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Relationship Between Upper Respiratory Tract Infection And Acute Otitis Media In Children

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ABSTRACT
Upper respiratory tract infections (URTI) are common in children and often trigger complications like ear infection that can affect hearing and development . This study aims to analyze the relationship between URTI and ear infections in children through a qualitative literature review . The findings suggest that URTI, particularly viral infection like nasopharyngitis , can disrupt the function of the Eustachian tube, increasing the risk of ear infections . Other risk factors , such as the child's age , air pollution , and exposure to second hand smoke , also worsen this condition . Raising parental awareness about early detection and management of URTI, along with preventive measures like vaccination and maintaining a healthy environment , can help reduce ear infection incidence .

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INTRODUCTION

Upper respiratory tract infection (URTI) is one of the most common health problems, especially in children. This condition includes various diseases such as colds, sinusitis, and pharyngitis which are generally caused by viral or bacterial infections. URTI can cause mild to severe symptoms, such as fever, cough, nasal congestion, and sore throat, which often interfere with children's daily activities. In addition to affecting the respiratory tract, URTI can also be a gateway for other, more serious complications. One of the complications that often occurs is acute otitis media (AOM), which is inflammation of the middle ear due to the spread of infection. Acute otitis media not only causes pain in children, but can also affect their hearing ability if not treated quickly and appropriately. This makes URTI and its complications such as AOM a health problem that requires special attention, given its significant impact on children's quality of life and development in the long term (Andi Retno Afifah et al., 2023) .

The prevalence of ARI in children is quite high, especially in developing countries. According to a report from the World Health Organization (WHO), ARI is a major cause of morbidity in children under the age of five, with the incidence rate continuing to increase in environments with low levels of hygiene and limited access to health care. In Indonesia, data from the Ministry of Health shows that ARI is one of the main causes of children's visits to health facilities, with a percentage reaching 30-40% of all cases of childhood illness.

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Meanwhile, acute otitis media is one of the most common complications of ARI in children. Research shows that around 70% of children under the age of three have experienced at least one episode of acute otitis media. This disease often begins with an upper respiratory tract infection, where bacteria or viruses spread through the Eustachian tube to the middle ear, causing inflammation. This complication not only causes pain, but also carries the risk of causing hearing loss, either temporary or permanent, if not treated quickly (Purba et al., 2021).

Environmental conditions such as air pollution, indoor smoking, and humid homes increase the risk of ARI and AOM in children. Air pollution irritates the respiratory tract, cigarette smoke damages the immune system, and humidity supports the growth of bacteria and fungi. Children in such environments are more susceptible to recurrent ARI which can develop into AOM. In Indonesia, this risk is even higher given the high levels of air pollution, especially in urban areas. This shows the importance of efforts to create a healthier environment to prevent ARI and its complications.

From the author's observation at one of the primary health care centers, many children who came with complaints of upper respiratory tract infections (URTIs) were also diagnosed with acute otitis media (AOM). This indicates a close relationship between the two conditions, where untreated URTI infections can spread to the middle ear and cause complications. Based on interviews with parents, most of them were unaware of the potential for these complications, so they often delayed taking their children to the doctor until symptoms worsened. This ignorance poses a risk of delayed treatment that can have a serious impact on children's health. Therefore, efforts are needed to increase public awareness of the relationship between URTIs and AOM, including the importance of early detection and appropriate treatment to prevent further complications.

In addition, the pattern of parental behavior in dealing with ISPA in children also affects the development of OMA complications. Some parents tend to use traditional medicine or postpone visits to health facilities for economic reasons or lack of understanding. This condition worsens the risk of complications and prolongs the duration of the disease. From a clinical perspective, the challenge that is often faced is the early diagnosis of OMA in children with ISPA. Children often find it difficult to express the symptoms they feel, so doctors need to conduct a careful physical examination to ensure complications. On the other hand, handling OMA requires the administration of appropriate antibiotics, but the problem of antibiotic resistance is a major concern that affects the success of treatment. (Medicine et al., 2024) .

