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Original Research Article

Assessment of severity of community acquired pneumonia by paediatric infectious diseases society and clinical and radiological profile in 0-5 year age group

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ABSTRACT

Background: The WHO estimates that ARI, mostly in the form of CAP, is the leading cause of death in children under five, killing over 2 million children annually. The present study's PEWS score and PIDS severity criteria were undertaken to know the clinical and radiological profile of patients with Pneumonia and to categorize these patients with PEWS score and PIDS criteria to redefine their severity and assess the management and outcomes.
Methods: Patients aged between 0 to 5 years who presented with cough complaints and respiration difficulty were assessed. The criteria for ICU admission is the presence of more than 2 minor criteria or one of the major criteria. PIDS criteria for CAP recommends ICU admission or continuous monitoring for children in ED.
Results: A prospective observational study of 104 children with CAP was included, and their pneumonia was evaluated using PIDS criteria. The patients were categorized for pneumonia according to PIDS criteria. 32.69% of children were classified as severe CAP (p value=0.02). This difference between non-severe and severe Pneumonia is considered to be statistically significant in which patients classified as severe CAP.
Conclusions: The patients were categorized for Pneumonia according to PIDS criteria. 32.69% of children were classified as severe CAP (p value=0.02). This difference between non-severe and severe Pneumonia is considered to be statistically significant in which patients classified as severe CAP needed vigorous management in emergency department followed by ICU management.

Keywords: CAP, PEWS score, PIDS criteria

INTRODUCTION

Community acquired pneumonia (CAP) can be defined clinically as the presence of signs and symptoms of Pneumonia in a previously healthy child due to an infection which has been acquired outside hospital. CAP is a common serious infection in children and a leading cause of morbidity and mortality in children under five. CAP is more common in developing countries, accounting for 95% of all cases. An estimated 4 lakh pneumonia deaths occur every year in India. The WHO estimates that acute respiratory infection, mostly pneumonia, is the leading cause of death in children under five, killing over 2 million children annually. It is recommended that the definition includes the isolation of a responsible organism. It is evident from numerous studies that a pathogen is not identified in a significant number of cases that otherwise meet the clinical definition. *Streptococcus pneumonia* is the most common bacterial pathogen responsible for pneumonia in preschool-aged children. Only a few studies have assessed the effectiveness ND integration of PEWS in the pediatric emergency department (ED).[1]

Objective

The pediatric early warning score (PEWS), and pediatric infectious diseases society (PIDS) severity criteria of the present study were undertaken to know the clinical and radiological profile of patients with pneumonia and to categorize these patients with PEWS score and PIDS criteria to redefine their severity and to assess the management and outcomes in such patients.

METHODS

A prospective observational study was carried out at the pediatric ward, NICU, and PICU of Medical College and Sir Sayajirao General Hospital, Vadodara.

The time period was from October 2021 to October 2022 (12 months). A total of 104 patients with CAP were enrolled in our study during this time which matched the inclusion and exclusion criteria as mentioned below, and their pneumonia was evaluated with PIDS criteria.

A total number of 104 patients in the age group 0 to 5 years were included in this study and all of them presented with clinical features of mainly lower respiratory tract infection. The detailed history of the illness and examination was conducted according to a questionnaire prepared for the purpose of the study. The children who met the inclusion criteria were included in the study.

Inclusion criteria

Confirmed case of pneumonia by showing infiltrate on X-ray chest and meeting the WHO criteria; age group 0-5 years; and acute onset of respiratory symptoms including fever >38.5°C, and/or cough, fast/ difficult breathing, chest wall in drawing and/or findings of crackles, bronchial breathing or diminished/silenced breath sounds on auscultation were included.

Exclusion criteria

H/O chronic respiratory symptoms, diagnosed case of congenital heart disease, severe congenital malformations like tracheo-esophageal fistula, kidney and liver diseases, acquired immune compromised states, patients were excluded if they had fever for >14 days and had IV antibiotic therapy for 7 days, hospital-acquired pneumonia, preterm infants, previous H/O prolonged hospital admission, and syndromic babies.

