Al-Mukhtar Journal of Sciences 39 (3): 124-129, 2024
Doi: https://doi.org/10.54172/wes60s26

Research Article

Open Access

Epidemiological Criteria and Management of Pediatric Inpatients with Community-acquired Pneumonia at Tobruk Medical Center - Libya

Ghamela S. S. Ali [1*], Fouziyah Jabullah[2], Salmi Boujaylah[3], Areej Alkasih[4] and Abdullah Al-shamikh Abdullah[5]

***Corresponding author:** Ghamela25@gmail.com, Department of Pediatric, Faculty of Medicine, Tobruk University, Libya.

[2, 3, 4, 5,] Department of Pediatric, Faculty of Medicine, Tobruk University, Libya.

Received:
20 June 2024

Accepted:
09 December 2024

Publish online:
31 December 2024

Abstract

The clinical manifestations of pneumonia obtained outside of a hospital setting are known as community-acquired pneumonia (CAP). Pneumonia is the most frequent infectious cause of child mortality worldwide. This study aims to evaluate the epidemiological criteria of community-acquired pneumonia in pediatric inpatients from 29 days to under 18 years, as well as the management and consequences of the condition. Data from the admission records of 365 patients with CAP, ages 29 days to under 18 years old, were gathered for the retrospective study, these patients made up 15.9% of hospital admissions. The M/F ratio was 1.2:1, with 198 (54.2%) male patients, predominantly infants, 221 (60.5%) ($p<0.001$), and mostly came from Tobruk 311(85.2%). Most cases were in Winter 170 (46.6%). Patients admitted to the intensive care unit had longer hospital stays 3.5 days on average. There were no deaths among the patients, and of those who required an intensive care unit (84 patients, 23%), 30 patients required an oxygen supply by using a nasal cannula and without the requirement for mechanical ventilation. The most often given intravenous antibiotic in 291 cases (79.7%) was cefotaxim (Claforan), whereas penicillin was used in 173 cases (47.4%). We conclude that Infants were the predominant age group that developed CAP and required PICU admission, with a higher incidence throughout the winter months.

Keywords: Community-Acquired Pneumonia, Epidemiological Criteria, Tobruk Medical Center-Libya.

INTRODUCTION

Both bacteria and viruses can cause pneumonia, an infection of the alveoli and distal bronchi in the lower respiratory tract. Clinical manifestations of pneumonia gained outside a hospital setting are explicitly referred to as community-acquired pneumonia (CAP) (Harris M et al. 2011). The leading infectious cause of mortality for children globally is pneumonia. Pneumonia killed 740180 children in 2019 (WHO 2022). It is the leading cause of death for children under the age of five. Low- and middle-income nations account for most of these fatalities (Nair H et al., 2013). Childhood pneumonia was associated with a history of low birth weight, severe malnutrition, partial or nonexclusive breastfeeding, indoor air pollution, and incomplete basic vaccinations (Vivi Ninda et al. 2021). According to O'Brien KL et al. (2009) and Watt JP et al. (2009), the main organisms linked to

childhood CAP include Mycoplasma pneumonia, Haemophilus influenzae, Staphylococcus aureus, Chlamydophila pneumoniae, and Streptococcus pneumonia. Numerous viral pathogens have also been identified as significant causes of community-acquired pneumonia (CAP), including influenza, rhinoviruses, human metapneumoviruses, adenoviruses, and respiratory syncytial virus (Jain S et al. 2015; Nair H et al. 2010). A combination of bacteria and viruses causes one-third of CAP cases. Generally, viruses cause 30–67% of pediatric CAP cases and are more common in children under the age of one than in those over the age of two (Harris M et al. 2011). Frequently, the diagnosis is determined based on clinical findings, such as fever, cough, breathing difficulty, nasal flare-ups, retractions of the intercostals, subcostals, and suprasternal, and grunting with or without X-ray signs of an acute lung infiltration or consolidation. (Messinger AI et al. 2017).

