Pediatric pneumonia

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Abstract

Aim of study: to study the characteristics, the clinical symptoms, the risk factors and complication in Diyala governorate, Iraq.

Patients and methods: This is a cross sectional study. It was conducted in the period from July 2023 to January 2024. We collected 25 patients who have been infected with pneumonia. We collected the sample from the patients who attend Al-Batool teaching hospital. We chose the under five years population

Results: 25 patients were enrolled in this study. 56% of them were males and 44% of them were females. The mean age was 24±20 months with minimum value of 2 months and maximum value of 60 months. 80% of them were fully immunized and 20% were not. 80% of them were malnourished and 20% were normal. 92% of them had normal birth weight and 8% were low birth weight. 72% of them had cough at the past 2 weeks, 84% of them suffered shortness of breath and 92% of them suffered fever. The mean duration of symptoms was 5.7 days and treatment duration was 3.5 days.

Conclusion: Pediatric pneumonia remains a serious health problem that can be both heavy and expensive to treat for both the health authorities and people. We recommend more vaccination campaigns and educational campaigns about the prevention and when to seek medical advice.

Table of contents

Chapter one
Introduction and aims

1.1 Introduction

On a global scale, pneumonia stands as a prominent cause of illness and death among children below the age of 5 years. While the majority of pneumonia-related deaths in children occur in developing regions, the burden of the disease is considerable. Additionally, in the developed world, there are noteworthy healthcare-associated costs associated with pneumonia. Despite variations in prevalence and outcomes between developed and developing nations, pneumonia's impact remains substantial, emphasizing the importance of addressing this respiratory infection as a critical public health concern worldwide (1).

Globally, there are approximately 120 million reported cases of pneumonia each year, leading to a staggering 1.3 million deaths. A significant proportion of pediatric deaths related to pneumonia, almost 80%, occurs among younger children under the age of 2 in developing regions. While the prognosis for pneumonia is generally more favorable in the developed world, resulting in fewer fatalities, the overall disease burden is substantial, with around 2.5 million cases annually. A significant portion of these cases, ranging from a third to half, necessitates hospitalization. Notably, the introduction of the pneumococcal vaccine has played a crucial role in reducing the risk of pneumonia in the United States (2,3).

The etiology of pneumonia in the pediatric population can be classified based on age-specific and pathogen-specific organisms. Neonates face the risk of bacterial pathogens from the birth canal, including group B streptococci, Klebsiella, Escherichia coli, and Listeria monocytogenes. In late-onset neonatal pneumonia, Streptococcus pneumoniae, Streptococcus pyogenes, and Staphylococcus aureus are identifiable (4).

Viral infections are the primary cause of pneumonia in older infants and toddlers, aged between 30 days and 2 years. Likewise, respiratory viruses remain the predominant cause in children aged 2 to 5 years, with an observed increase in cases related to Streptococcus pneumoniae and Haemophilus influenzae type B in this age group. Mycoplasma pneumonia is frequent in children aged 5 to 13 years, although Streptococcus pneumoniae remains the most commonly identified organism. Adolescents typically face similar infectious risks as adults. It is crucial to consider tuberculosis (TB) in immigrants from high-prevalence areas and children with known exposures to TB. Understanding the age-specific and pathogen-specific factors contributing to pneumonia helps guide effective prevention and treatment strategies in pediatric populations. (5).

The occurrence of pneumonia is linked to a breakdown in host defenses, infiltration by a highly virulent organism, and/or exposure to an overwhelming concentration of pathogens. Typically, pneumonia ensues after an upper respiratory tract infection that allows bacteria, viruses, or other pathogens to invade the lower respiratory tract, triggering an immune response and generating inflammation. The air spaces in the lower respiratory tract become filled with white blood cells, fluid, and cellular debris. This process reduces lung compliance, raises resistance, obstructs smaller airways, and may lead to the collapse of distal air spaces, air trapping, and altered ventilation-perfusion relationships. Severe infections are often associated with necrosis of bronchial or bronchiolar epithelium and/or pulmonary parenchyma. Understanding this process is vital for effective diagnosis and management of pneumonia (6).

