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The importance of vaccination against measles, rubella and mumps in preventing neurological complications in children

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LITERATURE REVIEW

RESUMO

A vacinação infantil contra o sarampo, rubéola e caxumba tem sido uma medida crucial na prevenção de complicações neurológicas. Estas doenças, potencialmente debilitantes e, em casos extremos, fatais, têm impactos significativos na saúde pública. Dentre as complicações mais graves, destacam-se as consequências neurológicas que podem afetar o desenvolvimento cognitivo e motor das crianças. Com a introdução de programas de imunização em larga escala, houve uma redução substancial na incidência dessas doenças, proporcionando não apenas a proteção individual, mas também contribuindo para a erradicação de surtos em comunidades. Objetivo: Analisar a literatura científica dos últimos 10 anos para compreender de forma abrangente como a vacinação contra sarampo, rubéola e caxumba impacta na prevenção de complicações neurológicas em crianças. Metodologia: A revisão foi conduzida seguindo as diretrizes do checklist PRISMA. Utilizamos as bases de dados PubMed, Scielo e Web of Science para buscar artigos relevantes. Os descritores foram "vacinação", "sarampo", "rubéola", "caxumba" e "complicações neurológicas". Critérios de inclusão abrangeram estudos publicados nos últimos 10 anos, focados em crianças e abordando os efeitos neurológicos pós-vacinação. Critérios de exclusão incluíram estudos com amostras não representativas e falta de informações detalhadas sobre os desfechos neurológicos. Resultados: A análise revelou uma significativa redução nas complicações neurológicas associadas ao sarampo, rubéola e caxumba após a implementação de programas de vacinação. Estudos destacaram a eficácia das vacinas na prevenção de encefalite e outras sequelas neurológicas. Adicionalmente, foi observado um declínio nas hospitalizações relacionadas a essas complicações. Conclusão: Esta revisão sistemática fortalece a importância da vacinação na prevenção de complicações neurológicas em crianças decorrentes do sarampo, rubéola e caxumba. A análise dos últimos 10 anos reforça a eficácia das vacinas, destacando não apenas os benefícios individuais, mas também os ganhos em saúde pública ao evitar surtos e reduzir as consequências graves associadas a essas doenças.

Palavras-chave: "vacinação", "sarampo", "rubéola", "caxumba" e "complicações neurológicas"

ABSTRACT

Childhood vaccination against measles, rubella and mumps has been a crucial measure in preventing neurological complications. These potentially debilitating and, in extreme cases, fatal diseases have significant impacts on public health. Among the most serious complications, the neurological consequences that can affect the cognitive and motor development of children stand out. With the introduction of large-scale immunization programs, there has been a substantial reduction in the incidence of these diseases, providing not only individual protection, but also contributing to the eradication of outbreaks in communities. Objective: To analyze scientific literature from the last 10 years to comprehensively understand how vaccination against measles, rubella and mumps impacts the prevention of neurological complications in children. Methodology: The review was conducted following the PRISMA checklist guidelines. We used the PubMed, Scielo and Web of Science databases to search for relevant articles. The descriptors were "vaccination", "measles", "rubella", "mumps" and "neurological complications". Inclusion criteria covered studies published in the last 10 years, focused on children and addressing post-vaccination neurological effects. Exclusion criteria included studies with unrepresentative samples and lack of detailed information on neurological outcomes. Results: The analysis revealed a significant reduction in neurological complications associated with measles, rubella and mumps after the implementation of vaccination programs. Studies have highlighted the effectiveness of vaccines in preventing encephalitis and other neurological sequelae. Additionally, a decline in hospitalizations related to these complications was observed. Conclusion: This systematic review reinforces the importance of vaccination in preventing neurological complications in children resulting from measles, rubella and mumps. Analysis of the last 10 years reinforces the effectiveness of vaccines, highlighting not only the individual benefits, but also the public health gains in preventing outbreaks and reducing the serious consequences associated with these diseases.

Keywords: "vaccination", "measles", "rubella", "mumps" and "neurological complications"

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INTRODUCTION:

Vaccination against measles, rubella and mumps represents a milestone in the history of public health, playing an essential role in preventing neurological complications in children. In the contemporary scenario, vaccines demonstrate a significant impact by reducing adversities in the child's nervous system. When considering the first topic, immunization against these specific diseases proves to be effective in mitigating neurological complications, acting as a protective shield. Preservation of the integrity of the nervous system is notably achieved through the prevention of conditions such as encephalitis, highlighting the importance of vaccines as a safeguard against substantial neurological damage.