Tachypnoea seems to be the most relevant clinical indicator because it's linked to the overall severity of CAP, lung infiltrates on chest radiographs, and hypoxemia (Harris M. et al. 2011). Based on age-related reference values, the medical description of the condition is as follows: < two months of age, > 60 breaths/min; two months up to one year > 50/min; one year to five years, > 40/min; and more than 5 years, > 20/min (Bradley JS et al. 2011). The prevalence of bacterial pneumonia has declined since the development of protein conjugate vaccines against Streptococcus pneumoniae and Hemophilus influenzae (Kaplan et al. 2015; Morris et al. 2008). Cristiano Alicino et al. (2017) state that the pneumococcal conjugate vaccines, which are 10-valent and 13-valent, PCV 10 and PCV13, significantly lower hospitalization rates for pneumonia. This is especially true for children under 24 months of age. Even though the developed world has a far lower prevalence of CAP-related mortality than the developing world, CAP nevertheless, accounts for a sizable share of medical visits and hospital stays in high-income nations.

This study aims to evaluate the epidemiological criteria of community-acquired pneumonia in pediatric inpatients from the age of 29 days to under 18 years, as well as the management and consequences of the condition.

MATERIALS AND METHODS

By gathering information from the Statistics Office, a retrospective analysis was conducted. The patient admission files provided the source of the data. These are the details of the CAP patients from July 2022 to June 2023, ranging in age from 29 days to under 18 years. Included were the date of admission, date of discharge, patient's gender, age, nationality, place of residence, admission type (general pediatric ward or PICU), any family history of the same illness, treatment options, and mortality. The incidence of CAP in children between the ages of 29 days and under 18 was the primary outcome measure. The percentage of patients in three age groups 29 days to 1 year (Infants), > 1 year to 5 years (young children), and > 5 years to 18 years (School-aged children), the percentage of male and female patients, the percentage of patients admitted to the PICU, the management strategy, seasonal variation, and regional distribution were the secondary outcome measures.

Statistics Analysis

The statistical package for social scientists, version 25, and percentage-expressed data were used in the statistical study. P values below 0.05 were regarded as statistically significant.

RESULTS

Between July 2022 and June 2023, a total of 2296 patients were admitted to the Pediatric Ward; 381 had CAP, of which 16 were excluded due to their age being under 29 days. This means that 365 patients with CAP between 29 days and under 18 years old account for 15.9% of all hospital admis-

sions. With an M/F ratio of 1.2:1 and 198 (54.2%) of the patients were male, 85.2% of the total originated from Tobruk 311, with the remaining originating from the surrounding area.
Hospital admissions for CAP were significantly higher in the winter, peaking in December 59 (16.2%) and January 83 (22.7%). The variation in the season was as follows: Winter 170 (46.6%), Spring 58 (15.9%), Summer 70 (19.2%), and Autumn 67 (18.3%) (P-value = 0.04), Figure 1 illustrates this.

