Bacterial pneumonia in children: An integrative review

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ABSTRACT

The aim of this study was to analyze the risk factors, symptoms, treatment, and diagnoses of bacterial pneumonia in children. The research consisted of an integrative review of the literature, using the Google Scholar and Scielo platforms to search for relevant articles on bacterial pneumonia in children. Strict inclusion criteria were applied, selecting only complete scientific articles available for free online, published between 2019 and 2024. The articles were selected based on their relevance to the topic, analyzing titles, abstracts and complete content. In the end, four articles were chosen and their data were synthesized in an Excel spreadsheet for later analysis. The reviewed studies emphasize bacterial pneumonia as an important public health challenge, especially among children under five years of age, where it is a leading cause of morbidity and mortality. Early identification of signs of severity, such as fever and difficulty breathing, is crucial to guide appropriate treatment, which should be personalized according to the severity of the condition and the specific etiology of the pneumonia. Prevention plays a crucial role in reducing the incidence of the disease, especially vaccination and hygiene measures, while family support is key to mitigating the worsening. However, challenges persist regarding the quality of health care, especially in disadvantaged socioeconomic areas, highlighting the need for investments in infrastructure and technology, as well as research to improve

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diagnostic and treatment methods. An integrated, multidisciplinary approach is essential to improve clinical outcomes and reduce morbidity and mortality associated with bacterial pneumonia in children and adolescents.

Keywords: Bacterial pneumonia, Children, Health.

INTRODUCTION

The history of pneumonia dates back centuries, being one of the oldest respiratory diseases known to mankind. Historical records indicate that the earliest descriptions of the disease date back to ancient civilizations, such as the Greeks and Romans, who associated it with cosmic influences or divine punishments. Over the centuries, the understanding of pneumonia has evolved, from theories such as "miasms" and "foul air" to the identification of infectious agents, such as bacteria and viruses, in the nineteenth century (RICCI et al., 2024).

Significant advances in the prevention, diagnosis, and treatment of pneumonia have been achieved over time, including the development of vaccines, antibiotics, and respiratory support techniques. Despite these advances, pneumonia continues to be a major cause of morbidity and mortality worldwide, highlighting the continued importance of research and interventions to mitigate its impact on public health (ROCHA et al., 2023).

As reiterated by Assunção, Pereira and Abreu (2018), bacterial pneumonia is a common lung infection in children, being one of the main causes of infant morbidity and mortality worldwide. This condition occurs when bacteria invade the lungs and cause inflammation in the air sacs (alveoli), leading to symptoms such as fever, cough, difficulty breathing, and chest pain. Among the most common bacterial agents associated with pneumonia in children are Streptococcus pneumoniae, Haemophilus influenzae type B, and Staphylococcus aureus.

Children are more susceptible to this infection due to their still-developing immune systems and exposure to different pathogens in settings such as daycare centers and schools. Common symptoms include fever, cough, difficulty breathing, and wheezing, which can vary in severity depending on the child's overall health status and the bacterial agent involved (NUNES et al., 2017).

Bacterial pneumonia in children can arise as a complication of respiratory viral infections or as a result of aspiration of contaminated contents into the lungs. Additional risk factors include immunodeficiencies, malnutrition, and exposure to secondhand smoke. Early diagnosis is critical for effective treatment, which often involves the administration of specific antibiotics to fight the bacterial infection, as well as respiratory support measures when necessary. Awareness of the signs and symptoms of bacterial pneumonia in children, along with the importance of vaccination and proper hygiene practices, plays a crucial role in the prevention and effective management of this condition (ASUNCION; PEAR TREE; ABREU, 2018).

In this context, the aim of this study was to analyze the risk factors, symptoms, treatment, and diagnosis of bacterial pneumonia in children. The results of this research are expected to provide theoretical and practical support to improve the understanding and management of this significant public health condition. The analysis of risk factors will allow a more accurate identification of the

most vulnerable groups, while the investigation of symptoms will help in the early detection of the disease.

METHODOLOGY

The research was conducted through an integrative review of the literature, with the objective of analyzing the risk factors, symptoms, treatment and diagnoses of bacterial pneumonia in children. For this, a search was carried out on the Google Scholar and Scielo platforms, which are recognized for covering a wide range of scientific journals. Keywords used in the research included "childhood bacterial pneumonia," "risk factors," "symptoms," "treatment," and "diagnosis." These keywords were combined using Boolean operators such as "AND" and "OR" to ensure a comprehensive and accurate search.

The inclusion criteria were rigorously applied during the article selection process. Only scientific articles were considered, with preference for those written in English or Portuguese and with Brazilian nationality, ensuring contextual relevance. In addition, only complete articles available for free on the internet were included, facilitating access to information. The publication period of the selected articles was restricted between the years 2019 and 2024, aiming to use updated and relevant information for the analysis of the proposed theme.

After the initial search, the articles were selected based on their relevance to the central theme of the research. Titles and abstracts were examined to assess their adequacy to the study objectives. Then, the selected articles were read in full for a more detailed analysis of their content. Throughout the process, criteria were used to evaluate the methodological quality and relevance of the studies to ensure the reliability of the results.