The symptoms of pneumonia are diverse and lack specificity, often manifesting subtly and depending on various factors such as the causative agents, the age of the affected individual, the size of the pathogen inoculum, and the person's

immune response. Commonly, pneumonia presents with an acute onset of fever, rapid breathing (tachypnea), and cough. However, fever may be absent in very young infants with infections caused by C. trachomatis, B. pertussis, or Ureaplasma. In infants, symptoms may be limited to poor feeding and increased fussiness. Children below the age of 5 often experience a prodrome characterized by low-grade fever and rhinorrhea resulting from a viral upper respiratory infection before developing lower respiratory tract symptoms. In some cases, fever and rapid breathing may precede the onset of cough in children (7).

Older children might complain of pleuritic chest pain or nuchal rigidity, which is indicative of lobe involvement. Signs of respiratory distress include tachypnea, hypoxemia (oxygen saturation below 92%), apnea, increased work of breathing (evidenced by subcostal, intercostal, or suprasternal retractions, nasal flaring, or grunting), or altered mental status. The variability in symptoms underscores the importance of considering multiple factors for an accurate diagnosis and appropriate management of pneumonia. (8).

Neonates diagnosed with pneumonia are typically best managed initially in a hospital setting due to the risk of rapid decompensation. The empirical antimicrobial therapy administered is akin to the treatment employed for neonatal sepsis. Adjustments to the therapy are made based on culture results, the patient's clinical response, and the severity of the condition at presentation. For infants aged 1 to 6 months with mild pneumonia, outpatient management under close medical supervision is feasible, provided they do not exhibit signs of illness, respiratory distress, hypoxemia (oxygen saturation below 92%), feeding intolerance, dehydration, or an underlying chronic medical condition. This approach allows for appropriate care while minimizing hospitalization when feasible, contingent upon the absence of specific risk factors or complications (9).

In the case of young infants under 4 months of age suspected of having pertussis or viral bronchiolitis, hospitalization is generally preferred, particularly during the peak stage of illness. This preference is based on the potential risks for apnea or hypoxia, and in the case of pertussis, the risk of pulmonary hypertension. Hypoxemia (oxygen saturation below 92%) serves as the single most crucial indicator for hospitalization, as a child experiencing hypoxemia is at a greater risk of mortality than a child with adequate oxygen levels (11).

Other indications for hospitalization include cyanosis, a rapid respiratory rate (exceeding 70 breaths per minute in an infant or 50 breaths per minute in a child), apnea, dyspnea, expiratory grunting, dehydration, a toxic appearance, poor oral intake, recurrent pneumonia, an underlying medical condition, or uncertainties about adequate observation at home. These criteria guide healthcare professionals in determining the appropriate level of care for infants and children with suspected pertussis or viral bronchiolitis, ensuring close monitoring and timely interventions when necessary. (11).

In the context of pneumonia management, initiating intravenous therapy with ampicillin is deemed appropriate. Ampicillin-sulbactam or a third-generation cephalosporin should be considered for individuals who have previously received antibiotics or are dealing with severe pneumonia. In regions where Streptococcus pneumoniae prevalence is notable, a third-generation cephalosporin is a viable choice. For patients with type-1 hypersensitivity to penicillin, suspected staphylococcal infection, or aspiration pneumonia, intravenous clindamycin may be considered. In cases of immunocompromised patients with pneumonia, particularly those with neutropenia, empiric therapy often involves intravenous cefepime, ceftazidime, or piperacillin-tazobactam. Additionally, empiric antifungal therapy may be considered initially or if there is an inadequate response to antibiotic therapy.

For confirmed or empirically suspected methicillin-resistant Staphylococcus aureus (MRSA) infections or severe, life-threatening pneumonia in children, vancomycin or linezolid is typically administered. These therapeutic choices are based on the specific clinical circumstances and causative agents involved in pneumonia. (12).

1.2 Aim of study

In Iraq, pediatric pneumonia imposes a significant burden on both the population and the healthcare system, particularly during periods of seasonal variations. This paper aims to investigate the characteristics, clinical symptoms, risk factors, and complications associated with pediatric pneumonia in Diyala governorate, Iraq. By focusing on this specific region, the study aims to provide valuable insights into the unique aspects of pediatric pneumonia in the local context, contributing to a better understanding of the disease's impact and informing targeted healthcare interventions.

Chapter two

Patients and methods

2.1 Patients and methods

his is a cross sectional study. It was conducted in the period from July 2023 to January 2024. We collected 25 patients who have been infected with pneumonia. We collected the sample from the patients who attend Al-Batool teaching hospital. We chose the under five years population. we collected information about age, weight, mode of delivery, any complications, chronic diseases, etc. we collected the information using prepared written questionnaire and by direct interview with the patients' parents. We preserved the privacy and we coded the patients for the reasons of confidentiality and risk of bias.

