size calculator using prevalence of pneumonia=20.4%[10] Confidence interval = 95%, margin of error (d) = 7% then the estimated sample size was 128. Patient's age between 2 months to 5 years admitted to the pediatric emergency department with first time wheeze with increased breathing rate and chest indrawing (as defined in operational definition) of both gender was included in the study. Children already on treatment for pneumonia or wheeze, known cases of chronic lung disease (e.g. cystic fibrosis, tuberculosis) and congenital heart disease on previous available medical record, failure to get informed consent, children having recurrent wheeze and who had used inhaled bronchodilators with in last 6 hours were excluded from the study.

Study was conducted after the approval from the Research evaluation unit CPSP, Karachi. Patients meeting the selection criteria attending emergency department of Liaquat University Hospital Hyderabad were enrolled in the study. Prior to inclusion the purpose, procedure, benefits and risks involved in the study were explained and informed consent was obtained by the parents/guardian. The Child who came first time with wheeze with signs of fast breathing and Chest Indrawing as per operational definition was nebulized with rapid acting inhaled bronchodilator i.e. Ventolin solution (0.5 ml) for up to three times 20 minutes apart according to standard IMNCI protocol and soon after three times nebulization child was reassessed for persistence of fast breathing and chest indrawing and reclassified as pneumonia as per operational definition. The chest radiography was conducted in all of the patients who were classified as pneumonia. The main outcome variables and demographics were entered in the proforma.

All the data was entered into SPSS version 20.0. Mean ± SD were calculated for age, weight & duration of symptoms. Frequencies and percentages were calculated for gender & outcome variable i.e. Pneumonia. Effect modifiers were controlled through stratification of age, gender, duration of symptoms and weight to assess the effect on these on outcome variables. Post stratification appropriate Chi square was applied considered $P \leq 0.05$ as statistically significant**.**

RESULTS

In this study 128 children were included to assess the frequency of radiological proven pneumonia in patients presented with wheeze and the results were analyzed as Mean ± SD of age was 21.13±12.06 with C.I (19.02-23.24) Table 1. Mean ± SD of duration of symptoms was 2.34±1.11 with C.I (2.15-2.54) days **Table 1.** Mean ± SD of weight was 9.58±3.45 with C.I (8.97…….10.18) kg Table 2. Out of 128 patients 67 (52.3%) were male and 61 (47.7%) were female Table 2. Positive radiological pneumonia was found to be 54 (42.2%) patients Table 2. Stratification of pneumonia with respect to effect modifier of the study i.e. age, gender, duration of symptoms and weight were done from (Table 2).

Table No. 1: Descriptive Statistics n=128

Descriptive Statistics		Statistic
AGE (In months)	Mean	21.13
	Std. Deviation	12.066
DURATION (In Days)	Mean	2.34
	Std. Deviation	1.111
WEIGHT (In Kg)	Mean	9.58
	Std. Deviation	3.452
FREQUENCY OF PNEOMONIA		N (%)
Radiological Proven Pneumonia		54 (42.2%)
Pneumonia having no radiological findings		74 (57.8%)

Table No. 2: Stratification of Age Group N=128

Characteristics		Pneumonia		Total	
		Yes	No		
Age Group (In Months)					
4--21	Count	31	38		
	% Of Total	24.2%	29.7%		
> 21	Count	23	36		0.4947
	% Of Total	18.0%	28.1%		
Total	Count	54	74		
	% Of Total	42.2%	57.8%	100.0%	
Gender					
MALE 67 (52.3%)	Count	30	37		
	% Of Total	23.4%	28.9%		
FEMALE 61 (47.7%)	Count	24	37		0.534
	% Of Total	18.8%	28.9%		
Total	Count	54	74		
	% Of Total	42.2%	57.8%	100.0%	
DURATION (In Days)					
1---3	Count	40	67		
	% Of Total	31.2%	52.3%		
>3	Count	14	7		0.013
	% Of Total	10.9%	5.5%		
Total	Count	54	74		
	% Of Total	42.2%	57.8%	100.0%	
WEIGHT (In Kg)					
4---10	Count	39	51		
	% Of Total	30.5%	39.8%		
>10	Count	15	23		0.686
	% Of Total	11.47%	18.0%		
Total	Count	54	74		
	% Of Total	42.2%	57.8%	100.0%	

DISCUSSION

Pneumonia is a second leading cause of childhood death (under 5 years of age) in Pakistan.[11] The incidence of Pneumonia is more in younger age children (age 2-6 months).[12] Other common associations of pneumonia include male gender, undernutrition, micronutrient deficiency, low immunization status, poverty, overcrowding, poor breastfeeding and exposure to indoor air pollution.

