

TRIGGERING FACTORS FOR ADENOID HYPERTROPHY IN CHILDREN

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ABSTRACT

Adenoid undergoes physiological enlargement during childhood. However, when this enlargement causes obstruction around the nasopharynx, this enlargement becomes a pathological disorder called adenoid hypertrophy. The etiology of adenoid hypertrophy remains unclear, but it is believed to be a multifactorial process. The study identified the triggering factors for adenoid hypertrophy in children at Prof. Dr. Margono Soekarjo Hospital, Purwokerto. This study was an observational research using a quantitative descriptive design. The population of this study consisted of children under 10 years old who were diagnosed with adenoid hypertrophy at Prof. Dr. Margono Soekarjo Hospital, Purwokerto from January 2021 to August 2024. The data used were secondary data obtained from medical records and supplemented through interviews. The collected data were then analyzed using univariate analysis. Of the 55 patients, 31 patients (56,4%) are male and 24 patients (43,6%) are female, with an age range of 0 to 9 years. The distribution of patients based on triggering factors shows that some patients have one factor, while others have two factors. The most common triggering factor found in patients with one factor is recurrent respiratory tract infections (40%), while in patients with two factors, the most common triggering factors are Down Syndrome with recurrent respiratory tract infections (7,3%) and congenital CMV with recurrent respiratory tract infections (7,3%). Adenoid hypertrophy in children is caused by a chronic inflammatory process in the adenoid, which can be triggered by various factors, either single factor or a combination of several factors.

Keywords : Adenoid Hypertrophy, Children, Triggering Factors

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INTRODUCTION

Adenoids are one of the components of Waldeyer's ring and play an important role in the mucosal immune system of the upper respiratory tract. Adenoid tissue undergoes physiological enlargement during childhood in response to continuous antigen exposure. Upon reaching puberty, the adenoid normally regresses and largely disappears in adulthood. However, excessive enlargement that causes narrowing or obstruction of the nasopharyngeal airway is known as adenoid hypertrophy (Geiger & Gupta, 2024).

Adenoid hypertrophy is a common condition in children and is one of the major causes of upper airway obstruction. A study conducted at a district-level hospital in Bangladesh in 2017 reported that adenoid hypertrophy accounted for approximately 9% of otorhinolaryngological cases. In Indonesia, adenoid hypertrophy is also frequently encountered in clinical practice, although national prevalence data are not yet available. Adenoid hypertrophy occurs more frequently in children than in adults, with reported prevalences of 34% in children and 2.5% in adults, although these figures may vary according to population characteristics and diagnostic methods (Mahafza et al., 2023).

Chronic adenoid enlargement may impair upper airway function through mechanical obstruction of the nasopharynx. This condition may cause various clinical manifestations, including nasal obstruction, mouth breathing, hyponasal speech, snoring during sleep, and sleep-disordered breathing, including obstructive sleep apnea (OSA). In addition, adenoid hypertrophy may impair Eustachian tube function and increase the risk of middle-ear disorders such as otitis media with effusion. When persistent, these conditions may adversely affect sleep quality, cognitive function, behavior, learning, and the growth and development of children (Chmielik et al., 2023). Therefore, identifying conditions associated with adenoid hypertrophy in children is important for early detection and prevention of complications.

This study aimed to describe the distribution of factors associated with adenoid hypertrophy among pediatric patients who underwent examination or treatment at Prof. Dr. Margono Soekarjo Hospital, Purwokerto. The factors evaluated included a history of recurrent upper respiratory tract infections, allergic conditions, allergic rhinitis, exposure to cigarette smoke, atopic dermatitis, a history of infection or other inflammatory conditions, and other clinical characteristics identified in the patients.

The etiology of adenoid hypertrophy is not fully understood, but the condition is believed to involve multifactorial mechanisms associated with chronic immune stimulation and recurrent inflammation of the adenoid tissue. Conditions frequently associated with adenoid hypertrophy include recurrent respiratory tract infections, allergic diseases, allergic rhinitis, exposure to cigarette smoke, and other inflammatory factors (Mahafza et al., 2023). Recurrent respiratory tract infections may cause persistent antigenic stimulation, thereby increasing lymphoid activity and proliferation of adenoid tissue. Meanwhile, allergic conditions such as allergic rhinitis and atopic dermatitis are associated with a type 2 immune response that promotes the release of inflammatory mediators and may sustain adenoid tissue enlargement.