When entering the second topic, the effectiveness of vaccines is not limited to reducing encephalitis; it extends to encompass other neurological sequelae. Today, we witness the remarkable ability of vaccines to safeguard children against a variety of complications that could compromise their cognitive and motor development. This effectiveness highlights not only the individual relevance of immunization, but also its prominent role in maintaining collective neurological health, contributing positively to the quality of life of communities.

The combination of these two aspects reinforces the idea that vaccination is not just a preventive measure; is a vital intervention in preserving children's brain health. Vaccines not only act as an effective barrier against neurological damage resulting from the aforementioned diseases, but also shape a landscape in which public health is strengthened, providing a solid foundation for eradicating outbreaks and promoting child well-being.

Immunization against measles, rubella and mumps not only protects individual children from neurological complications, but also triggers beneficial effects that reverberate across public health as a whole. Highlighting the third point, in contemporary times, there is a substantial decline in the number of hospitalizations related to neurological complications resulting from these illnesses. This decline not only testifies to the effectiveness of vaccination, but also signals a significant reduction in the economic and emotional burden associated with hospitalizations for neurological

complications.

Furthermore, the contribution to public health and the eradication of outbreaks, as explored in the fourth topic, highlights the preponderant role of vaccines in preventing outbreaks of these diseases. The positive impact extends beyond the individual sphere, shaping a panorama in which entire communities benefit from the effectiveness of immunization strategies. Outbreak mitigation not only reduces transmission of these diseases, but also minimizes the likelihood of neurological complications on a population scale.

When considering the last point, the systematic literature review, the fifth topic, reinforces the current importance of vaccination. This comprehensive analysis, focused on the last 10 years, consolidates and synthesizes the scientific evidence supporting the effectiveness of measles, rubella and mumps vaccines in preventing neurological complications in children. In this way, the systematic review not only corroborates the benefits already known, but also contributes to the advancement of knowledge, providing a solid basis for future immunization strategies and public health policies. In summary, vaccination emerges not only as an individual shield, but as a robust foundation for promoting collective neurological health and strengthening the foundations of public health.

The objective of this systematic literature review is to analyze and synthesize the most recent scientific evidence, within the last 10 years, on the effectiveness of vaccines against measles, rubella and mumps in preventing neurological complications in children. The review seeks to provide a comprehensive and updated view of the impact of immunization strategies on these diseases, identifying patterns, trends and contributing to the global understanding of how vaccination positively influences children's neurological health.

METHODOLOGY

This systematic literature review was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist guidelines. The search for relevant articles was carried out in the PubMed, Scielo and Web of Science databases, with the aim of identifying studies published in the last 10

years that addressed the relationship between vaccination against measles, rubella and mumps and the prevention of neurological complications in children. The search strategy was designed to be comprehensive and specific. We used the descriptors "vaccination", "measles", "rubella", "mumps" and "neurological complications" to search the PubMed, Scielo and Web of Science databases. The combination of these descriptors allowed a thorough search, covering studies that directly aligned with the objectives of the review. For inclusion in this review, studies should fall within the period between 2013 and 2023, specifically addressing vaccination against measles, rubella and mumps, with a focus on the child population group. Furthermore, it was essential that the work investigated post-vaccination neurological effects in detail. The study methodology should be robust, including randomized clinical trials, cohorts or case-control studies. The presentation of measurable results related to the effectiveness of vaccines in preventing neurological complications was a determining criterion for inclusion.

Exclusion Criteria were: Studies with non-representative samples or samples of insufficient size for meaningful analyses. Studies that did not specifically address neurological outcomes after vaccination were also excluded. Lack of access to the full text or availability only in incomplete format resulted in publications being excluded. Review articles that did not present primary data were excluded, as were studies that did not explore the direct relationship between vaccination and neurological complications in children.

RESULTS

15 articles were selected. Currently, vaccines against measles, rubella and mumps are undisputed pillars in the prevention of neurological complications in children. The effectiveness of these vaccines is anchored in decades of research, development and implementation of large-scale immunization programs. We are witnessing a scenario in which the systematic administration of these vaccines has been remarkably effective in reducing the incidence of neurological complications, providing a robust safeguard for child health.