This study aims to explore the relationship between upper respiratory tract infection and acute otitis media in children, with the hope of providing deeper insight into the risk factors that influence this relationship. The author also wants to know the level of parental awareness of the relationship between these two diseases, as well as preventive efforts that can be made. In addition , this study is expected to contribute to improving the quality of health services, especially in the aspects of preventing and treating ARI and AOM. By understanding the relationship between the two better, it is hoped that medical personnel can provide more effective interventions to prevent serious complications in children.

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The main objective of this study was to analyze the relationship between ARI and acute otitis media in children, with an approach that includes epidemiological data analysis , clinical observation, and interviews with parents. This study also aims to identify the most effective interventions in preventing complications of acute otitis media in children with ARI. With this study, it is hoped that the public can better understand the importance of early treatment of ARI to prevent complications such as acute otitis media. In addition, the results of this study can be the basis for health policies in improving efforts to prevent and treat infectious diseases in children.

RESEARCH METHODS

This research uses a qualitative method with a literature approach. review to explore the relationship between upper respiratory tract infection (URTI) and acute otitis media (AOM) in children. This approach was chosen because it allows researchers to review in depth various literature, previous studies, and relevant data to understand the patterns, risk factors, and mechanisms that link the two conditions. Literature reviews provide a comprehensive overview based on existing scientific evidence, so that they can be a basis for drawing accurate conclusions (Sugiyono, 2021) .

The data in this study were obtained through searching scientific journals, reference books, and research reports related to ISPA and AOM. The literature sources used were selected based on relevance, validity, and credibility, such as publications in reputable international or national indexed journals . The search was conducted using keywords such as "ISPA," " acute otitis media," "relationship between ISPA and AOM," and "risk factors for ISPA." Furthermore, the literature found was analyzed systematically to identify key themes, patterns of relationships, and conclusions that could be used to answer the research questions.

Data analysis in this study was conducted using a qualitative descriptive method. Researchers reviewed the results of previous studies, compared findings from various sources, and identified existing knowledge gaps. Thus, this approach not only helps understand the relationship between ISPA and OMA but also provides recommendations for further research or practical application in efforts to prevent and treat ISPA and OMA. The analysis was conducted critically to ensure the validity of the resulting interpretations. (Rukminingsih, 2020) .

Literature approach This review is expected to provide an important contribution in understanding the relationship between ISPA and AOM in children. By integrating findings from various studies, this study can be a reference for health workers, policy makers, and the community in increasing awareness and management of both conditions. This method also allows the collection of rich information without having to conduct direct field research, so that the results can be accessed and applied more quickly.

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RESULTS AND DISCUSSION

Results

From the results of the literature study review , it was found that the relationship between upper respiratory tract infection (URTI) and acute otitis media (AOM) has been widely discussed in various studies. URTI is one of the main causes of AOM, especially in children, because the shorter and horizontal anatomy of the Eustachian tube facilitates the spread of infection from the respiratory tract to the middle ear. Several literatures also show that untreated URTI can trigger inflammation of the middle ear, causing pain, fever, and temporary hearing loss. In addition, risk factors such as exposure to cigarette smoke, air pollution, and poor environmental hygiene increase the likelihood of URTI developing into AOM. This study highlights the importance of public education to increase awareness of the relationship between URTI and AOM, while emphasizing the need for early intervention in the treatment of URTI to prevent these complications.

No	Writer	Year	Article Title	Number of Samples	Research Design	Results	Determinant Factors
1	Alfian (Andi Retno Afifah et al., 2023)	2023	The Relationship between the Incidence of Acute Suppurative Otitis Media and Upper Respiratory Tract Infections in Children at Dr. La Paloloi Regional Hospital .	100	Analytical Observation , Cross Sectional	Finding a relationship between ISPA and AOM in children.	Upper respiratory tract infection, Eustachian tube dysfunction , bacterial infections such as Streptococcus , negative pressure in the middle ear.
2	Nafis, Ibn Yuda, Aditiya Alam, Perkasa Zakiyyah (Medicine et al., 2024)	2024	RELATIONSHIP TO ACUTE UPPER RESPIRATORY TRACT INFECTIONS	150	Cross Sectional	Shows that ISPA is a predisposing factor for the occurrence of AOM in children.	Spread of infection from the nasopharynx to the middle ear, mucociliary disorders, Eustachian tube function .

