Identifying and addressing challenges in pediatric antibiotic therapy: A review of current practices and recommendations

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Felipe Silva Ribeiro
Graduating in Medicine
UniRV – University of Rio Verde – Goianésia - GO
E-mail: felipesilva.ribeiro@hotmail.com
LATTES: https://lattes.cnpq.br/3643674992530519

Quimilda Gabriela Machados de Castro Alves Pontes Soares
Medical Student
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: qgmcaps.10@gmail.com
LATTES: http://lattes.cnpq.br/7331874278592286

Jéssica Alves Querido
Medical Student
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: jessicaquerido@hotmail.com
LATTES: http://lattes.cnpq.br/1208309133356846

Demócrito Andrade Costa Filho
Graduating in Medicine
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: democritomed@gmail.com
LATTES: http://lattes.cnpq.br/5597023294315861

Danielle Ribeiro Bueno
Medical Student
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: daniellerbueno@gmail.com
LATTES: http://lattes.cnpq.br/2766815569770287

Isabella Nepomuceno Dias
Medical Student
CEUMA University - Imperatriz Campus
E-mail: isaisabella.00@gmail.com
LATTES: https://lattes.cnpq.br/0425890254248564

Gabriel Gonçalves Pacheco
Graduating in Medicine
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: ggoncalvespacheco@gmail.com
LATTES: http://lattes.cnpq.br/5731608056750535

Davi Sousa Fries
Graduating in Medicine
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: davifries00@gmail.com
LATTES: http://lattes.cnpq.br/7443284040349453

Luma Crys Pinheiro Lima
Medical Student
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: lumapinheiro28@gmail.com
LATTES: http://lattes.cnpq.br/2340558715518727

Lucas Cerqueira Pessoa
Graduating in Medicine
UNINOVAFAPI - University Center - Teresina - PI
E-mail: lucas7cerqueira@gmail.com
LATTES: http://lattes.cnpq.br/2261767320884569

Marilda Rodrigues Rebêlo
Medical Student
UNINOVAFAPI - University Center - Teresina - PI
E-mail: marildasena2012@hotmail.com
LATTES: http://lattes.cnpq.br/3817050584564668

Alice Maria da Silva
Medical Student
AFYA - Instituto Tocantinense Presidente Antônio Carlos Porto - Porto Nacional - TO
E-mail: alicems156@gmail.com
LATTES: https://lattes.cnpq.br/5256611869109968

ABSTRACT

Introduction: The use of antibiotics in pediatric populations, especially in neonates, represents a significant challenge for health professionals due to the increased vulnerability of neonates to infections and possible consequences if antibiotics are not administered. However, current practices and recommendations for pediatric antibiotic therapy are often inadequate and rely on data extrapolated from adult studies, failing to consider pediatrics-specific factors. Objective: In this review, we examine the challenges related to pediatric antibiotic therapy. We address the use of antibiotics in neonatal intensive care units (NICUs), the risks of negative outcomes resulting from inappropriate

and prolonged use of antibiotics, the lack of scientific basis to support recommendations on the duration of therapy, and particular issues related to the NICU. Methodology: This review examines challenges in pediatric antibiotic therapy through comprehensive research in medical databases. Selected studies, including epidemiology, reviews, and professional opinions, reveal problems such as antibiotic overuse and a lack of solid guidelines for duration of therapy. Limitations in the literature, such as the absence of specific studies and robust guidelines for NICUs, have been identified. Discussion: The article demonstrates that the duration of antibiotic therapy for pediatric conditions is limited and variable, and the exact duration of antibiotic therapy for certain conditions is inaccurate. Results: It is crucial to address current gaps in knowledge by researching clinical parameters that can accurately stratify the severity of CAP and make them more sensitive and specific, as well as educating pediatric medical residents to ensure the safe and effective use of antibiotics. In addition, the existing antibiotic arsenal and the potential danger of long-term antibiotic use in neonates should be taken into account. Issues such as culture-negative LOS in premature infants and empirical use of antibiotics to "exclude" are major contributors to the overall use of antibiotics in neonatal units, and strategies for safe antibiotic restriction are difficult to identify and implement. Conclusion: Future research should focus on developing more accurate and effective diagnostic and therapeutic strategies for pediatric antibiotic therapy, as well as on identifying safe and effective strategies for antibiotic restriction in neonatal units. Overall, the results of this review highlight the need for ongoing research and education to improve pediatric antibiotic therapy practices and address the challenges associated with its use.

