To assess the correlation of Hypoxemia among Children admitted with Pneumonia: A Descriptive Cross-sectional Study

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ABSTRACT

Objective: To determine the frequency and correlation of hypoxemia in children admitted with pneumonia
Study Design: Descriptive Cross-sectional study
Place and Duration: Department of Pediatrics Liaquat University of Medical and Health Sciences, Jamshoro from 1st March to 31st August 2017
Methodology: Children with the clinical diagnosis of pneumonia were included. Age, gender, weight, height, duration of illness and oxygen saturation by pulse oximetry was assessed. Weight and height was plotted on the standard growth chart to determine the centiles and those with oxygen saturation < 90% was labeled as hypoxemic.
Results: A total of 196 children with the clinical diagnosis of pneumonia were assessed, among them 54.08% male and 45.92% female with an average age of 26.22±11.24 months. Frequency of hypoxemia in children presenting with pneumonia was observed in 11.22%. Rate of hypoxemia was not significant among this age group (p=0.305).
Conclusion: Hypoxemia was not significant among age groups children (26.22±11.24months) with pneumonia.
Keywords: Children, Age group, Pneumonia, Pulse oximeter, Hypoxemia, Oxygen saturation.

How to Cite This:
Tarik F, Shaikh S, Chohan MN, Hanif M, Shaikh FA. To assess the correlation of hypoxemia among children admitted with pneumonia: A Descriptive Cross-sectional Study. Isra Med J. 2020; 12(4): 184-187.

INTRODUCTION

According to Integrated Management of Newborn and Childhood Illness (IMNCI), the Pneumonia is the presence of, either or both; i.e. Fast breathing (>50 breaths/min in children between 2 and 12 months, and > 40 breaths/min from 1 year to 5-year old children), and secondly, the Chest indrawing. Presence of any general danger our sign or Stridor along with cough/difficulty in breathing is called severe pneumonia[1].

Pneumonia is an important cause of morbidity in children less than 5 years of age with estimated 156 million cases and 20 million admissions worldwide. Incidence of pneumonia per year in developed countries is about 33 per 10,000 in <five years old children and 14.5 per 10,000 in children 0 to 16 years[2]. In developed countries mortality rate is low (<1 per 1000 per year)[3] but in developing countries, about > 2 million deaths occurs annually. Among the nations of the world, Pakistan has been reported to have 3rdhighest death rate in pneumonia related deaths[4].

Although in developing countries, vaccines against the common causes of pneumonia in children (Hib type B and PCV) have been introduced but, coverage is still lagging far behind. Therefore, in these regions improved early diagnosis and treatment is crucial, but treatment coverage, accurate diagnosis remains low[5], this leads to childhood death due to Pneumonia[6.] These deaths can be prevented by early identification of at risk patients and prompt treatment with antibiotics and oxygen therapy, if needed. According to IMCI guidelines pneumonia is defined as the presence of fast breathing (2 months to 12 months > 50breaths / min, and; > 12 months to 5 years i.e. 60 months, >40breaths/min) or chest in-drawing or both[7,8]. Children having severe pneumonia are referred to hospital or health facility for injectable antibiotics and supportive therapy like oxygen supplementation.

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Received for Publication: April 19 2019
1st Revision of Manuscript: September 28, 2019
2nd Revision of Manuscript: March 18, 2020
3rd Revision of Manuscript: May 24, 2020
4th Revision of Manuscript: June 18, 2020
Accepted for Publication: September 16, 2020

Hypoxemia is a strong predictor of mortality in children with pneumonia[9]. Studies shows that about 15% of children who were hospitalized for pneumonia had hypoxemia[10] and about 1.5 million children with pneumonia needed oxygen supplementation[11]. Hypoxemia is defined as an Oxygen saturation on the pulse oximeter <90% and it is usually associating with bluish discoloration of oral mucous membrane, lips and nailbeds[12]. Utilization of the easy to use non-invasive pulse-oximetry in community health-care settings can detect hypoxemia and therefore prompt early referral to a secondary or tertiary setup can be done.

