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Research Article

Outcome of Community-Acquired Pneumonia in Children Admitted to PICU at Minia Children University Hospital.

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Abstract

Background: Among the primary reasons contributing to morbidity and mortality in children is community-acquired pneumonia (CAP). **Aim of the work:** To assess the clinical outcomes of community-acquired pneumonia (CAP) in children admitted to PICU at Maternity and Children's Hospital of Minia University. **Methods:** This research was carried out at Maternity and Children's Hospital of Minia University, Pediatric Department (Chest ward and Pediatric ICU) from June 2023 to December 2023. The study enrolled 80 children with community acquired pneumonia (40 patients with mild to moderate CAP admitted to the chest ward as controls and 40 patients with severe CAP admitted to PICU as cases). Demographic and clinical data were gathered. X-ray was used to assess the diagnosis of pneumonia. **Results:** incidence of fever, cyanosis, respiratory distress, complication, duration of hospital stay, and 1-month mortality were significantly higher in cases with severe CAP admitted to PICU in comparison with mild to moderate CAP pediatric patients admitted to the chest ward p-value <0.05. Duration of hospital and PICU stay was significantly lower among cases with mild to moderate CAP (7.7±2.8 days) than in cases with severe CAP (16.25±3.3 days) p-value <0. 001.The incidence of one -month mortality among children with severe pneumonia was 17.5% versus 2.5% in children with mild to moderate pneumonia p-value <0.05. **Conclusion:** CAP remains one of the major causes of morbidity and mortality in children all over the world. Pediatric cases with sever CAP are usually admitted to PICU and is associated with high mortality risk and poor clinical outcome.

Keywords: Pneumonia, Children, Outcome, PICU.

Introduction

The term community-acquired pneumonia (CAP) refers to acute infection of lung parenchyma in a patient who gained the infection outside the hospital. CAP is a prevalent illness with high rates of morbidity that has the potential to be serious [(1)].

One of the main reasons of death and morbidity in children all over the world is pneumonia, accounting for a total number of 120 million new cases annually and the mortality rate among patients with severe pneumonia is approximately 8.7%, particularly in young infants [(2)].

Early CAP diagnosis and management is very important due to the high mortality rate of severe CAP in children [(3)].

Assessment of the disease's severity is a key component of the management of pediatric CAP, in many settings worldwide, this is primarily based on clinical symptoms, signs, and radiological findings.

A higher death rate is linked to improper outpatient care or delaying the admission of CAP patients to the pediatric intensive care unit (PICU) [4].

Aim of the work

To assess the clinical outcomes of community-acquired pneumonia (CAP) in children admitted to PICU at Maternity and Children's Hospital of Minia University in comparison with mild to moderate CAP pediatric patients admitted to the chest ward.

Methods:

Our prospective cross-sectional study was carried out at Maternity and Children's Hospital of Minia University, Pediatric Department (chest ward and pediatric ICU) during the period from June 2023 to December 2023 after obtaining an approval from Medical Ethical Committee, Faculty of Medicine, Minia University and written informed consents were obtained from the caregivers of included children. Eighty infants and children aging from 2 months to 5 years were enrolled in the study and they were grouped as following:

Group 1: 40 children with mild to moderate CAP admitted to chest ward as controls.

Group 2: 40 children with severe CAP admitted to pediatric ICU (20 children on MV and 20 children not on MV) as cases.

The British Thoracic Society's classification system was used to determine the severity of CAP [5].

We excluded from our study patients with hospital acquired pneumonia, patients with congenital heart disease and congenital chest diseases, patients with other, patients with other infectious diseases as tuberculosis (TB), patients with bronchial asthma, diabetes, hepatitis and liver cell failure (LCF), also immunocompromised patients were excluded.

All studied children had been subjected to:

- Full history: personal history, history of symptoms related to pneumonia and history of other medical illness and other infectious diseases.
- Clinical examination: general examination with vital signs assessment including blood pressure (BP), heart rate (HR), respiratory rate (RR), O_2 saturation and temperature of the body. and local chest examination including chest inspection, palpation and auscultation.
- Chest x- ray: postero-anterior views

Statistical analysis

SPSS 26 for windows (SPSS Inc., Chicago, IL, USA) was used to gather, tabulate, and statistically analyze all the data.