Keywords: Pediatric antibiotic therapy, Challenges, Neonatal intensive care.

1 INTRODUCTION

Pediatric antibiotic therapy is an essential component in the treatment of bacterial infections in children. However, despite its importance, this form of therapy presents challenges that healthcare professionals must face to ensure the best outcomes for patients. In this review, we will identify and address the common challenges associated with pediatric antibiotic therapy. We will also explore how healthcare professionals can identify and address these challenges. In addition, we will examine current practices and recommendations for pediatric antibiotic therapy. In doing so, we hope to provide a comprehensive understanding of the challenges associated with pediatric antibiotic therapy and offer recommendations to improve patient outcomes.

2 GOAL

In this review, the focus is on the analysis of the challenges associated with pediatric antibiotic therapy. The challenges mentioned include the use of antibiotics in neonatal intensive care units (NICUs), the risk of adverse outcomes due to prolonged and inappropriate use of antibiotics, the lack of scientific evidence to support recommendations for duration of therapy, and specific NICU-related issues.

3 METHODOLOGY

This literature review was based on a broad and systematic search of the relevant scientific literature, in order to achieve the proposed objectives. Medical databases, such as PubMed, MEDLINE

and Google Scholar, were consulted, using keywords related to "pediatric antibiotic therapy", "challenges", "neonatal intensive care". We selected studies that directly addressed the challenges faced in pediatric antibiotic therapy, including epidemiological studies, systematic reviews, clinical studies, and opinion articles by health professionals.

The results of the selected studies were analyzed and synthesized to identify common challenges in pediatric antibiotic therapy. The main points of discussion were grouped into categories, such as overuse of antibiotics, lack of scientific evidence to guide the duration of therapy, and strategies to address challenges in the NICU environment.

It was recognized that the current literature on pediatric antibiotic therapy has limitations, such as the lack of specific studies on the duration of therapy and the need for more robust guidelines for the use of antibiotics in NICUs.

4 DISCUSSION

4.1 CHALLENGES IN PEDIATRIC ANTIBIOTIC THERAPY

4.1.1 What are the common challenges associated with pediatric antibiotic therapy?

The use of antibiotics in pediatric populations is a major challenge, especially in neonatal intensive care units (NICUs). This is due to the increased vulnerability of neonates to infections, as well as the fear of possible consequences if antibiotics are not administered [1]. Long-term use of antibiotics without evidence of sepsis can lead to adverse outcomes such as increased mortality and morbidities [1], while inappropriate use of antibiotics early in life is associated with increased risk of various medical conditions in childhood [2]. Antibiotic use is highest among children two years and younger, and the duration of therapy is largely based on conventions and expert opinions [2], with little scientific evidence to support many of the recommendations. Studies on the duration of antibiotic therapy often rely on data extrapolated from adult studies and do not take into account pediatrics-specific factors [2]. Issues such as culture-negative LOS in premature infants and empirical use of antibiotics to "exclude" are major contributors to overall antibiotic use in neonatal units [3], and strategies for safe antibiotic restriction are difficult to identify and implement [1]. To improve the use of antibiotics, biomarker decision tools, biomarkers with excellent sensitivity and specificity, better diagnostics and optimization of blood culture volume [1] can be employed. Vaccination against Streptococcus pneumoniae, Haemophilus influenza and measles may also have a substantial impact on the overall use of antibiotics for EOS assessments in premature infants [3]. To address the unique challenges of the NICU environment, there is a need for validated antimicrobial use guidelines, sepsis calculators, and evidence-based strategies and easy-to-use point-of-care guidelines [1]. Audit and feedback schemes have been found to be effective in reducing overall antibiotic use, while applying antimicrobial management strategies to NICU populations can be challenging [1].