Chest radiographs are advised frequently at Clinics for suspected pneumonia in children. [13] According to an international study chest radiographs were performed in upto 94% of cases to confirm the diagnosis of suspected pneumonia. [14] Guidelines for the developed countries cannot be applied to the developing countries, hence requiring regular review in the context of new information.

As the clinical features of lower respiratory tract infections are nonspecific, it causes a problem for clinicians in making the diagnosis. That's why imaging is justified for making the final diagnosis of Pneumonia. [15]

Some guidelines advocate chest xray only in severe pneumonia having the need of hospitalization, while the others advocate performing chest xray in suspected pneumonia having the less reliable history and examination. [16] In infants advising chest xray for the diagnosis of Pneumonia is the best decision because the signs and symptoms are usually non-specific or subtle).

In our study there were more male children, out of 128 patients 67 (52.3%) were male and 61 (47.7%) were female. The male to female ratio was 1.09: 1. An international study also showed the similar gender distribution, 311 (50.6%) were males and the median age was 27.2months. [17] Out of 128 children with wheeze, 54 [42.2%] diagnosed to have radiologically proven pneumonia while 74 [57.8%] did not have radiological findings of pneumonia. Children 4-21 months had higher proportion of radiological proven pneumonia than children > 21 months of age, and this difference was not statistically significant [p=0.668]. In an unsimilar international study Chest Xray done in children with first time wheeze, among them 24% children showed radiological findings of Pneumonia while 76% showed no radiological finding of Pneumonia. Radiological findings were more in children having elevated temperature, an absence of a family history of asthma, and localized wheezes or rales by auscultatory examination. [18]

Although there have been previous studies that have identified some clinical factors that predict the presence of radiographic pneumonia, there is still no validated clinical rule that informs the clinician as to which patients should get a CXR. [19] In an international study high grade fever was significantly associated with radiological confirmed Pneumonia 63 (51.6%). [20] In another international multicenter study fever, fast breathing, crepitations and hypoxemia was associated with radiological proven pneumonia, while wheeze was not present in most of the children with radiological proven pneumonia. [21] In another study fever within 48 hours of admission was directly associated with radiological proven pneumonia, 109 (38.5%) children had radiological confirmation and 143 (50.5%) had no radiological confirmation. Children without radiologically-confirmed pneumonia were younger than those with radiologically-confirmed pneumonia. [22]

Regarding the etiological agent Pneumococci was more common in radiologically confirmed pneumonia in comparison with patients with normal CXRs (24.2% vs 8.3%, P = .04). [23] A Local study from Lahore showed that X-ray findings were present in 91(39.6%) cases

while in 139(60.4%) children chest xray was normal. Ronchi were present in 42(18.3%) children (p-value <0.001). [24]

In an international study the combination of fast breathing and oxygen saturation <96% in children (>12 months old) and nasal flaring in children (<12 months old) was strongly associated with radiologically proven pneumonia. [25] In a study Chest Xray performed in children with viral induced wheeze (fever and wheeze), 14% of chest Xray showed findings suggestive of bacterial Pneumonia. [26]

In present study age, gender, duration of symptoms and weight played as a role of confounders / effect modifiers. In univariate analysis of age group (4-21) and (> 21) months pneumonia was found in 31 (24.2%) and 23(18%) respectively and P value found to be non-significant i.e. (P=0.497); Similarly, in stratification of gender 30(23.4%) pneumonia was found in male whereas 24 (18.8%) was found in female and P value found to be non-significant i.e. (P=0.534). On the other hand, significant difference was found in stratification for duration of symptoms in days (1-3) and (> 3) days radiologically proven pneumonia was found in 40 (31.2%) and 14(10.9%) respectively and P value found to be significant i.e. (P=0.013). In analysis of weight group (4-10) and (> 10) kg pneumonia was found in 39 (30.5%) and 15(11.47%) respectively and P value found to be non-significant i.e. (P=0.686).

CONCLUSION

Our study shows that out of 128 children who presented with first time wheeze; 42.2% had radiologically proven pneumonia while 57.8% did not have radiologically proven pneumonia. Based on our study findings, it is suggested that pneumonia commonly presents with wheeze and there is a need to screen all children for Pneumonia who admit with wheeze. However, there is a need to conduct more studies using large sample size with multiple study sites in Pakistan to validate these results.

Author's Contribution:

Concept & Design of Study:	Muhammad Touseef
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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