To ascertain whether or not the data were normally distributed, the Shapiro Walk test was employed. Frequencies and relative percentages were utilized to express the qualitative data. The range and mean ± SD (standard deviation) was used to display the quantitative data.

To determine the difference between the qualitative variables, the Fisher Exact Test and the Chi Square Test were utilized.

For parametric and non-parametric variables, respectively, the difference between the quantitative variables in the two groups was determined by the Independent T test and the Mann Whitney test.

All statistical comparisons were two tailed with significance Level of P-value ≤ 0.05.
A P-value ≤ 0.05 indicates a significant difference, $p<0.001$ indicates a highly significant difference, and $P>0.05$ indicates a non-significant difference.
To determine the one-month mortality rate, logistic regression analysis was done.

Results

Clinical data of the studied groups were tabulated and statistically analyzed. Result of the study are shown in the present tables as following:

The mean age of cases with mild to moderate pneumonia admitted to chest ward was 2.6 years compared to 2.5 years in cases with severe pneumonia admitted to PICU, also 52.5% of cases with mild to moderate pneumonia were males compared

to 45% of cases with severe pneumonia, regarding the comparison of baseline data between cases with mild to moderate CAP and cases with severe CAP, the results was non-statistically significant (p value >0.05) **(Table1).**

Regarding the comparison of clinical data and radiological data between children with mild to moderate CAP and children with severe CAP, the results was statistically significant regarding incidence of cyanosis, respiratory distress and complication (p value <0.05) the mean temperature of patients with mild to moderate pneumonia was 37.7 which is significantly lower than in cases with severe pneumonia (mean temperature=39.3), also lower percentage of cases with mild to moderate pneumonia had RD grade 4 and cyanosis (0% and 2.5%) than in cases with severe pneumonia (67.5% for each item separately). Also lower percentage of cases with mild to moderate pneumonia had multiple lobe lesions (20%) than in cases with severe pneumonia (90%), while a significant higher percentage of cases with mild to moderate pneumonia had no complication (82.5%) than in cases with severe pneumonia (42.5%)., as out of 40 cases with severe pneumonia, there were 9 cases had pleural effusion, 6 cases had hydropneumothorax, 5 cases had pneumothorax and 2 cases had septic shock, on other hand, non-significant difference was found regarding incidence of cough as all cases with CAP either mild or severe had cough **(table2).** Regarding the comparison of Duration of hospital and PICU stay, need for ventilation and 1 month mortality between cases with mild to moderate CAP and cases with severe CAP, the results were statistically significant (p value <0.05) as mean Duration of hospital and PICU stay was significantly lower among cases with mild to moderate CAP (7.7±2.8 days) than in cases with severe CAP (16.25±3.3 days).

Regarding mortality, it was found that 7 cases out of 40 cases with severe CAP died compared to only 1 case among cases with mild to moderate CAP **(table 3).**

Table (1): Comparison of baseline data between children with mild to moderate CAP admitted to chest ward and children with severe CAP admitted to PICU.

	Mild to moderate CAP (N=40)	Severe CAP (N=40)	p value
Age (years)			
Mean ±SD	2.6±2.5	2.5±2.7	0.75
(Range)	0.25-12	0.25-12	
Sex			
Male	21(52.5%)	18(45%)	0.65
Female	19(47.5%)	22(55%)	

Table (2): Comparison of clinical data and radiological between cases with mild to moderate CAP and cases with severe CAP.