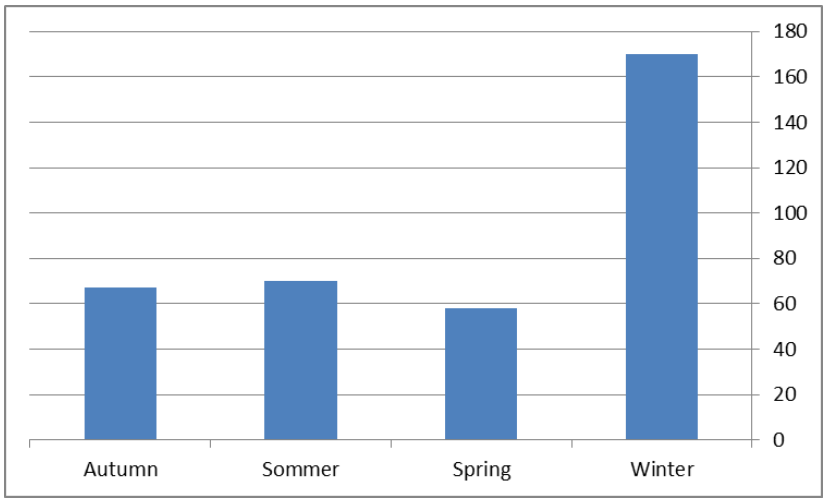

Figure: (1). Seasonal variation of CAP

The patients were 23.7 months old on average, divided into three age groups: 221 (60.5%) for Infants, 104 (28.5%) for young children, and 40 (11%) for School aged children (p value< 0.001), Figure 2 illustrates this.

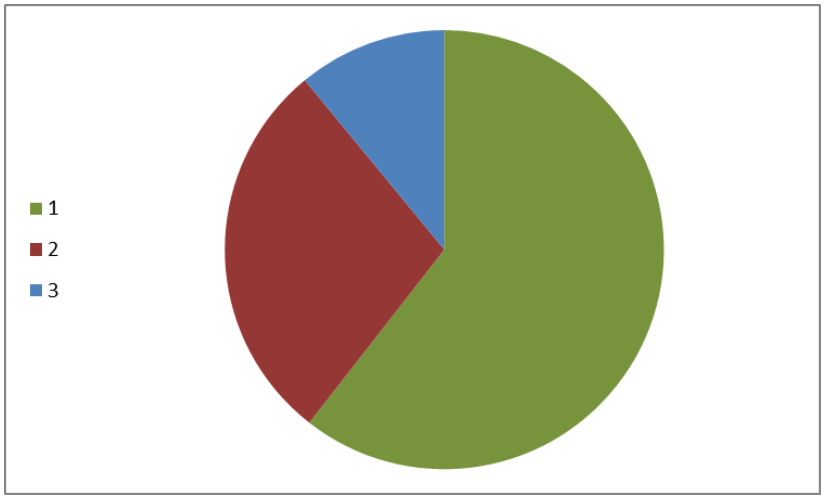

Figure: (2). Age Groups of patients: 1. Infants, 2. Young children, 3. School-aged children.

Thus, there was a significant increase in CAP in infants under one year old, particularly throughout the winter. 7 patients (1.9%) left against medical advice (LAMA). The mean duration of hospital stay was 3.5 days, with an increase in patients who needed PICU treatment. Among the 84 (23%), 30 (8.2%), needed an oxygen supply while they were in the PICU, and 61 (72.6%) of them were infants, Figure 3 illustrates this, no deaths were reported. Infants were the predominant age group that developed CAP and required PICU admission, with a higher incidence throughout the winter

months. Cefotaxim (Claforan) was the most often used intravenous antibiotic in 291(79.7%). Penicillin was used in 173 cases (47.4%), Macrolide in 33 cases (9%), Cefixime in 33 cases (9%), and small percentages of Ampicillin, Cloxacillin, Meropenem, and Amikacin were also utilized.