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No	Writer	Year	Article Title	Number of Samples	Research Design	Results	Determinant Factors
3	Sembiring, Meta Aubina , Tobing, Jerry, Sinurat, Puji (Sembiring et al., 2020)	2020	The Relationship between Upper Respiratory Tract Infections and the Incidence of Acute Otitis Media (AOM).	120	Cross Sectional	Shows that children with ARI are more susceptible to AOM.	Untreated ARI can cause complications in the middle ear, Eustachian tube disorders .
4	Waqqas , Safirah Alwamiqah , Umar, Mahdi (Waqqas & Umar, 2024)	2024	Characteristics of Patients with Acute Otitis Media.	80	Descriptive, Observational	To find general characteristics of AOM patients, including association with upper respiratory tract infections.	History of ARI, child age factor, immune system disorders.
5	Purba, Lidya Angelina, Imanto, Mukhlis, Angraini, Dian Isti (Purba et al., 2021)	2021	The Relationship between Acute Otitis Media and History of Upper Respiratory Tract Infection in Children.	90	Observational , Cross Sectional	Found a significant relationship between a history of ARI and the incidence of AOM in children.	Eustachian tube function .
6	Zakiyyah, MT, Arifuddin, ATS (Zakiyyah et al., 2024)	2024	Literature Review : The Relationship Of Upper Respiratory Tract Infections With Acute Otitis Media In Children .	-	Literature Reviews	Confirming the relationship between ISPA and AOM in children.	Untreated ARI can lead to AOM.

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No	Writer	Year	Article Title	Number of Samples	Research Design	Results	Determinant Factors
7	Morris, Peter S. (Morris, 2019)	2019	Upper Respiratory Tract Infections (Including Otitis Media).	-	Reviews	Concluded that ISPA can trigger the occurrence of AOM, especially in children who are more vulnerable.	Viral infections, impaired Eustachian tube function , the child's immune system is not yet well developed.
8	Chonmaitree , Tasnee , Revai , Krystal, Grady, James J., Clos , Audra, Patel , Janak A., Nair , Sangeeta , Fan , Jiang , Henrickson , Kelly J. (Chonmaitree et al.,2022)	2022	Viral upper respiratory tract infection and otitis media complications in young children .	200	Prospective, Observational	Found a strong association between upper respiratory tract infections and complications of otitis media in children.	Viral infections, impaired Eustachian tube function , age factors.
9	Hassooni , Hanan Raheem , Fadhil, Samih Faiq, Hameed , Raed M., Alhusseiny , Adil Hassan, Ali Jadoo , Saad Ahmed (Hassooni et al.,2020)	2020	Upper respiratory tract infection and otitis media are clinically and microbiologically associated .	150	Observational , Cross Sectional	Found a significant clinical and microbiological relationship between ARI and AOM.	Bacteria and viruses, mucociliary disorders , upper respiratory tract infections.

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No	Writer	Year	Article Title	Number of Samples	Research Design	Results	Determinant Factors
10	Doyle , William J., Alper , Cuneyt M. (Doyle & Alper,2023)	2023	Prevention of otitis media caused by viral upper respiratory tract infection : Vaccines , antivirals , and others approaches .	-	Reviews	Presenting an approach to the prevention of AOM caused by upper respiratory tract infections through vaccines and antivirals .	Use of vaccines and antivirals to prevent ear infections associated with ARI.

Discussion

The relationship between upper respiratory tract infections (URTIs) and acute otitis media (AOM) in children is very close, especially because URTIs can disrupt the function of the Eustachian tube , which plays an important role in maintaining the balance of air pressure in the middle ear. When the Eustachian tube is disrupted due to respiratory tract infections, such as nasopharyngitis , there can be a decrease in function that causes negative pressure in the middle ear. This then draws fluid from the nasopharynx into the middle ear, which can cause infection and inflammation, increasing the risk of AOM in children. Children who experience URTIs, especially those who do not receive proper treatment, are more susceptible to this complication, which can affect their hearing and development.