Patients having CAP were included in the study, and their pneumonia was evaluated using PIDS criteria. The criteria for ICU admission is the presence of at more than 2 minor criteria or one of major criteria. PIDS criteria for CAP recommends ICU admission or continuous monitoring for children meeting severe criteria. This study aims to assess the ability of the PIDS severity criteria to predict hospital admission, including interventions and diagnosis and help improve the management and clinical outcome of pneumonia.

This study was approved by the Institutional Ethics Committee of Medical College and SSG Hospital, Vadodara.[2]

RESULTS

A prospective observational study of 104 children having CAP was included in the study, and their pneumonia was evaluated with PIDS criteria. The most common age group of presentation of CAP was from 0 to 1 year, followed by 1 year to 2 years.

It shows that 75% of patients having pneumonia belonged to the 0-2 year age group. The gender distribution of patients revealed that nearly 60% of patients were males who had been infected with pneumonia. The geographic distribution showed that the majority of children who had pneumonia belonged to the urban (45%), followed by rural (28.16%) and tribal areas (26.21%). The religion distribution showed that 77.88% belonged to the Hindu religion and 22.12% were Muslims.

The socio-economic status-wise distribution of patients according to the Modified Kuppuswamy classification. It shows a higher incidence of CAP in the upper lower and lower socio-economic class. As Regards the presenting complaints on the day of admission, Out of them, most of the patients had a fever (99.4%) and cough (99.4%), followed by fast breathing (94.23%), rhinorrhea (87.50%) in the majority of the population. 68.27% patients were fully immunized and, 24.04% were partially immunized, 07.69% were unimmunized, respectively.

According to the IAP classification, nearly 53.84% of children had malnutrition grading from grade 1 to grade 4, and 46.15% of patients had normal nutritional status. On examination, nearly 47% of children had mild pallor followed by 32% with moderate pallor and 19% with severe pallor. Cyanosis was observed in 11% of children. Children were also examined regarding respiratory distress and it was observed that 74.03% children had nasal flaring, 33.01% had intercostal retraction, 43.27% had subcostal retraction and 30.10% had suprasternal retraction.[3]

Tachypnea was the most common finding, present in 83.65% of patients, followed by mouth breathing (83.65%), chest-indrawing (64.42%), tachycardia (58.65%), hypoxia (SpO_2<90%) (20.91%) and grunting (9.61%). In the present study, feeble peripheral pulse was present among 10 patients (9.62%).

41.11% of cases of CAP presented with lethargy. 9.62% had prolonged CFT, and 9.62% of patients had cold peripheries. 9.62% children were found hypotensive in this study and had presented with features suggestive of shock. On-auscultation, crepitation was present in 74.03% of

cases. The median CRP was 20 (11-39) among the children.

The majority of patients presented with chest X-ray findings of bronchopneumonia (40.38%) followed by lobar pneumonia (32.69%). The majority of patients presented with chest X-ray findings of bronchopneumonia (40.38%) followed by lobar pneumonia (32.69%). The blood culture was sent in all patients and the culture yield was 50.96%.

The most common bacteria isolated was coagulase negative *Staphylococci* (43.13%), followed by *Staphylococcus aureus* in 17.30%, *Klebsiella pneumonia* in 11.76%. The throat culture was sent in 104 patients, out of which the organisms were in 37.50% of cases. The most common organisms isolated were coagulase-negative *Staphylococci* (14.42%) and *Klebsiella pneumonia* (09.62%).[12] All the children had been given antibiotics in the treatment, and 41.34% of patients needed the antibiotic change. First-line single antibiotics were started in 27.90%, and first-line double antibiotics were started in 30.76% of patients.

Second-line antibiotics were started in 41.34% of cases. Nearly two-thirds of the patients had been given analgesics and anti-pyretic for symptomatic treatment. Nearly 70% of children had been given oxygen supplementation, and 36% of children had been given mechanical ventilation. 40.38% required PICU admission for intensive care management, whereas the remaining 59.62% required treatment in the ward.