2.2 Statistical analysis

Statistical analysis was done by using SPSS Version 25 for the description of the data and to calculate the odd ratio. We expressed the quantitative data by arithmetic mean, standard deviation and mode and the qualitative data by frequencies. Chi square was used to identify the association between the variables when P value less than 0.05 considered significant.

Chapter three

Results and discussion

3.1 Results

25 patients were enrolled in this study. 56% of them were males and 44% of them were females. The mean age was 24±20 months with minimum value of 2 months and maximum value of 60 months.

Their mode of feeding is demonstrated in table 1.

Table 1. mode of feeding

Mode of feeding	Frequency	Percent
Breastfeeding	2	8.0
Bottle feeding	11	44.0
Mixed	12	48.0
Total	25	100.0

56% of them were born by cesarean section, 44% of were born by Vaginal delivery. 80% of them were fully immunized and 20% were not.

The educational level of their mothers is demonstrated in table 2.

Table 2. mothers' level of education

Level	Frequency	Percent
Primary	17	68.0
Secondary	6	24.0
Academic	2	8.0
Total	25	100.0

Their gestational age is demonstrated in table 3.

Table 3. gestational age

Age	Frequency	Percent
Term	14	56.0
Preterm	8	32.0
Post-term	3	12.0
Total	25	100.0

80% of them were malnourished and 20% were normal. 92% of them had normal birth weight and 8% were low birth weight. 72% of them had cough at the past 2 weeks, 84% of them suffered shortness of breath and 92% of them suffered fever.

72% of them went to the health care institutes seeking medical advice and table 4 demonstrate the attendance.

Table 4. source of health services

Places	Frequency	Percent
Hospital	12	48.0
Primary health care centers	4	16.0
Consultatory clinics	2	8.0
Private Clinic	7	28.0
Total	25	100.0