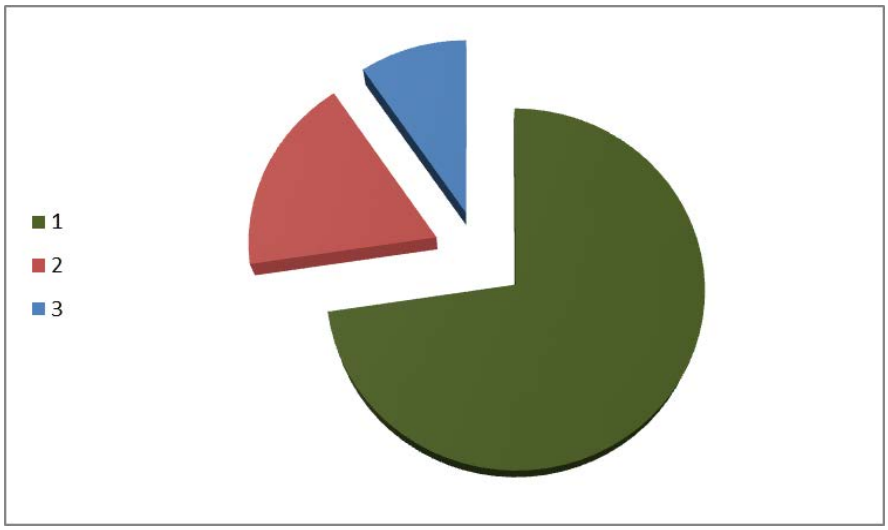

Figure: (3). PICU cases of CAP, 1= Infants, 2=Young Children, 3= School-aged children

DISCUSSION

During this study, we reported 365 hospitalizations for community-acquired pneumonia among children aged 29 days to under 18 years old, accounting for 15.9% of total hospital admissions during that period.

With an average age of 23.7 months, the majority of participants of the study were in the infant age range (> 29 days to 1 year), the same findings were found in studies conducted in Alexandria, Egypt (Noha Fadl et al., 2020), Iraq (Mortadha H Kreeb Al-Dalfi et a. 2023) and in Syria (Damascus) (Abdullah Almouslli et al. 2023). In our research, there are 198 (54.2%) more male patients than female patients (1.2:1), studies were carried out in Alexandria, Egypt (Noha Fadl et al., 2020), Syria (Damascus) (Abdullah Almouslli et al., 2023), Iraq (Mortadha H Kreeb Al-Dalfi et al. 2023) and southern Brazil (Tiago Neves Veras et al., 2011) which revealed similar results.

The study demonstrates a correlation between seasonal changes and the incidence of CAP; the findings, which were confirmed by an Australian study, indicate that the incidence was higher in Winter 170 (46.6%). (Katherine M Murdoch et al 2014).

Third-generation cephalosporins, especially cefotaxim, were more frequently used to treat CAP in inpatients in our study (291, 79.7%); this was also the case in Syria (Damascus) (Abdullah Almouslli et al., 2023). However, in Saudi Arabi (Sultan Al Albuhairi et al., 2020) Amoxicillin Clavulanate was administered to most patients (57.9%), with Ceftriaxone closely after (30%), and in the north of England (Julia E. Clark, 2006), second-generation Cephalosporins, such as cefuroxime, were the most frequently used intravenous antibiotics in 61% of cases. The usage of antibiotics depends on local guidelines and local bacteria resistance.

About a quarter of our patients 84 (23%) were admitted to an intensive care unit and were mainly infants 61 (72.6%). These findings were also reported in Tunis (Samia Hamouda et al 2016).

The median hospital stay was 3.5 days, corresponding to findings from Beirut, Lebanon (Rim Tannous et al 2020).

CONCLUSION

We conclude that infants were the predominant age group that developed CAP and required PICU admission, with a higher incidence throughout the winter months.

ACKNOWLEDGEMENT

We express thanks to the pediatric ward team at Tobruk Medical Center as well as the statistics office team.

Duality of interest: We declare we have no duality of interest associated with this study.

Author contributions: Contribution is equal between authors.

Funding: We did not receive funding for this study.

REFERENCES

Abdullah Almouslli, Ali Alriz, Bernard Khazem 2020. Causes and treatment of pneumonia in children in Damascus Hospital. DOI: 10.21203/rs.3.rs-3686844/v1

Bradley JS, Byington CL, Shah SS, Alverson B, Carter ER, Harrison C, et al. 2011. The management of community-acquired pneumonia in infants and children older than 3 months of age: clinical practice guidelines. Clin Infect Dis. 2011; 53:e25–76. doi: 10.1093/cid/cir531.

Cristiano Alicino, Chiara Paganino, Andrea Orsi, Matteo Astengo, al et 2017.
The impact of 10-valent and 13-valent pneumococcal conjugate vaccines on hospitalization for pneumonia in children: A systematic review and meta-analysis, Volume 35, Issue 43, 13 October 2017, El Sevier.

