

Original Research Article

Epidemiological patterns and clinical outcomes of paediatric community-acquired pneumonia in a tertiary care hospital, Ajman, UAE

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Abstract

Purpose: To examine the sociodemographic characteristics and clinical manifestations among patients admitted with community-acquired pneumonia (CAP) at the tertiary care hospital, Ajman, UAE.

Methods: This observational retrospective cohort study involved 177 confirmed pediatric CAP patients admitted from January 2021 to December 2023. Data on sociodemographic status and clinical characteristics were obtained, and results were stratified according to the inclusion and exclusion criteria.

Results: Study population included 53.1 % males and 46.9 % females, and the mean age of the population was 4.3 years. Intravenous treatment was given to all patients; the treatment course varied from one to three days. Cough was more prevalent than fever; vomiting was the third most frequent after cough and fever, while difficulty breathing was more frequent in females compared to males. Furthermore, 50.28 % of the patients were discharged without new complications, and an equal proportion, 40.11 %, had to be prescribed antibiotics after discharge. Minor complications were recorded in 6.21 % of the patients, while 2.26 % needed transfer to the intensive care unit. No deaths were reported during the study.

Conclusion: Short hospitalization durations suggest that the participants received adequate treatment. The various treatment regimens are considered appropriate as there were no mortalities. Finally, age was a significant factor since neonates are more prone to complications and need more aggressive therapy.

Keywords: Infectious Disease, Clinical outcomes, Antibiotic Outcomes, Pediatric patients

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INTRODUCTION

Community-acquired pneumonia (CAP) is the single most common cause of childhood bacterial infections, hospitalization and mortality from infectious diseases [1]. Fever, cough, anorexia and hypoxemia are some of the common clinical presentations in pediatric patients suffering from

CAP, which usually reduce a child's health and well-being [2].

Diagnostic imaging, like chest radiographs, is common among hospitalized children with CAP to help identify disease causes and future clinical outcomes [2]. The pharmacists have a central part to play in the pursuit of antibiotic

stewardship, as well as appropriate isolation measures and preventive measures against the complications of CAP in improving patient outcomes [3].

Global concern is warranted as CAP affects millions of people annually. Community-acquired pneumonia is a disease whose prevalence rate depends on the country, availability of adequate health care facilities and economic development level [2]. This is a disease that was previously known as the "forgotten killer of children" and is estimated to be the cause of 1.1 to 1.4 million deaths in children per year, or 17 – 19 % of all child deaths [2]. Most of the deaths take place in Low and Middle-Income Countries, where access to health care services is still a challenge.

The primary risk factors contributing to pediatric pneumonia development in the UAE also differ across age groups. It is essential not to use antibiotics in viral pneumonia, especially in cases of pneumonia that usually present initially with flu-like symptoms, lower, gradual onset, bilateral rales, and nontoxic appearances [4,5]. Among bacterial pathogens, *Streptococcus pneumoniae* remains the most prevalent pathogen in "typical" pneumonia in all pediatric age groups. Symptoms of bacterial pneumonia in preschool-aged children are usually severe, rapid in onset and result in moderate to severe respiratory difficulty, usually requiring admission [6,8]. This study aimed to evaluate demographic trends of pediatric admissions with infectious diseases and evaluate the incidence of infectious disease among patients below the age of 18 years.

METHODS

Study design

This research was designed as a retrospective cohort study.

Study period

Descriptive data were gathered for all children who were admitted to the hospital between January 2021 and April 2023, following age inclusion and exclusion criteria. Data collection lasted almost four months, and all pediatric patients admitted to MTRH during the study period (January 2021 – December 2023) were included. In this case, information was manually obtained from different patients' records.

Study location

The study occurred in a teaching hospital offering third-level care in the emirate of Ajman, United

Arab Emirates. All the pediatric patients with confirmed CAP who met the inclusion and exclusion criteria were enrolled. The locations comprised the general pediatric ward, pediatric intensive care unit (PICU), and emergency department.

Study population

The target participants included children up to the age of 18 years with diagnosed CAP who presented at the hospital from January 2021 to December 2023.

Inclusion criteria

Children and young adults from newborns up to 18 years of age. A definitive clinical diagnosis of CAP, according to clinical signs and symptoms, techniques (e.g., chest x-rays), and investigations (e.g., laboratory results). Targeted only the CAP subset to examine this cohort of patients' treatment response and clinical status.

Exclusion criteria

Patients affected by pneumonia who developed in hospitals or obtained via a healthcare-connected location. Patients who have comorbidities include severe immunosuppression or severe physical disabilities that affect the patients' outcomes.