Alam et al. (2022) reported that several conditions were associated with adenoid hypertrophy, including house-dust allergy, allergic rhinitis, a history of recurrent tonsillitis with or without pharyngitis, and exposure to cigarette smoke in the home environment. In addition, other studies have suggested possible involvement of chronic inflammatory or infectious conditions, such as atopic dermatitis, congenital cytomegalovirus (CMV) infection, and dental abscesses, which may contribute to persistent immune stimulation. These conditions were included in the present study because they have a biological basis involving the potential to induce chronic inflammatory responses that may contribute to lymphoid hyperplasia of the adenoid tissue.

Although various studies have evaluated factors associated with adenoid hypertrophy, most previous studies have focused on the relationship between one or several specific factors and adenoid hypertrophy using analytical designs. Information regarding the distribution of various conditions found in children with adenoid hypertrophy in the hospital-care setting, particularly in Indonesia, remains limited. In addition, comprehensive descriptions of associated characteristics, such as recurrent respiratory tract infections, allergic conditions, environmental exposure, and other inflammatory conditions, among pediatric patients with adenoid hypertrophy at regional referral hospitals are scarce. Based on these considerations, a study describing the associated factors identified in children with adenoid hypertrophy is needed to characterize patients and support early-detection strategies. This study was not intended to determine causal factors for adenoid hypertrophy, but rather to describe the distribution of various associated conditions identified among pediatric patients with adenoid hypertrophy.

RESEARCH METHODS

This was an observational study using a quantitative descriptive design. The study population comprised pediatric patients diagnosed with adenoid hypertrophy at Prof. Dr. Margono Soekarjo Hospital, Purwokerto. The sample consisted of children younger than 10 years who were diagnosed with adenoid hypertrophy at Prof. Dr. Margono Soekarjo Hospital, Purwokerto, between January 2021 and August 2024 and met the inclusion and exclusion criteria. The independent variable was the associated factor, whereas the dependent variable was pediatric adenoid hypertrophy. Total sampling was used, yielding a sample of 55 patients. Data were collected from patients' medical records obtained from the Medical Records Unit of Prof. Dr. Margono Soekarjo Hospital, Purwokerto, and from interviews with patients' guardians when the medical-record data were incomplete.

The study began by reviewing the medical records of pediatric patients who had been diagnosed with adenoid hypertrophy by an otorhinolaryngology–head and neck surgeon at Prof. Dr. Margono Soekarjo Hospital, Purwokerto. Patient demographic characteristics and histories of conditions associated with adenoid hypertrophy were extracted from the medical records. For patients whose records did not contain information regarding associated factors, interviews with their guardians were conducted to complete the relevant history. After all sample data had been collected, the data were processed and analyzed using SPSS software. Univariate analysis was performed to describe the characteristics of the study sample. The results were presented as distribution tables showing the number and percentage of patients according to sex, age, and associated factors, as well as a diagram showing the distribution of patients according to associated factors.

RESULTS AND DISCUSSION

The analysis included 55 samples that met the inclusion and exclusion criteria and agreed to participate in the study.

Table 1. Sex-Based Distribution of Patients

Sex	Total (n)	Percentase (%)
Male	31	56,4
Female	24	43,6
Total	55	100

Table 1 shows that among the 55 participants, male patients outnumbered female patients: 31 (56.4%) were male and 24 (43.6%) were female.

Tabel 2. Distribution of patients by age

Age (Years)	Total (n)	Percentage (%)
0	1	1,8
1	6	10,9
2	5	9,1
3	7	12,7
4	7	12,7
5	3	5,5
6	8	14,5
7	10	18,2
8	5	9,1
9	3	5,5

Table 2 shows that the study sample ranged in age from 0 to 9 years. The largest proportion of the sample was 7 years old, comprising 10 patients (18.2%), whereas the smallest group was 0 years old, comprising 1 patient (1.8%). Table 3 presents the distribution of patients according to associated factors identified through medical-record review and interviews. Patients were categorized according to the number of associated factors identified: one factor or two factors. This categorization was based on the medical-record review and interviews conducted for all 55 samples, in which some patients had one associated factor and others had two associated factors. Among patients with a single associated factor, recurrent upper respiratory tract infection was the most frequently identified condition, occurring in 22 patients (40.0%), whereas atopic dermatitis and congenital CMV infection were the least frequently identified, each occurring in 2 patients (3.6%). Among patients with two associated factors, Down syndrome with recurrent upper respiratory tract infection and congenital CMV infection with recurrent upper respiratory tract infection were the most frequently identified combinations, each occurring in 4 patients (7.3%). The least frequent combination was atopic dermatitis with recurrent upper respiratory tract infection, identified in 1 patient (1.8%).