Several risk factors, such as the child's young age, exposure to air pollution, and smoking habits in the surrounding environment, also worsen this condition. Children under the age of five are more susceptible to ear infections because their immune systems are not yet fully developed. Environmental factors such as air pollution and cigarette smoke can worsen ARI and increase the likelihood of AOM, especially if the child is frequently exposed. Therefore, it is important for parents to understand the relationship between ARI and AOM and to take preventive measures by maintaining the health of the child's respiratory tract, avoiding risk factors, and immediately taking the child to the doctor if symptoms of ARI or AOM appear.

The Relationship Between ISPA and AOM in Children

Upper respiratory tract infection (URTI) is a very common condition in children, especially those under the age of five. URTI involves various infections in the upper respiratory tract, such as colds, sinusitis, pharyngitis, or nasopharyngitis , which are usually caused by viruses or bacteria. This condition can affect the respiratory system as a whole, and in some cases, can lead to more serious complications such as acute otitis media (AOM). AOM is an

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infection of the middle ear that can be caused by an infection that spreads from the upper respiratory tract, and it is a health problem that is often found in children.

One of the main mechanisms explaining the relationship between ARI and AOM is disruption of the Eustachian tube function . The Eustachian tube is a channel that connects the middle ear to the nasal cavity and functions to maintain the balance of air pressure in the middle ear. When a child experiences ARI, infection in the nasopharynx can cause swelling and inflammation of this channel, which ultimately disrupts the airflow and normal function of the Eustachian tube . This disruption leads to the formation of negative pressure in the middle ear, which causes fluid from the nasopharynx to be drawn into the middle ear, triggering infection and inflammation known as acute otitis media.

Under normal conditions, the Eustachian tube functions to maintain air pressure in the middle ear and ensure proper drainage of fluid. However, when the Eustachian tube is compromised due to swelling or upper respiratory tract infection, normal airflow becomes obstructed. This decreased function of the Eustachian tube can cause fluid to collect in the middle ear, creating an ideal environment for the growth of bacteria or viruses, which eventually leads to acute otitis media. Therefore, children who experience ARI are at higher risk of developing AOM, especially if the respiratory tract infection is not treated promptly.

Other factors that worsen the risk of AOM in children with ARI are the young age of the child and the immune system that is not yet fully developed. Children under the age of five have shorter and more horizontal Eustachian tubes , which makes them more susceptible to infection. In addition, children's immune systems that are not yet fully developed make it more difficult for them to fight infections, increasing the risk of AOM after experiencing ARI. With a better understanding of this relationship, it is important for parents and medical personnel to recognize the signs of ARI and AOM early on to avoid more serious complications.

Risk Factors and Their Impact on Children

Several risk factors play a significant role in increasing the association between upper respiratory tract infections (URTIs) and acute otitis media (AOM) in children. One of the most important factors is the child's age. Children under the age of five are more susceptible to ear infections because their Eustachian tubes are still short, more horizontal, and not fully developed. This condition makes the ear canal more easily blocked by mucus or fluid produced during respiratory tract infections. In addition, children's immune systems are still developing, making it more difficult for them to fight infections effectively, increasing the likelihood of ear infections such as AOM after exposure to URTIs (Leony et al., 2022) .

Exposure to air pollution is another environmental risk factor that can worsen ARI and increase the likelihood of developing AOM. Air pollution contains harmful particles that can damage the respiratory tract, worsen inflammation of the upper respiratory tract, and weaken the immune system. Children who live in areas with high levels of air pollution, especially in large cities, are at higher risk of developing ARI and related complications such as AOM. Long-term exposure to air pollution can also interfere with the development of a child's respiratory system, further worsening their health and increasing the risk of more serious complications.

In addition to air pollution, smoking habits in the child's environment are also an important risk factor. Cigarette smoke contains substances that can damage the respiratory

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tract tissue and increase mucus production. When children are exposed to cigarette smoke, their respiratory tract is more susceptible to infection, which worsens the symptoms of ARI and increases the likelihood of developing AOM. Research shows that children who are exposed to cigarette smoke at home are more likely to experience ear infections and hearing loss than children who are not exposed. Therefore, reducing exposure to cigarette smoke around children is very important to reduce the risk of ARI and AOM. (Medicine et al., 2024) .