This study is aimed at determining the frequency of hypoxemia in children presenting with pneumonia. It will help us to determine the burden of this critical complication of pneumonia for the development of better protocols, for early detection and timely referral of such patients for appropriate facilities. Ultimately it will lead to improvement in mortality with provision of timely intervention to these at risk children. So, this study was conducted with an objective to determine the frequency and correlation of hypoxemia in children admitted with pneumonia.

METHODOLOGY

This Descriptive Cross-sectional study was conducted at Department of Pediatrics Liaquat University of Medical and Health Sciences, Jamshoro from 1st March to 31st August 2017 (Total 6 months' duration). Children were selected through non-probability, consecutive sampling. Patients of either gender presenting to Pediatric OPD or ER of Hospital with the clinical diagnosis of pneumonia between age of 2 months to 5 years were included. Children who had other co-morbid cardiac or pulmonary conditions, like known valvular heart disease, asthma, cystic fibrosis or Known history of kidney disease, liver disease, diabetes and having Congenital malformations were excluded from the study. Children suffering from severe Pneumonia were also excluded from the study. Sample size calculated by using the open Epi software, taking 95% confidence interval, prevalence15%, error at 5%[10].

Detailed history and physical examination were carried out and those meeting the inclusion criteria were included in the final analysis. Age, gender, weight, height, duration of illness and oxygen saturation by pulse oximetry was noted. Weight and height was plotted on the standard growth chart to determine the centiles. Those with oxygen saturation < 90% was labeled as hypoxemic. Data was collected on a pre-prescribed Proforma.

Data Analysis: Data was analyzed using Statistical package for social sciences SPSS version 20. Frequency and percentage was calculated for nominal data like, gender and hypoxemia (outcome). Mean and standard deviation was calculated for age, weight, height, duration of illness, weight, and height centile and oxygen saturation. Outcome (hypoxemia) was stratified for age, gender and duration of illness groups. Chi^2 was used and p-Value of ≤0.05 or less was taken as significant.

RESULTS

A total of 196 patients with the clinical diagnosis of pneumonia were included in this study. There were 106(54.08%) male and 90(45.92%) female. Age distribution showing that more children belonged to age group 13 to 24 months of age. Frequency of hypoxemia in children presenting with pneumonia was observed in 11.22% (22/196) as shown in table-I.

Table-I: Frequency of demographic characteristics and hypoxemia (N= 196)

Age (Months)	n	Percentage (%)
<12	17	8.67
13-24	110	56.12
25-36	45	22.96
>36	24	12.24
Gender		
Male	106	54.08
Female	90	45.92
Hypoxemia		
Yes	22	11.22
No	174	88.78

Table-II: Frequency of different characteristics like age, anthropometry, symptoms duration and oxygen saturation (N=196)

Variables	Mean	SD
Age (months)	26.22	11.24
Weight (kg)	11.62	2.68
Weight Centile	36.64	22.20
Height (cm)	84.76	8.77
Height (centile)	35.38	20.02
Duration of Symptoms (days)	3.48	1.74
Oxygen Saturation (%)	92.17%	2.87%

Table-III: Description of hypoxemia in various age groups, gender and symptoms duration (N= 196)

Age Groups	HYPOXEMIA		Chi-Square	p-Value
	Yes	No		
≤ 12 months	3(17.6%)	14(82.4%)	3.623	**0.305**
13 to 24 months	15(13.6%)	95(86.4%)		
25 to 36 months	2(4.4%)	43(95.6%)		
>36 months	2(8.3%)	22(91.7%)		
Gender				
Male	10(11.1%)	80(88.9%)	**0.002**	**0.963**
Female	12(11.3%)	94(88.7%)		
Duration of Symptoms (Days)				
1 to 3	13(11.7%)	98(88.3%)	**1.947**	**0.378**
4 to 6	9(12.7%)	62(87.3%)		
7 to 9	0(0%)	14(100%)		