Clinical data and complication	Mild to moderate CAP (N=40)	Severe CAP (N=40)	p value
Body temperature			
Mean ±SD	37.7±0.68	39.3±0.5	<0.001*
(Range)	36.5-39	38-40	
Cough			
No	0(0%)	0(0%)	—
Yes	40(100%)	40(100%)	
Respiratory distress			
No	3(7.5%)	0(0%)	<0.001*
RD1	18(45%)	0(0%)	
RD2	12(30%)	0(0%)	
RD3	7(17.5%)	13(32.5%)	
RD4	0(0%)	27(67.5%)	
Cyanosis			
No	39(97.5%)	13(32.5%)	<0.001*
Yes	1(2.5%)	27(67.5%)	
Complication			
No	33(82.5%)	17(42.5%)	<0.001*
Pneumothorax	0(0%)	5(12.5%)	
Hydropneumothorax	2(5%)	6(15%)	
Pneumomediastinum	0(0%)	1(2.5%)	
Pleural effusion	3(7.5%)	9(22.5%)	
Lung collapse	1(2.5%)	0(0%)	
Failure to thrive	1(2.5%)	0(0%)	
Septic shock	0(0%)	2(5%)	
Radiological data			
Single lobe	32(80%)	4(10%)	<0.001*
Multiple lobe	8(20%)	36(90%)	

Table (3): Comparison of hospitalization and outcome between cases with mild to moderate CAP and cases with severe CAP.

	Mild to moderate CAP (N=40)	Severe CAP (N=40)	p value
Duration of hospital and PICU stay **Mean ±SD** **(Range)**	 7.7±2.8 4-15	 16.25±3.3 10-24	 <0.001*
Ventilation **No** **Yes**	 40(100%) 0(0%)	 20(50%) 20(50%)	 <0.001*
Duration of ventilation **Mean ±SD** **(Range)**	 ___	 6.6±1.6 4-10	
1 month mortality **Survived** **Died**	 39(97.5%) 1(2.5%)	 33(82.5%) 7(17.5%)	 0.05*

Discussion

One of the major causes of death in children under five is childhood pneumonia, 17 to 30 percent of cases of community-acquired pneumonia (CAP) are severe enough to necessitate hospitalization. Admission to pediatric intensive care unit (PICU) may be necessary for certain hospitalized children with severe community-acquired pneumonia (CAP) due to serious complications [(6).] In our study we assessed the clinical outcomes of community-acquired pneumonia (CAP) in children admitted to PICU at Maternity and Children's Hospital of Minia University in comparison with mild to moderate CAP pediatric patients admitted to the chest ward.

According to our findings, cases with severe CAP admitted to PICU had a significantly higher incidence of cyanosis and respiratory distress than mild to moderate CAP cases who were admitted to the chest ward. This is in line with Güven and Kişlal [(7)] who reported that incidence of cyanosis and respiratory distress were significantly higher among children with severe CAP in comparison to those with non-severe disease.

Abdelgadir et al., [(8)] also reported higher incidence of respiratory distress including dyspnea and tachypnea among children with CAP admitted to PICU than CAP pediatric patients admitted to inpatient ward.

Our study showed that the incidence of complication among CAP patients who were admitted to PICU was higher than that in mild to moderate CAP patients and pleural effusion is the most common complication this is partially in agreement with Krapiec [(9)] who reported that the most common complication of CAP in his study on pediatric patients was pleural effusion.

Our results showed that the duration of hospital stay among cases with severe CAP admitted to PICU was significantly higher than mild to moderate patients admitted to the chest ward, the mean duration of hospital stay among severe CAP patients admitted to PICU was 16.25±3.3 days versus mean duration of 7.7±2.8 days in mild to moderate patients.

These results agree with Huang et al., [(5)] who reported that the mean duration of hospital stay for children with severe CAP with progressive clinical course was higher than that of children with non-progressive CAP, the mean duration of hospital stay was 16.2 days versus 7.5 days respectively.

Regarding the 30- days mortality rate our results showed that the 30- days mortality rate was significantly higher in patients admitted to PICU in comparison with mild to moderate CAP pediatric patients who were admitted to the chest ward, The 30-days mortality rate was 17.5% versus 2.5% respectively. This is in line with Song et al., [10] who reported that Patients with severe CAP had a significantly higher 30-days mortality rate than mild to moderate cases as it was 12% versus 2% respectively.

Conclusion

CAP remains one of the major causes of morbidity and mortality in children all over the world. Pediatric cases with sever CAP are usually admitted to PICU and is associated with high mortality risk and poor clinical outcome. We recommend conducting extensive additional research on a wide range of cases.

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