The successful outcome was achieved in 90.38% of patients who were discharged, whereas 2.8% of the patient did not complete treatment and were discharged against medical advice. 6.73% of patients expired during the study, and all of them were severely malnourished and unimmunized. The majority of the children had been classified into the scoring of 3 to 5 (60.57%) requiring emergency room observation followed by >6 scores (32.69%) indicating an urgent need for intensive care unit management.[5,12]

All cases of mortality of CAP in our study had PEWS score >6 (p value=0.01). This difference between PEWS score 0-5 and PEWS score >6 is considered to be statistically significant.[6,12]

There is a statistically significant p value (0.01) in which patients with high PEWS scores (12) needed vigorous management in the form of evaluation in the emergency department followed by ICU management. The patients were categorized for pneumonia according to PIDS criteria. There were 32.69% children who were classified as severe CAP (p value=0.02) This difference between non-severe and severe Pneumonia is considered to be statistically significant in which patients with classified as severe CAP were needed vigorous management in the form of evaluation in the emergency department followed by ICU management.[7]

Table 1: Demographic profile of study patients.

Variables	N	%
Age group (years)		
0-1	58	55.76
1-2	20	19.23
2-3	13	12.5
3-4	6	5.76
4-5	7	6.73
Gender		
Male	62	59.61
Female	42	40.38
Geographic location		
Urban	47	45.63
Rural	29	28.16
Tribal	27	26.21

Table 2: Presenting signs of respiratory distress in study patients.

Variables	N	%
Grunting		
Present	18	9.61
Absent	86	90.39
Use of accessory muscles		
Present	14	13.46
Absent	90	86.54
Mouth breathing		
Present	86	82.69
Absent	18	17.31
Chest indrawing		
Present	67	64.42
Absent	37	35.57
Tachypnea		
Present	87	83.65
Absent	17	16.32
Clinical cyanosis		
Present	9	8.65
Absent	95	91.35
Tachycardia		
Present	61	58.65
Absent	43	41.35
Oxygen saturation		
<90%	21	20.91
>90%	83	79.09

Table 3: Blood culture and sensitivity pattern.

Variables	N	%
Coagulase-negative staphylococcus	22	43.13
Staphylococcus aureus	18	17.3
Klebsiella pneumonia	6	11.76
Pseudomonas	5	9.8
E. coli	2	2.88

Table 4: PEWS score.

PEWS score	N	%	P value
0-2	7	6.73	0.01
3-5	63	60.57	
>6	34	32.69	
Total	104	100	

Table 5: Classification according to PIDS criteria.

Variables	N	%	P value
Non-severe	70	67.31	0.02
Severe	34	32.69	
Total	104	100	

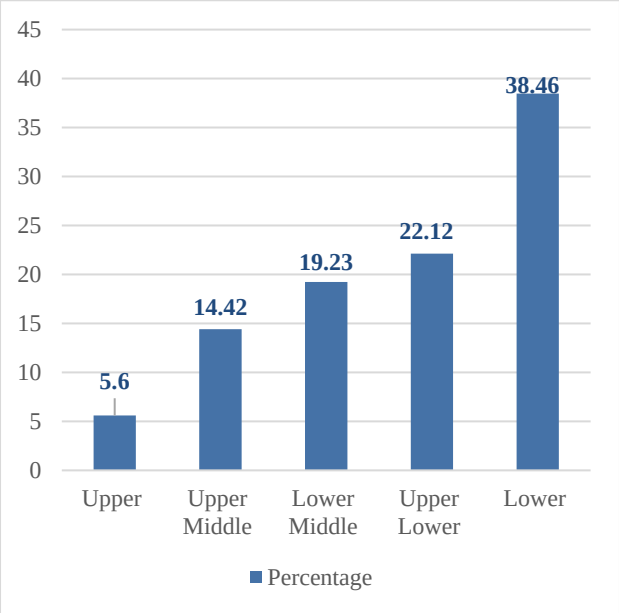

Figure 1: Bar diagram showing socio-economic status.