As a result of the integrative review process, four articles were selected. The data from these articles were synthesized in an Excel spreadsheet for further analysis.

RESULTS AND DATA ANALYSIS

Based on the integrative review carried out, it was possible to select four scientific articles that met the established inclusion criteria, as shown in chart 1.

Table 1. Sample of articles selected in the integrative review

Authors	Objective	Methodology	Conclusions
Prestes et al. (2023)	Review the criteria for diagnosis, hospitalization, and clinical approach, focusing on bacterial pneumonia and common complications in children	Bibliographic research	The article presents a detailed review of childhood pneumonia, a significant public health problem due to its high incidence and potential severity, being one of the leading causes of death in children under 5 years of age. Bacterial pneumonia, with symptoms such as fever, cough, and difficulty breathing, is discussed in detail, emphasizing the importance of identifying signs of severity that justify hospitalization, such as inability to drink, seizures, and oxygen saturation below 90%. The text also addresses diagnostic criteria, markers of severity, and management recommendations, including the use of antibiotics, supplemental oxygen, and fluid therapy, with an emphasis on the appropriate choice of treatment depending on the etiology of pneumonia. In addition, prevention strategies such as vaccination and hygiene measures are discussed, which play a crucial role in reducing the incidence of the disease and its complications.
Nascimento-Carvalho (2020)	To provide state-of-the-art information for the management of children under five years of age with community-acquired pneumonia, based on the most recent evidence published in the literature, with an emphasis on bacterial childhood pneumonia	Bibliographic research	Community-acquired pneumonia (CAP) remains a leading cause of morbidity and mortality in children under five years of age worldwide, with respiratory viruses being recognized as the main causative agents. However, the assessment of severity highlights danger signs that are predictors of death and indicators of hospitalization, including hypoxemia and increased respiratory effort. Regarding antibiotic treatment, amoxicillin is the first-line option for outpatients, while ampicillin, aqueous penicillin G, or intravenous amoxicillin are recommended for hospitalized patients. It is essential for future research to prioritize the identification and validation of tools that can differentiate children with CAP from those with viral infection from those with bacterial infection, especially considering the significant impact of bacterial pneumonia on child health.
Schaefer, Servant at Petitt (2019)	To analyze uncomplicated community-acquired pneumonias in immunocompetent children	Bibliographic research	Bacterial pneumonia in children is still a significant public health concern, representing an important cause of morbidity and mortality in children under five years of age. Despite the decrease in the incidence and severity of childhood pneumonia due to access to health services and vaccination, cases of complicated pneumonia caused by Streptococcus pneumoniae have increased, especially with the emergence of more virulent serotypes. Bacterial pneumonia is often associated with risk factors such as malnutrition, lack of breastfeeding, poor housing conditions, and low birth weight. In diagnosis, it is challenging to distinguish between viral and bacterial infections due to the lack of specific signs and symptoms, but it is crucial to consider factors such as fever, tachypnea, and signs of respiratory effort. Antibiotic treatment, usually initiated empirically, depends on the severity of the condition and may include amoxicillin for outpatients and ampicillin or penicillin G for hospitalized patients. Future investigations should prioritize the identification of tools to differentiate viral and bacterial infections and improve methods of diagnosis and treatment of bacterial pneumonia in children.
Paredes et al. (2023)	To identify in the scientific literature the general clinical characteristics of community-acquired childhood pneumonia in hospitalized children and adolescents, with emphasis on bacterial pneumonia	Integrative review	Bacterial pneumonia in children is a relevant concern, as viral infections of the respiratory tract can progress to serious diseases such as bronchiolitis, bronchitis, and pneumonia. Assessment of the severity of pneumonia in children is primarily clinical, with criteria such as tachypnea and respiratory rate related to severity. In Brazil, where pneumonia is one of the main causes of hospitalization, environmental and socioeconomic factors influence its in-hospital morbidity profile. Tools such as imaging and etiological investigation are important for diagnosis and risk stratification. The worsening of pneumonia in children can be mitigated with family support, but there are still challenges in terms of the quality of health care. Investments in health infrastructure and technology are needed to address these challenges and improve outcomes for children and adolescents with bacterial pneumonia.

Source. Survey data (2024).

The article by Prestes et al. (2023) offers a comprehensive and detailed review of childhood pneumonia, a public health condition of great relevance due to its high incidence and potential severity, especially among children under 5 years of age, where it is one of the leading causes of mortality. Particular attention is paid to bacterial pneumonia, whose characteristic symptoms include fever, cough and difficulty breathing, and it is essential to identify signs of severity that justify hospitalization, such as inability to drink, seizures and oxygen saturation below 90%.

The text carefully addresses the diagnostic criteria, severity markers, and management recommendations, emphasizing the importance of appropriate treatment choice depending on the specific etiology of pneumonia. This includes discussion of the use of antibiotics, supplemental oxygen and fluid therapy, emphasizing the need for a personalized approach tailored to each clinical case.