Harris M., Clark J., Coote N, 2011. British thoracic society guidelines for the management of community acquired pneumonia in children: update. Thorax. 2011; 66(Suppl 2):ii1–ii23.

Julia E Clark, Donna Hammal, David Spencer, Fiona Hampton, 2006. Children with pneumonia: how do they present and how are they managed? BMJ 2006.

Jain S, Self WH, Wunderink RG, Fakhran S, Balk R, Bramley AM et al. (2015) Community-acquired pneumonia requiring hospitalization among U.S. adults. N Engl J Med 373(5):415–427.

Kaplan SL et al (2015) Multicenter surveillance of Streptococcus pneumoniae isolates from middle ear and mastoid cultures in the 13-valent pneumococcal conjugate vaccine era. Clin Infect Dis 60(9):1339–1345.

Katherine M Murdoch, Biswadev Mitra, Stephen Lambert, Bircan Erbas, 2014. What is the seasonal distribution of community acquired pneumonia over time? A systematic review, Australas Emerg Nurs J, Feb 2014.

Messinger AI et al (2017) Management of pediatric community-acquired bacterial pneumonia. Pediatr Rev 38(9):394–409.

Morris SK, Moss WJ, Halsey N (2008) Haemophilus influenzae type b conjugate vaccine use and effectiveness. Lancet Infect Dis 8(7):435–443.

Mortadha H Kreeb Al-Dalfi, Shrouk Abdulrazak, and Ali Kadhim Al-Rubaye 2023. The severity of pneumonia and its association with socio-demographic factors among children under five years old in Wasit governorate hospitals, Iraq, J Public Health Africa.

Nair H, Simões E, Rudan I, Gessner B, Azziz-Baumgartner E, Zhang J, et al 2013. Global and regional burden of hospital admissions for severe acute lower respiratory infections in young children in 2010. a systematic analysis. Lancet 381(9875):1380–1390.

Noha Fadl, Ayat Ashour & Yasmine Yousry Muhammad 2020. Pneumonia among under-five children in Alexandria, Egypt: a case-control study, Journal of the Egyptian Public Health Association

O'Brien KL, Wolfson LJ, Watt JP, Henkle E, Deloria-Knoll M, McCall N et al (2009) Burden of disease caused by Streptococcus Pneumoniae in children younger than 5 years: global estimates. Lancet 374(9693):893–902.

Rim Tannous Raymond N Haddad, Paul-Henri Torbey, 2020. Management of Community-Acquired Pneumonia in Pediatrics: Adherence to Clinical Guidelines. Frontiers Pediatrics J.

Sultan Albuhairi a, Muhammad Asad Farhan b, Sami Alanazi c, et al May 2020. Antibiotic Prescribing Patterns for Hospitalized children with Community-Acquired Pneumonia in a Secondary Care Center. Journal of Infection and Public Health.

Samia Hamouda, Karima Chraiet, et al, 2016. Community-acquired pleuropneumonia in children: Bacteriological and therapeutic challenges, Tunis. Med. 2016 Apr;94(4):290-297.

Tiago Neves Veras, Gleisver Sandim, Kali Mundim et al, January 2011. Epidemiological profile of pediatric inpatients with pneumonia, Scientia Medica 20(4).

Vivi Ninda Sutriana, MPH, Mei Neni Sitaresmi, MD, PhD, and Abdul Wahab, Dr, MPH, 2021. Risk factors for childhood pneumonia: a case-control study in a high prevalence area in Indonesia. Clin Exp Pediatr, v.64(11).

World Health Organization, 2022. Pneumonia in children. https://www.who.int/news-room/fact-sheets/detail/pneumoniaAccessed November 11,

Watt JP, Wolfson LJ, O'Brien KL, Henkle E, Deloria-Knoll M, McCall N et al, 2009. Burden of disease caused by Haemophilus influenzae type b in children younger than 5 years: global estimates. Lancet 374(9693):903–911.