Sample size calculation

This study involved all patients who met the inclusion criteria and received admission from January 2021 to December 2023. To increase coverage, universal sampling was used to identify all eligible patients during the study period.

Ethical approval

The study received approval from the Institutional Review Board (IRB) of the tertiary care hospital (approval no. IRB-COP-STD-62-NOV-2023).

Data collection

The researcher developed a data collection form to collect data from the patient's medical record available at the Hospital Information Management System. Data obtained in the study included age, weight, body surface area, gender, and race of the patients admitted, their diagnosis, and medication history. Data collection and cleaning were done in Excel, and monthly investigator meetings were held to ensure data validity.

Data confidentiality

Precaution was exercised to maintain the details provided. Firstly, identifying information such as the patient's names was replaced by hospital numbers only. Proper identification numbers were provided so the researcher could access the files and data to ensure they did not fall into the wrong hands. The data was collected using a Google Form for security purposes and then transferred to Excel for analysis. Although the data required for education or publications may be requested by the Ministry of Health and Prevention (MOHAP) or partner hospitals.

Statistical analysis

Structured data obtained from Excel was analyzed using the IBM SPSS Statistics (Version 22.0). The analysed data is available with the principal investigator for five years. Data were described and analysed as proportions and means $\pm$ standard deviation and medians and ranges, as appropriate. Numerical variables were compared with analysis of variance (ANOVA), while association tests were done with Chi-square tests. A P-value of < 0.05 was used to determine the statistical significance between the researched factors.

RESULTS

Demographic information of participants

Table 1 presents a demographic overview of 177 participants, where 53.1 % were male and 46.9 % were female. The average age was 4.8 years, with a standard deviation of 2.96 years. The data provides a comparison of new CAP cases over two years (2022 and 2023). According to the demographic information, there was a slight decrease in new CAP cases from 2022 to 2023, with approximately 8.64 % drop in cases. About 54.32 % of the cases were from 2022 and 45.68 % from 2023. Nationality distribution was diverse, with the highest percentage of participants from India (34.46 %), followed by Yemen (16.38 %), Pakistan (12.43 %), and UAE (7.91 %). Smaller groups came from countries such as Bangladesh (4.52 %), Egypt (5.08 %), Sudan (2.82 %), and Syria (1.69 %), with several other countries contributing under 2 % each. A majority (95 %) had no Central Nervous System (CNS) involvement, while 5 % did. All participants (100 %) received intravenous (IV) treatment, with varying durations: 44 % were treated for 2 days, 25.9 % for 3 days, and 18.6 % for 1 day. Longer treatment durations, such as 4, 5, or 7 days, were less common, affecting less than 6 % of participants each. The majority of patients

experienced short stays, with a mean hospital stay of 2.45 ± 1.3 days.

Table 1: Epidemiological trends and sociodemographic characteristics of the study population

Demographic Information	N (%)
Gender	
Male	94 (53.1%)
Female	83 (46.9%)
Age (mean $\pm$ SD)	4.8 $\pm$ 2.96
Min.	10 days
Max.	12 years
Nationality	
Australia	1 (0.56%)
Bangladesh	8 (4.52%)
Egypt	9 (5.08%)
Ethiopia	2 (1.13%)
India	61 (34.46%)
Iran	4 (2.26%)
Iraq	1 (0.56%)
Jordan	4 (2.26%)
Kenya	1 (0.56%)
Mauritania	1 (0.56%)
Morocco	1 (0.56%)
Pakistan	22 (12.43%)
Palestine	4 (2.26%)
Philippines	2 (1.13%)
Somalia	2 (1.13%)
South Sudan	1 (0.56%)
Sri Lanka	2 (1.13%)
Sudan	5 (2.82%)
Syria	3 (1.69%)
UAE	14 (7.91%)
Yemen	29 (16.38%)
Year	
2022	96 (54.32%)
2023	81 (45.68%)
CNS	
Yes	9 (5%)
No	168 (95%)
Route IV	177 (100%)
Duration (days)	2.45 $\pm$ 1.3

Clinical symptoms based on gender

Table 2 shows the clinical symptoms data of the subjects by gender. Cough was present in 100 % of both females and males. Vomiting occurred in 51 females (61.45 %) and 55 males (58.51 %), while abdominal pain was rare, seen in only 1 female (1.20 %) and 1 male (1.06 %). Fever was observed in 80 females (96.39 %) and 94 males (100 %), and febrile convulsion occurred in 1 female (1.10 %) but not in males. Poor oral intake was noted in 76 females (91.57 %) and 89 males (94.69 %), while difficulty breathing was more common in females (36.14 %) than males (13.83 %).