The average age of the patients was 26.22±11.24 months and mean weight 11.62Kg, Sd 2.68, weight centile: 36.64, Sd 22.20, mean height: 84.76 cm, Sd 8.77, height centile: 35.38, Sd 20.02),

mean duration of symptoms: 3.48 days, Sd 1.74 and oxygen saturation: mean 92.17%, Sd 2.87% is also shown in table-II.
Rate of hypoxemia was not significant among age groups (p=0.305) as shown in table-III. Stratification of analysis was also performed with respect to gender and duration of symptoms and found that rate of hypoxemia was also not significant between male and female (p=0.963) as well as duration of distribution of symptoms (p=0.378) as shown in table-III.

DISCUSSION

Although Pneumonia can occur at any age, but it is more common in younger children. 13% of all infectious illnesses are due to Pneumonia in infants younger than 2 years. In our study, 8.6% children were from 0-12 months, 56.12% were from 13-24 months, 22.9% were 25-36 months and 12.2% were from 37-60 months of age. Age distribution showing that more children belonged to 13 to 24 months of age. The average age of the patients was 26.22±11.24 months. Frequency of hypoxemia in children presenting with pneumonia was observed in 11.22%. In a similar study, the prevalence of hypoxemia was 13%[13]. Various cohort international studies suggested that the presence of normal oxygenation (oxygen saturation >96%) decreased the likelihood of pneumonia[14]. A multicenter, observational study also showed hypoxemia prevalence of 17.3% in children with pneumonia[15]. A study from India showed hypoxia in 50.9% children[16], and from Bangladesh observed 28% hypoxia prevalence in children with pneumonia, this is higher than our study and this difference may be due to obese children in their study[17].
Hypoxemia is a common and potentially lethal complication of acute respiratory infection in children under-five, particularly among those with severe disease. In various studies prevalence of hypoxemia on admission was 27.9%, 19.8% to 20.1% of these children died[18]. In our study hypoxia was more common (17.6%) in < 1-year age group children, it is similar to a study which showed more hypoxia prevalence in young infants[19]
The impact of gender on pneumonia has been identified through international working group (on hospitalized severe pneumonia cases). Admissions of boys were more than girls for pneumonia, especially in the first year of life. In our patients with clinical diagnosis of pneumonia majority were 54.08% males which is statistically similar to an international study, reporting majority (57.3%) children were males[19]
A study signifies the strong suspicion of hypoxia in children with head nodding and unable to feed, where pulse oximetry is not available. In another study there were 41.5% hypoxic children due to pneumonia[20], most of them were restless signifying this sign an indicator of hypoxia in children having pneumonia.
In a study early presentation was most common in younger children. Parents of younger children are more cautious, that's why their presentation at health facility is more as compared to older children[21,22]. In our study rate of hypoxemia was not significant among age groups. This signifying the early detection of hypoxemia and timely use of oxygen supplementation to decrease the mortality in children with pneumonia. So, recording oxygen saturation by the pulse oximeter is highly recommended in all children presented with fast breathing and chest indrawing to avoid potentially fatal complications due to hypoxemia

CONCLUSION

Hypoxemia was not significant among age groups children with pneumonia.

Recommendations:

1. Oxygen saturation should be recorded by the pulse oximeter in all children presented with fast breathing and chest indrawing
2. Routine use of Pulse Oximetry can avoid potentially fatal complications due to hypoxemia.

AUTHOR'S CONTRIBUTION

Tarik F: Conceived idea, Designed Research methodology, Data Collection, Manuscript writing
Shaikh S: Manuscript final reading, Manuscript approval
Chohan MN: Literature Search, Literature Review, Statistical Analysis
Hanif M: Manuscript Writing
Shaikh FA: Literature Search

Disclaimer: None.
Conflict of Interest: None.
Source of Funding: None.

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