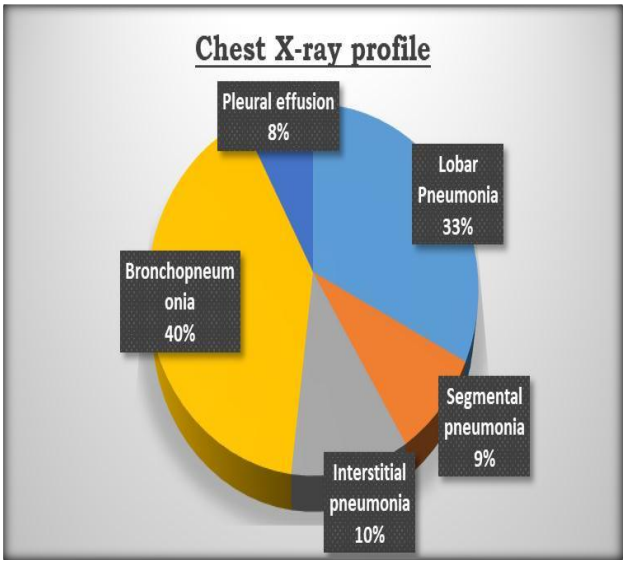

Figure 2: Pie chart showing chest X-ray profile of the patients.

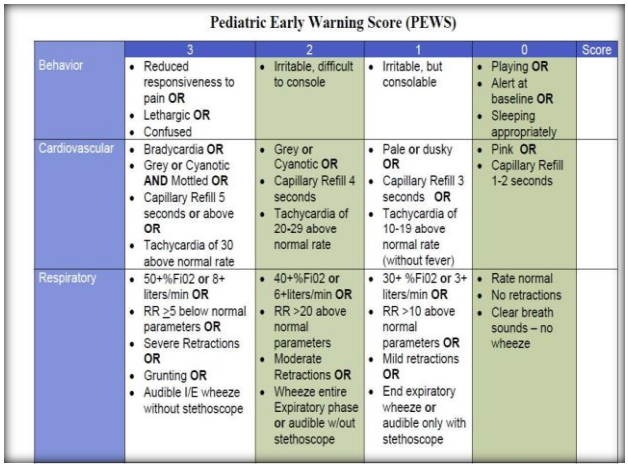

Figure 3: PEWS.

DISCUSSION

The PIDS severity criteria have high sensitivity for admission. The use of hospital or ICU admission as an outcome has limitations. Many factors, including clinician impressions, varied admission criteria across individuals and institutions, psychosocial considerations, the potential for non-adherence, or concern about follow-up, influence site-of-care decisions.[13]

The most common age group of presentation of CAP was from 0 to 1 year, followed by 1 year to 2 years. Patients were categorized into different age groups; 55.76% of the patients belonged to the age group of 0-1 year, followed by 19.23% of patients from 1 year to 2 years. A study conducted by Alexandre Cannesson and Narcisse Elenga, French Guiana, France, 2021 on CAP requiring hospitalization among 415 French Guianese children enrolled.

The mean age was 3:5±3:0 years. 52% of patients were less than 2 years, and 74.7% of patients were less than 5 years old, which is comparable to our study.[14] The gender distribution of patients revealed that nearly 60% of patients were males who had been infected with pneumonia. The male-to-female ratio was 1.4:1. The geographic distribution showed that the majority of children who had pneumonia belonged to the urban (45%), followed by rural (28.16%) and tribal areas (26.21%). A cross-sectional survey was conducted by Awasthi et al Lucknow, 2016, to assess the proportion of CAP cases that were hospitalized in the last 12 months. A total of 3,351 children (2-59 months) were enrolled in their study, showing that 38% of patients belonged to urban areas and 62 % were from rural areas. Our study has a similar correlation regarding the geographic distribution of patients.[15] The religion distribution showed that 81 (77.88%) belonged to the Hindu religion and 23 (22.12%) were Muslims. The socio-economic status-wise distribution of patients according to the Modified Kuppuswamy classification in which 15 patients belonged to the upper middle class, 20 patients belonged to the lower middle, 23 patients belonged to the

upper lower class, and 40 patients belonged to the lower class. It shows a higher incidence of community-acquired pneumonia in the upper lower and lower socio-economic class.[16] A study conducted by Nirmolia et al Dibrugarh town, Assam, 2016 in slums included a total of 630 patients. According to the modified Kuppuswamy 2014 socio-economic classification, 42.3% belonged to the upper lower class, 32.5% belonged to the lower middle class, 17.78% belonged to the upper middle class, and 7.3% belonged to the lower class, which is comparable to our study. Tachypnea was the most common finding, present in 83.65% of patients, followed by mouth breathing (83.65%), chest indrawing (64.42%), tachycardia (58.65%), hypoxia (SpO_2<90 %) (20.91%) and grunting (9.61%). In a study conducted by Alexandre Cannesson and Narcisse Elenga, French Guiana, France, 2021, a total of 415 patients were enrolled in this study.