Less common symptoms included ear pain in 1 male (1.06 %) and noisy breathing in 1 female (1.20 %). Loose stool was reported in 1 male (1.06 %) only. These findings indicate similar symptom distributions between genders, with slight variations in vomiting, poor intake, and difficulty breathing. The p-value indicates the statistical significance of the differences observed between the two groups (female and male) for each clinical symptom.

Clinical characteristics based on age category

The clinical characteristics data reveal significant differences across age groups regarding *Mycoplasma* infection and CNS involvement, as well as the prescribed medications. *Mycoplasma* infection was more prevalent in children (57.2%) and infants (51.8%) compared to neonates (25 %; $p < 0.001$). In contrast, CNS involvement was significantly higher in neonates (50%) than in infants (5.35%) and children (3.4 %; $p < 0.001$). Regarding CNS organism (Group A

Streptococcus), it was identified in 50 % of neonates, compared to only 1.69 % of both infants and children ($p < 0.001$). In terms of drug prescriptions, Ceftriaxone was commonly prescribed in children (96.58 %) and infants (62.50 %), while vancomycin and meropenem were used exclusively in neonates (25 % each; $p < 0.001$). Notably, no medication was administered to 12.5 % of infants, indicating different treatment approaches based on age group and condition. These findings underscore the significant variations in infection prevalence, CNS complications, and treatment choices across different age categories. The identification of ceftriaxone allergies among 8 patients emphasizes the critical role of personalized medicine in paediatric antibiotic therapy. By adapting treatment plans based on individual patient needs and allergies, healthcare providers enhance safety and optimize therapeutic outcomes. This format presents the findings related to ceftriaxone allergies as part of the results while maintaining clarity and focus on the implications for patient care.

Table 2: Clinical symptoms upon admission based on gender

Clinical symptom	Gender	
	Female (n=83)	Male (n=94)
Cough	83 (100%)	94 (100%)
Vomiting	51(61.45%)	55 (58.51%)
Abdominal pain	1 (1.20%)	1 (1.06%)
Fever	80 (96.39%)	94 (100%)
Febrile convulsion	1 (1.10%)	0
Poor intake	76 (91.57%)	89 (94.69%)
Difficulty breathing in	30 (36.14%)	13 (13.83%)
Ear Pain	0	1 (1.06%)
Noisy breathing	1 (1.20%)	0
loose stool	0	1 (1.06%)

Table 3: Clinical characteristics based on age category

Clinical characteristic	Age Category			P-value
	Neonate < 2 months (n=4)	Infants 2m -2years (n=56)	Children 2-11 years (n=117)	
<i>Mycoplasma</i>				<0.001
Positive	1 (25%)	29 (51.8%)	67 (57.2%)	
Negative	3 (75%)	27 (48.2%)	55 (47%)	
CNS				<0.001
Yes	2 (50%)	3 (5.35%)	4 (3.4%)	
No	2 (50%)	53 (94.65%)	113 (96.6%)	
CNS organism				<0.029
Negative	2 (50%)	3 (1.69%)	3 (1.69%)	
Positive (Group A Strep.)	0	0	1 (0.56%)	
Drug Prescribed				<0.001
Ceftriaxone	1 (25%)	35 (62.50%)	113 (96.58%)	
Azithromycin	0	1 (1.79%)	0	
Clarithromycin	0	0	0	
Meropenem	1 (25%)	0	0	
Vancomycin	1 (25%)	0	0	
Gentamicin	0	0	1 (0.85%)	
Ceftriaxone/Clarithromycin	1(25%)	0	0	
Ceftriaxone/Azithromycin		13 (23.21%)	2(1.71%)	
No Medication	0	7 (12.50%)	0	

Distribution of organisms among participants

Following the graphical representation of CNS organism cases, majority (94 %) of cases fall under the "No CNS" category, while 4 % are classified as "Negative" for CNS organisms. Only 1 % of cases are "Positive" for CNS organisms, and 1 % are due to Group A Streptococcus.

DISCUSSION

The findings of this work offer helpful information regarding the epidemiologic profile, clinical presentation, and prognosis of children with CAP who are admitted to a tertiary care center in Ajman, UAE [8,9]. The study involved 177 participants, and the analysis was done on gender, age, nationality, clinical signs, severity levels according to the predisposition, insult, response, organ dysfunction PIRO score, and effects of treatment protocol.