4.1.2 How can healthcare professionals identify and address these challenges?

Healthcare professionals should take into account the risks and benefits of administering antibiotics to newborns [1]. In order to properly identify and address these challenges, healthcare professionals need to strive for appropriate education and research. For example, pediatric medical residents are essential in this process as they play a critical role in determining the optimal use of antibiotics [4]. In addition, they are responsible for initiating antibiotic therapy and often alternate between adult and pediatric settings [4]. Educational interventions have been suggested to address the potential misuse of antibiotics [4]. In addition, research is needed to accurately stratify the severity of CAP and develop more sensitive and specific tools that can help determine the duration of antibiotic therapy [3][5]. In addition, a meta-analysis suggests that 5 days of antibiotic therapy is effective for uncomplicated acute otitis media, and short-term therapy is recommended for CAP in healthy children [6]. Current studies on the duration of antibiotic therapy are limited [2]. In addition, the existing antibiotic arsenal should be taken into account to illustrate the required duration of antibiotic therapy [7]. In addition, it has been suggested that antibiotics should be routinely administered in the perioperative period to prevent surgical site infection [8]. Finally, health professionals should be aware of the evolution of CAP epidemiology, diagnostic and therapeutic challenges, and antibiotic prescribing practices [9].

4.1.3 What are the current practices and recommendations for pediatric antibiotic therapy?

Research has shown that the duration of antibiotic therapy therapy for pediatric conditions is limited and variable [6], and the exact duration of antibiotic therapy for certain conditions is inexact [7]. For example, the recommended duration of antibiotic therapy for uncomplicated acute otitis media is 5 days [6], while surgical site infection in pediatric patients requires an indeterminate time of antibiotic use [8]. Neonatal providers also often initiate antibiotic therapy without evidence of sepsis [1][10]. In this sense, it is crucial that health professionals are aware of the evolution of the epidemiology of CAP, along with the diagnostic and therapeutic challenges associated with pediatric CAP [9]. It is also essential to adhere to the standard of care, prescribing antibiotics according to age group and local epidemiology, in doses capable of reaching therapeutic concentrations [5]. In addition, it is important to take into account the existing antibiotic arsenal [7], as well as the potential danger of long-term antibiotic use in neonates [1]. Therefore, it is essential to address current gaps in knowledge by researching clinical parameters that can accurately stratify the severity of CAP and make them more sensitive and specific [3], as well as educating pediatric medical residents to ensure the safe and effective use of antibiotics [4].

5 FINDINGS

The results obtained from this study on "Challenges in pediatric antibiotic therapy" reveal that the use of antibiotics in pediatric populations, especially in neonatal intensive care units (NICUs), represents a complex challenge for health professionals. This challenge is based on the vulnerability of neonates to infections, as well as concerns about the possible consequences if antibiotics are not administered appropriately. In addition, research demonstrates that long-term use of antibiotics in neonates without evidence of sepsis may result in adverse outcomes, such as increased mortality and morbidities. Similarly, inappropriate use of antibiotics early in life is associated with a higher risk of various medical conditions in childhood.

An important aspect that emerges from the results is the gap in the scientific evidence to support recommendations for the duration of antibiotic therapy in pediatric populations. The duration of antibiotic therapy is often based on conventions and expert opinions, and many of these recommendations lack sound scientific foundation. In addition, the lack of pediatrics-specific data in studies on the duration of antibiotic therapy is remarkable, since many studies rely on data extrapolated from adult studies.

The review also highlights specific challenges in neonatal intensive care units, where issues such as the empirical use of antibiotics to "exclude" infections, the difficult identification and implementation of strategies for safe antibiotic restriction, and concern about premature infants with negative culture results contribute to overall antibiotic use.

The results point to the need for more precise and personalized approaches in pediatric antibiotic therapy, as well as the implementation of strategies aimed at reducing the inappropriate use of antibiotics, especially in neonates. Education of healthcare professionals, including pediatric medical residents, is considered an essential approach to addressing antibiotic misuse and improving the safe and effective administration of these medications to children. Future research is essential to fill the gaps in the scientific literature and develop validated guidelines, diagnostic tools, and more sensitive and specific therapeutics to guide pediatric antibiotic therapy.

6 CONCLUSION

Based on the analysis of the results, the clinical implications and possible strategies to face the identified challenges were discussed. Specific recommendations included the use of biomarker-based decision tools, vaccination to reduce antibiotic use, antimicrobial management strategies, and education of healthcare professionals, especially pediatric medical residents.

Finally, the importance of health professionals being aware of the challenges associated with pediatric antibiotic therapy and providing recommendations to improve the administration of antibiotics in children is reiterated.

In conclusion, the results of this study reinforce the complexity of the challenges in pediatric antibiotic therapy and highlight the importance of continuous research, medical education, and the development of targeted strategies to address these challenges and improve the quality of antibiotic treatment in children.

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