In addition, prevention strategies such as vaccination and hygiene measures are analyzed, which play a crucial role in reducing the incidence of the disease and preventing its complications. These preventive measures are considered essential to combat the spread of bacterial pneumonia in children and reduce their morbidity and mortality.

The review presented in the article highlights the importance of a comprehensive approach, which encompasses both early and accurate diagnosis and appropriate management of childhood pneumonia, in addition to emphasizing the relevance of preventive measures to effectively control the spread of the disease. The discussion is based on current scientific evidence and offers a broad and up-to-date view on the subject, contributing to knowledge and clinical practice in the area of child health.

Nascimento-Carvalho (2020) highlights community-acquired pneumonia (CAP) as one of the main causes of morbidity and mortality in children under five years of age worldwide, with respiratory viruses being recognized as the main causative agents. Severity assessment emphasizes the importance of identifying danger signs, such as hypoxemia and increased respiratory effort, which are predictors of death and indicators of hospitalization.

With regard to antibiotic treatment, the article points out that amoxicillin is the first-line option for outpatients, while ampicillin, aqueous penicillin G, or intravenous amoxicillin are recommended for hospitalized patients. The text highlights the need for future research to prioritize the identification and validation of tools that can differentiate children with CAP from those with viral infection from those with bacterial infection, recognizing the significant impact of bacterial pneumonia on child health.

This review offers important insights into the management of CAP in children, highlighting the importance of early identification of signs of severity and appropriate choice of treatment to improve clinical outcomes and reduce morbidity and mortality associated with this condition. In

addition, it highlights the continuous need to advance in the development of differential diagnostic tools to optimize the therapeutic approach and prevent complications resulting from bacterial pneumonia.

The article by Schafer, Chakr, and Petitot (2019) addresses bacterial pneumonia in children as a significant public health concern, being an important cause of morbidity and mortality in children under five years of age. Despite the decrease in the incidence and severity of childhood pneumonia due to access to health services and vaccination, cases of complicated pneumonia caused by Streptococcus pneumoniae have increased, especially with the emergence of more virulent serotypes.

The text highlights that bacterial pneumonia is often associated with risk factors such as malnutrition, lack of breastfeeding, poor housing conditions, and low birth weight. In diagnosis, it is challenging to distinguish between viral and bacterial infections due to the lack of specific signs and symptoms, but it underscores the importance of considering factors such as fever, tachypnea, and signs of respiratory effort.

As for antibiotic treatment, the article indicates that it is usually initiated empirically, depending on the severity of the condition, and may include amoxicillin for outpatients and ampicillin or penicillin G for hospitalized patients. The text emphasizes the need for future investigations to prioritize the identification of tools to differentiate viral and bacterial infections, in addition to improving the methods of diagnosis and treatment of bacterial pneumonia in children.

In addition, Paredes et al. (2023) highlight the relevance of bacterial pneumonia in children, emphasizing that viral infections of the respiratory tract can progress to serious diseases, such as bronchiolitis, bronchitis, and pneumonia. The assessment of the severity of pneumonia in children is described as mainly clinical, with criteria such as tachypnea and respiratory rate related to the severity of the condition.

In the Brazilian context, where pneumonia is one of the main causes of hospitalization, environmental and socioeconomic factors are pointed out as influencing the in-hospital morbidity profile of this condition. The text highlights the importance of tools such as imaging tests and etiological investigation for diagnosis and risk stratification.

In addition, the study highlights that family support can help mitigate the worsening of pneumonia in children, but recognizes that there are still significant challenges in terms of the quality of health care. Investments in health infrastructure and technology are highlighted as essential to address these challenges and improve outcomes for children and adolescents with bacterial pneumonia.

FINAL THOUGHTS

In conclusion, the review of the analyzed articles highlights bacterial pneumonia as a relevant public health issue, especially in children under five years of age, where it is one of the main causes of morbidity and mortality.

Characteristic symptoms include fever, cough, and difficulty breathing, and it is essential to identify signs of severity to guide clinical management, such as the need for hospitalization.

Diagnosing bacterial pneumonia in children is challenging due to the overlap of symptoms with viral infections, but it is crucial to consider factors such as fever, tachypnea, and signs of respiratory effort.

With regard to treatment, a personalized approach is recommended, with the use of antibiotics and other therapeutic resources according to the severity of the condition and the specific etiology of the pneumonia.

Prevention plays a crucial role in reducing the incidence of bacterial pneumonia in children, especially vaccination and hygiene measures. In addition, family support is essential to mitigate the worsening of the disease, although there are still challenges regarding the quality of health care, especially in disadvantaged socioeconomic contexts.

To advance the effective management of bacterial pneumonia in children, investments in health infrastructure and technology are needed, as well as research aimed at differentiating viral and bacterial infections, improving diagnostic and treatment methods. This integrated, multidisciplinary approach is key to improving clinical outcomes and reducing morbidity and mortality associated with this condition in children and adolescents.

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