The study showed that boys are more vulnerable to respiratory infections than girls in childhood [5-10]. The participants' mean age was 4.8 years, demonstrating that CAP is most common in young children, especially those between the ages of 2 and 11 years, as represented by most of the participants. The present study emphasizes the need to direct more attention to this age group since effective prevention and management intervention for CAP is still relevant today, given that childhood CAP continues to be one of the leading causes of hospital admission in children worldwide [1,2].

Nationality distribution of the children was also diverse. This is due to the multinational population of the UAE, which highlights the importance of culturally appropriate etiquette that should be followed in healthcare institutions for each group/ethnicity [11]. The study was conducted in 2022 and 2023, which enabled the investigation of an up-to-date situation concerning CAP in the population of interest [12]. There were no differences in clinical symptoms of CAP between genders; however, the most common symptoms were cough, fever and poor intake [13]. Cough was rated as the most severe symptom by both the male and female participants and thus was found to be the most important symptom of CAP [14]. Fever was also prevalent in the majority of female participants and all of the male participants. These findings are consistent with the baseline clinical characteristics of CAP in pediatric age groups [5].

Vomiting was higher in female respondents (61.45 %), while in male respondents (58.51 %)

[6]. Easy breathing was higher in female respondents (36.14 %), compared to male respondents (13.83 %). These sex differences could be due to differences in immune response or self-reporting of symptoms [8]. Notably, the CNS involvement was low (5 %), meaning significant neurological complications were uncommon among this group. This finding indicates that although CAP is a life-threatening condition, CNS complications were not reported to be frequent and may be caused by early medical management. Clinical scale differences in older patients result in different primary structures of care than for middle-aged and young patients [8].

The study also reported significant differences between age groups in CAP's clinical features and prognosis [15]. For instance, Mycoplasma infection was more prevalent in older children (57.2 %; 95 CI 46.3 - 68.1 among children aged 2 - 11 years) than in neonates (25 %; 95 CI 12.8 - 37.2). On the other hand, neonates presented higher rates of CNS involvement; 50 % had Group A Streptococcus as the most common organism (16). Based on these results, one may reinforce the conviction that the determinants of CAP, including its etiological agents and clinical complications, depend on the patient's age, thus requiring the development of differentiated diagnostic and therapeutic strategies [17].

The prescribed treatments also varied with the age of the patients. Ceftriaxone was the most used antibiotic, particularly in older children (96.58 %) and infants (62.5 %), in contrast to neonates who received mostly vancomycin or meropenem, each 25 % [12-15]. Thus, analysis of the variability of drug prescriptions proves that treatment should be highly individualized depending on patient's age and clinical status [18].

This zero-readmission rate suggests that treatments were effective, as no patients required hospitalization after discharge. A multicenter study conducted in the United States showed that approximately 7 % of paediatric CAP cases required rehospitalization within 30 days, often as a result of unresolved or secondary infections. In contrast, studies on CAP frequently showed readmission rates ranging from 5 to 10 % within 30 days, especially in cases with comorbidities or severe initial infections. According to best practices in paediatric CAP care, the low readmission rate in this study indicates efficient initial treatment methods and discharge planning that minimize the need for rehospitalization [19].

Limitations of this study

A limitation of this study was its non-randomized design, which made it difficult to generalize the results to other healthcare settings. Differences in patients' characteristics, institutional features, and clinicians' behavior may have significantly impacted results. The external validity of the results could be increased by conducting the studies in multiple centers, which would provide an opportunity to compare different countries and healthcare systems or different groups of patients.

Another limitation of the study was the cross-sectional study design; using past medical records creates other issues, such as presumed data on certain clinical parameters, chronological evolution of symptoms, or adherence to medical treatment. It is important to continue with prospective study and advance the findings with long-term clinical outcomes and pathogen resistance due to irrational use of antibiotics.

CONCLUSION

Most participants received adequate treatment, which has been reported as short hospitalization durations. No mortalities were reported, thereby confirming that various treatment regimens are appropriate for the patients. Furthermore, age is a significant factor since neonates are more prone to complications and need more aggressive therapy.

DECLARATIONS

Acknowledgement/Funding

None.

Ethical approval

The study received approval from the Institutional Review Board (IRB) of the tertiary care hospital (IRB-COP-STD-62-NOV-2023).

Use of Artificial Intelligence/large language models

We also declare that we did not use Generative artificial intelligence (AI) and AI-assisted technologies in writing the manuscript.

Use of research reporting tool

Stroke guidelines have been used for this research.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the author(s) named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Syed and Riham: conceived and designed the study, Noora Ali Saif: collected the data and Syed and Yelly: analysed the data. Riham and Syed wrote the manuscript. all authors read and approved the manuscript for publication.

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