Out of them, 80.5% had a fever, 63.3% had a cough, 50.8% had difficulty in breathing, and 38.13% had rhinorrhea present at the time of admission, which is comparable to our study. The minor criteria showed greater variability, with tachypnea, increased work of breathing, multilobar infiltrates and PEWS demonstrating moderate-to-high sensitivity and altered mental status, hypotension, pleural effusion, apnea, metabolic acidosis and SpO_2/FiO_2 demonstrating higher specificity.[13] The majority of patients presented with chest X-ray findings of bronchopneumonia (40.38%) followed by lobar pneumonia (32.69%). Interstitial pneumonia (10.57%), whereas pleural effusion (7.69%). A study conducted by Jonnalagadda et al Ecuador, 2017 showed that lobar pneumonia was seen in 65.9%, consolidation in 3.6%, air trapping in 14.0%, and interstitial pneumonia in 16.5%, which is comparable to our study.[17]

The blood culture was sent to all patients, and the culture yield was 50.96%. The most common bacteria isolated was coagulase-negative *Staphylococci* (43.13%), followed by *Staphylococcus aureus* at 17.30%, *Klebsiella pneumonia* at 11.76%, *and Pseudomonas aeruginosa* at 9.80% and *E. coli* in 2.88%. Alexandre Cannesson and Narcisse Elenga, French Guiana, France, a bacterial etiology was found in 57 (61.3%) patients out of 93 blood cultures. The most commonly isolated pathogenic bacteria were *Streptococcus pneumonia*, *Staphylococcus aureus*, and *Haemophilus influenza*, which is comparable to our study.[14] The majority of the children had been classified into the scoring of 3 to 5 (60.57%) requiring emergency room observation followed by >6 scores (32.69%), indicating an urgent need for intensive care unit management.[13]

All cases of mortality of community-acquired pneumonia in our study had PEWS score >6 (p value=0.01). This difference between a PEWS score of 0-5 and a PEWS score >6 is considered to be statistically significant. There is a statistically significant p value (0.01) in which patients with high PEWS scores needed vigorous management in the form of evaluation in the emergency department, followed by ICU management.[6] The patients were categorized for pneumonia according to PIDS criteria. There were 34 (32.69%) children who were classified as severe CAP (p value=0.02). This difference between non-severe and severe pneumonia is considered to be statistically significant in which patients classified as severe CAP needed vigorous management in the form of evaluation in the emergency department followed by ICU management.

Table 6: Classification according to PIDS criteria.[6]

Classification
Major criteria
Invasive mechanical ventilation
Fluid refractory shock
Acute need for non-invasive positive pressure ventilation
Hypoxemia requiring FIO_2 at a higher concentration or flow feasible in the general care area
PEWS>6
Minor criteria
The respiratory rate for age
0-2 months: RR>60/min
2-12 months: RR>50/min
1-5 years: RR>40/min
5 year: RR >30/min
Apnea
Increased work of breathing
PaO_2/FiO_2<250
Multi-lobar infiltrates
Pediatrics early warning score (1-5)
Altered mental status
Hypotension
Pleural effusion
Comorbid conditions
Unexplained metabolic acidosis

Limitations

Our study had a small sample size, and hence more number of studies over a longer period of time and including a greater number of subjects are required to validate these results. The present study occurred at a single center and results may not be generalizable; however, we have no reason to believe that CAP severity would differ by location.

CONCLUSION

The patients were categorized for pneumonia according to PIDS criteria. There were 34 (32.69%) children who were classified as severe CAP (p value=0.02). This difference between non-severe and severe Pneumonia is considered to be statistically significant in which patients classified as severe CAP needed vigorous management in the form of evaluation in the emergency department followed by ICU management. The PEWS score and PIDS criteria is a new

predictive tool specifically for patient with CAP helps in the emergency room to categorize patients according to the severity and improve clinical decision-making.

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Ethical approval: The study was approved by the Institutional Ethics Committee of *Biomedical and Health Research, Government Medical College, Baroda, Gujarat, India*

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