These environmental factors have long-term impacts on children's health. When children are exposed to air pollution and cigarette smoke continuously, their health condition becomes more susceptible to respiratory tract infections and other complications. Repeated respiratory tract disorders, coupled with the body's inability to fight infections optimally, can lead to more serious health problems, including hearing disorders and physical and cognitive development of children. Therefore, it is important to provide a healthy and clean environment for children, by reducing exposure to air pollution and cigarette smoke to reduce the risk of ARI and AOM which can have a negative impact on their quality of life.

Proper Prevention and Handling

Although the relationship between upper respiratory tract infections (URTIs) and acute otitis media (AOM) is quite clear, these conditions often do not receive proper treatment immediately. One of the main reasons is the lack of parental awareness of the relationship between the two conditions. Many parents consider respiratory tract infections such as colds or coughs as not too serious problems, without realizing that these infections can develop into more serious complications, such as AOM. Therefore, it is important for parents to be educated about the symptoms that indicate AOM, such as earache, fever, and hearing loss, so that they can immediately seek appropriate medical care before the condition worsens (Murwaningrum et al., 2019) .

Increasing parental knowledge about the signs and symptoms of AOM, as well as awareness of the importance of having children examined by medical personnel when experiencing ARI, will greatly assist in preventing complications. If AOM is diagnosed and treated early, the risk of permanent damage to the ear and hearing loss can be minimized. Education about when to seek medical help, such as if the respiratory tract infection does not improve or if the child shows more severe symptoms, is also very important. In addition, parents need to understand that some ARI symptoms that appear mild at first can develop into more serious problems if not treated properly.

In addition to medical treatment, preventive measures are also very important to reduce the risk of AOM. One effective way is to vaccinate against viral infections that often cause ARI, such as influenza or pneumococcus viruses . This vaccination can help reduce the incidence of upper respiratory tract infections which in turn reduces the risk of AOM in children. Therefore, it is important for parents to ensure that their children receive the vaccinations recommended by medical personnel according to the specified schedule (Silvana et al., 2023) .

In addition, avoiding environmental factors that can worsen children's health conditions is also an equally important preventive measure. Air pollution and cigarette smoke are two environmental factors that can worsen upper respiratory tract conditions and increase the risk

of AOM. Children who are exposed to air pollution or cigarette smoke are more susceptible to respiratory infections and other complications. Therefore, creating a healthy environment, by maintaining air quality at home and avoiding smoking habits around children, will help reduce the incidence of ARI and AOM. These steps, if carried out consistently, can improve children's quality of life and reduce the risk of more serious health problems in the future.

The relationship between upper respiratory tract infection (URTI) and acute otitis media (AOM) in children is very close, and parental awareness and appropriate preventive measures are needed to reduce the risk of complications. By understanding the early signs of AOM, increasing knowledge about the importance of immediate medical examination, and implementing preventive measures such as vaccination and creating a healthy environment, can help prevent and reduce the incidence of AOM. Therefore, the role of parents, medical personnel, and the community in increasing awareness and appropriate management of these two conditions is very important for the health and optimal development of children.

CONCLUSION

In conclusion, the relationship between upper respiratory tract infection (URTI) and acute otitis media (AOM) in children suggests that URTI can trigger disruption of Eustachian tube function , which then increases the risk of AOM. Factors such as child age, air pollution, and exposure to cigarette smoke worsen this condition, making children more susceptible to ear infections. Therefore, parental awareness of the signs and symptoms of AOM and the importance of prompt medical treatment are essential to reduce the negative impact of this condition. Prevention also plays a crucial role in reducing the incidence of AOM, with vaccination as one of the effective preventive measures against viral infections that cause ARI. In addition, avoiding adverse environmental factors, such as pollution and smoking, can significantly reduce the risk of AOM in children. Therefore, increasing public knowledge and involving various parties, including parents, medical personnel, and the government, to create a healthier environment and support prevention efforts are key to reducing the incidence of AOM in children.

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