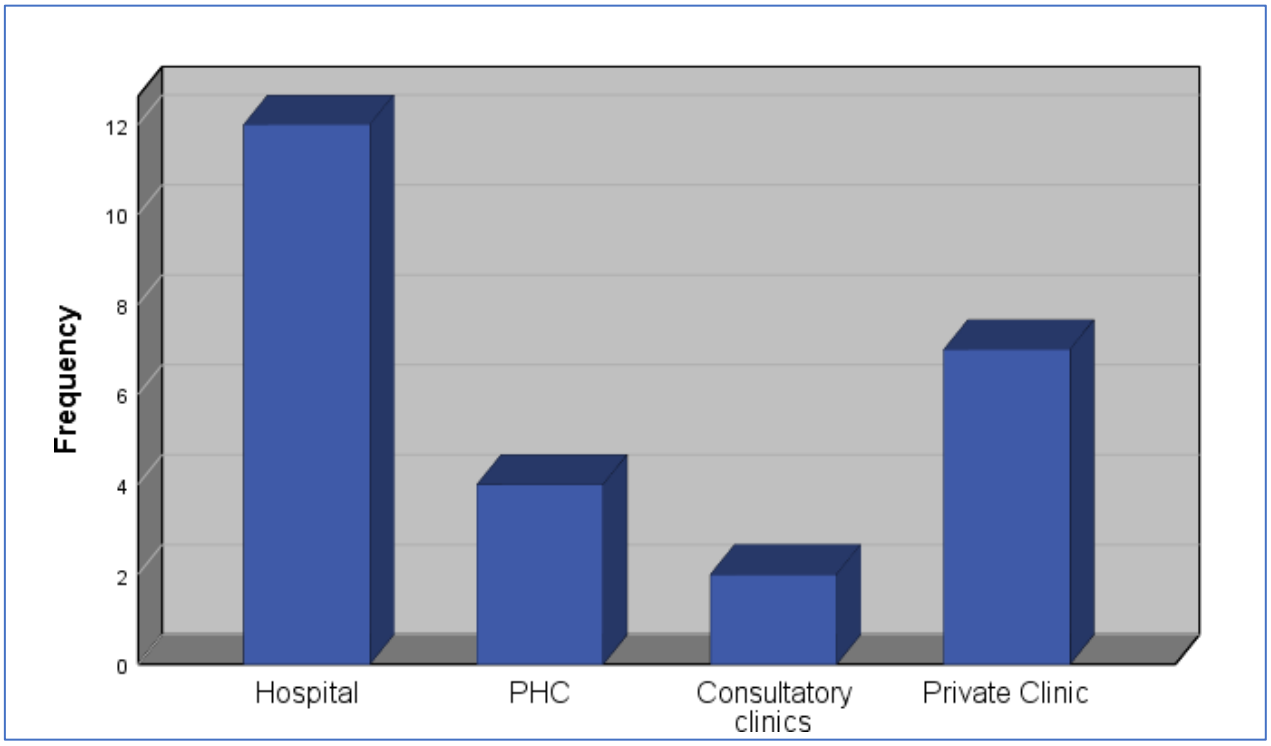

Figure 1. distribution of health services

The mean duration of symptoms was 5.7 days and treatment duration was 3.5 days.

3.2 Discussion

Pediatric pneumonia is frequently underdiagnosed or undertreated, resulting in elevated morbidity and mortality rates. To enhance outcomes, a collaborative interprofessional team approach is crucial for effective management. Primary care providers, pediatricians, and nurse practitioners are typically at the forefront of managing the majority of patients. Patient and caregiver education play pivotal roles in this process. It is imperative to instruct parents to refrain from smoking, emphasize the significance of thorough handwashing, and stress the importance of vaccination against pneumococcus and influenza. These preventive measures, coupled with a comprehensive and coordinated healthcare approach, contribute to improved pediatric pneumonia management and overall patient well-being (13).

Historical and physical examination findings serve as valuable tools in stratifying children based on the risk of radiographic pneumonia. However, individual physical examination findings, like focal rales, lack the necessary sensitivity and specificity to definitively confirm or rule out the diagnosis of pneumonia. Specific characteristics, such as hypoxia, absence of wheeze, and the presence of focal rales, are indicative of an increased risk of radiographic pneumonia in children (14).

Conversely, the likelihood of pneumonia is lower in the absence of hypoxia and fever, as well as when there are no focal auscultatory findings. While physical examination findings contribute to risk assessment, they are most effective when considered in conjunction with other clinical and diagnostic factors. The comprehensive evaluation of historical and physical findings aids in identifying children who may require further investigation or intervention for suspected pneumonia. (15).

Children who were not exclusively breastfed until the age of 6 months faced a significantly higher risk of contracting pneumonia, with an almost 8-fold increase compared to those exclusively breastfed. However, the study revealed that only 8% of the children surveyed met the goal of exclusive breastfeeding until 6 months, a considerable gap from the national target of 80%. Exclusive breastfeeding is crucial as breast milk contains a range of nutrients, hormones, growth factors, and elements that contribute to preventing allergies and inflammation while promoting immunity. Recent research conducted in the United States and the United Kingdom further supports the idea that children exclusively breastfed experience fewer instances of illness compared to those who are not breastfed. Encouraging and supporting exclusive breastfeeding practices is vital for the overall health and well-being of children (16).

In our study, the majority of participants had received complete basic immunization (80%), although this falls short of the national target. Both the initial and booster vaccines play a crucial role in preventing various childhood illnesses, making immunization one of the most cost-effective strategies to prevent childhood deaths from pneumonia. This aligns with the findings of Damanik et al., suggesting that children aged 12–24 months experiencing Acute Respiratory Infections (ARIs), including pneumonia, are 3.8 times more likely to be lacking basic immunizations compared to their counterparts who do not suffer from ARIs. Encouraging and achieving higher rates of complete basic immunization is essential for minimizing the risk of pneumonia and other preventable childhood diseases (17).

The results of interaction and stratification tests have indicated a noteworthy association between gender and exclusive breastfeeding in relation to the incidence of child pneumonia. This implies that, among infants and toddlers who are not exclusively breastfed, girls exhibit a higher likelihood of developing pneumonia

compared to boys. The observed gender-specific association highlights the potential impact of exclusive breastfeeding on respiratory health, emphasizing the need for targeted interventions and healthcare strategies to address this gender-related vulnerability in pneumonia incidence (18).

3.3 Conclusion

Pediatric pneumonia remains a serious health problem that can be both heavy and expensive to treat for both the health authorities and people. We recommend more vaccination campaigns and educational campaigns about the prevention and when to seek medical advice.