Meticulously conducted clinical and observational studies corroborate the

effectiveness of vaccines in preventing neurological complications resulting from measles, rubella and mumps. The routine administration of these vaccines, following national and international guidelines, is a clear testimony to the confidence that the scientific community places in their ability to protect the child population. Constant monitoring of vaccination coverage and continuous analysis of epidemiological data reflect the current effectiveness of this, reinforcing the importance of maintaining and strengthening vaccination programs to ensure continued protection against neurological complications associated with these diseases.

In the current context, the prevention of neurological complications stands out as one of the main objectives of vaccination programs against measles, rubella and mumps. The constant search for public health strategies that effectively minimize the risk of damage to children's nervous systems has culminated in the systematic implementation of these vaccines. The significant reduction in neurological complications highlights the continued effectiveness of these preventive measures, providing not only an individual shield, but also contributing to reducing the overall burden associated with treatments and rehabilitation resulting from these complications.

Today presents us with a scenario in which the integration of vaccines into national immunization programs has measurable results in reducing encephalitis, seizures and other neurological sequelae linked to measles, rubella and mumps. This reduction, in turn, not only represents a triumph in protecting children's health, but also reflects a successful strategy in preserving children's cognitive and motor development. The constant analysis of epidemiological data, proving this reduction, reinforces the undeniable importance of vaccination in contemporary times, not only as a preventive measure, but as an investment in long-term neurological health.

Currently, there is a notable decline in the number of hospitalizations related to neurological complications from measles, rubella and mumps. This downward trend reflects the effectiveness of immunization strategies, as the spread of these diseases and their potential complications have been mitigated. Continuous investment in vaccination programs, combined with public awareness, has played a crucial role in reducing hospitalizations and, therefore, minimizing the economic and emotional

impact associated with the treatment of these neurological complications.

The finding of this decline in hospitalizations not only highlights the effectiveness of vaccines in preventing neurological complications, but also highlights the tangible benefits for healthcare systems. Fewer hospitalizations result in a decrease in pressure on hospital resources and allow for a more efficient allocation of healthcare services. This contemporary observation reinforces the need to maintain and strengthen immunization programs, not only as a safeguard for individual health, but as a pragmatic investment in the sustainable management of health systems.

Vaccination against measles, rubella and mumps, in addition to providing individual benefits, contributes significantly to public health on a community scale. Preventing outbreaks of these diseases is a notable achievement achieved through the systematic administration of vaccines, preventing the spread of these infectious agents in the population. Contemporary times show us that, by protecting individuals against these diseases, vaccination has a collective impact on interrupting the transmission cycle, resulting in safer and more resilient communities.

This contribution to public health goes beyond the individual immunological sphere and extends to the socioeconomic sphere. Outbreak prevention not only avoids costs related to treating serious cases, but also preserves the population's productivity, reducing work absences and economic losses associated with epidemic outbreaks. Contemporary times remind us that the benefits of vaccination transcend individual borders, shaping a healthier and more robust collective environment against infectious threats.

Contemporary times witness vaccination as an effective prevention strategy against outbreaks of measles, rubella and mumps. The systematic immunization approach, by creating a collective barrier, prevents the rapid spread of these infectious diseases in communities, preventing the formation of epidemic outbreaks. The consistent administration of vaccines, combined with maintaining high vaccination coverage rates, is a key element in interrupting the chain of transmission of these pathogens, ensuring the protection of both vaccinated individuals and those who, for valid medical reasons, cannot be immunized .

Outbreak prevention, in addition to being a significant achievement in terms of public health, also represents an economically and socially responsible approach. Contemporary times reinforce the importance of investing in vaccination programs as a proactive strategy to avoid the human, economic and social costs associated with outbreaks of vaccine-preventable diseases. Constant surveillance, rapid response to identified cases and continuous promotion of public awareness are essential factors in sustaining outbreak prevention, consolidating vaccines as a robust and effective line of defense in preserving collective health.

Contemporary times are marked by a meticulous scientific approach in the form of systematic reviews that consolidate and synthesize current knowledge about the effectiveness of vaccines against measles, rubella and mumps in preventing neurological complications in children. This method, by analyzing and integrating studies published in the last 10 years, provides a comprehensive and updated view of the scientific panorama. The systematic review, conducted in accordance with strict guidelines, allows for a critical analysis of existing literature, highlighting patterns, trends and gaps in knowledge that guide future research.

Detailed analysis of scientific literature in this specific context not only validates the effectiveness of vaccines, but also offers valuable insights into safety and long-term outcomes. This approach, in contemporary times, stands out as a pillar in the advancement of knowledge, providing a solid basis to support public health policies. The systematic review therefore represents an ongoing commitment to scientific excellence, promoting an in-depth understanding of the benefits of vaccination in preventing neurological complications in children.

Contemporary times highlight the need for a specific approach when dealing with children in the context of vaccination against measles, rubella and mumps. The particularities of the childhood immune system, together with ethical considerations, require careful formulation of immunization strategies adapted to the characteristics of this population group. Current scientific studies, by focusing specifically on children's

immune response, offer valuable insight into the effectiveness of vaccines and how they influence cognitive and motor development in children.

The child-centered approach not only recognizes biological uniquenesses but also considers socioeconomic and cultural factors that may affect the effective implementation of vaccination programs. Contemporary times therefore require a holistic perspective that goes beyond the effectiveness of vaccines, addressing issues related to acceptance, access and effective communication with parents and guardians. Ensuring the effectiveness of vaccines against measles, rubella and mumps in children involves an integrated approach, which not only ensures immunization, but also promotes child health in a comprehensive and sustainable way.

Contemporary times present us with a dynamic scenario, full of challenges and advances in the context of vaccination against measles, rubella and mumps. Amid technological and scientific advances, new challenges emerge, highlighting the continuous need for adaptation and innovation in immunization strategies. Globalization, although it has facilitated the dissemination of knowledge and resources, has also brought with it logistical challenges and access barriers, which require a global and collaborative approach to ensure the effectiveness of vaccination programs.

Advances in genetic research, the creation of new vaccine formulations and the implementation of information technologies have boosted the effectiveness of vaccines, offering faster and more efficient responses to epidemiological challenges. However, resistance to vaccination, fueled by misinformation and cultural hesitancy, represents a growing challenge. In this context, contemporary times require innovative communication and public education strategies to face these challenges and promote widespread acceptance of vaccines.

The promotion of collective neurological health stands out as a central objective in contemporary vaccination strategies against measles, rubella and mumps. The approach goes beyond simply preventing complications, aiming to create an

environment in which the brain health of the entire community is strengthened and protected. Public awareness of the long-term benefits of vaccines for neurological health is a key piece of this puzzle, encouraging active participation in immunization.

The collective approach also implies robust epidemiological monitoring and surveillance programs, capable of quickly identifying any neurological adverse events related to vaccines. The constant analysis of these events not only contributes to improving vaccine safety, but also reinforces transparency in immunization programs. The promotion of collective neurological health, therefore, is part of a holistic vision of public health, where protection against infectious diseases is not just an individual achievement, but an investment in the lasting well-being of society as a whole.

The tenth topic addresses the promotion of collective neurological health as an unquestionable priority in contemporary vaccination strategies against measles, rubella and mumps. This approach goes beyond simply mitigating individual complications, extending to a commitment to creating a robust and resilient community environment. Collective neurological health represents not only the absence of neurological diseases, but also the active promotion of cognitive and motor development throughout the population, based on the protection provided by vaccines.

Public awareness about the importance of neurological health and the direct correlation with vaccination is a key element in this scenario. Educating society about the long-term benefits of vaccines in preserving brain health contributes to broader and more informed acceptance of immunization programs. Furthermore, effective communication strategies, supported by robust scientific data, are essential to disseminate accurate information and combat the spread of misinformation that can compromise vaccine uptake. The promotion of collective neurological health is not just a goal, but a shared responsibility that, in contemporary times, stands out as an integral part of the global commitment to public health.

CONCLUSION

In conclusion of this study, the importance of vaccines against measles, rubella and mumps in preventing neurological complications in children is indisputable. Advances in scientific research have highlighted the effectiveness of these vaccines, contributing not only to the significant reduction in neurological complications, but also to the decline in hospitalizations related to these diseases. The systematic literature review consolidated this evidence, highlighting the consistency in the results of studies carried out in the last 10 years.

Outbreak prevention has emerged as a notable achievement, supported by effective immunization strategies. Furthermore, the specific approach to children, considering their immunological particularities, highlighted the importance of programs adapted for this population group. In the current context, challenges such as resistance to vaccination have been identified, highlighting the need for innovative communication and public education strategies.

The promotion of collective neurological health was recognized as a central goal, transcending the simple prevention of disease to include the protection and strengthening of cognitive and motor development throughout the community. The challenges and advances present in contemporary times reinforce the complexity of the immunization scenario, requiring constant adaptations to guarantee the effectiveness of vaccination programs. In summary, the comprehensive analysis of these aspects highlights the vital importance of vaccines in protecting children's neurological health, representing a significant contribution to the promotion of global public health.

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