Table 3. Distribution of patients by associated factors

Associated factor(s)	Jumlah (n)	Persentase (%)
Single factor		
Allergic rhinitis	15	27,3
Recurrent upper respiratory tract infection	22	40
Dental abscess	3	5,5
Congenital CMV infection	2	3,6

Atopic dermatitis	2	3,6
Two factor		
Down syndrome + recurrent upper respiratory tract infection	4	7,3
Atopic dermatitis + recurrent upper respiratory tract infection	1	1,8
Asthma + recurrent upper respiratory tract infection	2	3,6
Congenital CMV infection + recurrent upper respiratory tract infection	4	7,3

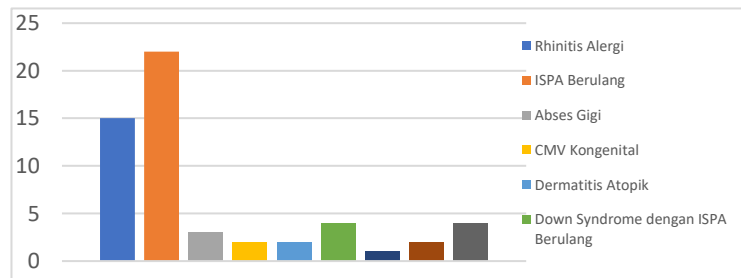


Figure 1. Distribution of patients according to associated factors.

Figure 1 shows that among the 55 study samples, recurrent upper respiratory tract infection was the most frequently identified associated factor, occurring in 22 samples (40.0%), whereas atopic dermatitis with recurrent upper respiratory tract infection was the least frequently identified combination, occurring in 1 sample (1.8%). The distribution indicates that patients with a single associated factor were more numerous than patients with two associated factors.

Patient Characteristics by Sex and Age

The patient characteristics by sex in this study showed that adenoid hypertrophy was more frequently identified in male patients than in female patients. This finding is consistent with Alam et al. (2022) and Rilwanu et al. (2022), who reported a higher proportion of male patients with adenoid hypertrophy than female patients. The predominance of male patients in some previous studies has been hypothesized to be related to differences in airway anatomy and respiratory immune responses between males and females. Some literature suggests that the size of lymphoid tissue and airway characteristics may influence the tendency toward airway obstruction in boys, although the precise mechanism underlying this difference remains incompletely understood (Kim & Taranto-Montemurro, 2019). Thus, the male predominance observed in this study primarily reflects the distribution of patients with adenoid hypertrophy at the study site and does not indicate that sex is a causal factor for adenoid hypertrophy.

By age, the largest proportion of patients in this study was 7 years old. This finding differs from that of Rilwanu et al. (2022), who reported that adenoid hypertrophy was more frequently observed among children aged 3–5 years. Differences in age distribution may be influenced by variations in study-population characteristics, referral patterns, and the

timing of medical evaluation. Physiologically, adenoid tissue undergoes active growth during childhood and generally reaches its maximum size early in life before gradually regressing toward puberty (Wang et al., 2021). Therefore, childhood remains an important period for evaluating symptoms associated with nasopharyngeal obstruction.

Distribution of Associated Factors Identified in Patients with Adenoid Hypertrophy

Review of medical records and interviews with patients' guardians showed that some patients had more than one condition associated with adenoid hypertrophy. This finding is consistent with the concept that adenoid hypertrophy has multifactorial mechanisms involving interactions among infectious, inflammatory, allergic, and certain medical conditions (Mahafza et al., 2021). However, because this study used a descriptive design, the presence of these factors only indicates conditions observed among patients with adenoid hypertrophy and cannot be used to establish causal relationships.

Recurrent upper respiratory tract infection was one of the most frequently identified conditions in this study. This finding is consistent with Alam et al. (2022), who reported a history of recurrent infection among some patients with adenoid hypertrophy. Biologically, adenoid tissue is part of the mucosal defense system of the nasopharynx and plays a role in recognizing antigens from the respiratory tract. Repeated antigen exposure may activate lymphoid tissue and sustain local inflammation. Nevertheless, this study did not perform microbiological examinations or assess the degree of tissue inflammation; therefore, this mechanism can only be discussed on the basis of theory and previous research.

Differences in the proportion of recurrent upper respiratory tract infections compared with other studies may be influenced by several factors, including patient age, infection history obtained from guardians through interviews, and variation in the definitions of recurrent infection used across studies. Therefore, the present findings indicate that a history of recurrent upper respiratory tract infection is a frequently observed condition among patients with adenoid hypertrophy, but they do not establish it as a direct cause of adenoid hypertrophy.

Allergic Conditions in Patients with Adenoid Hypertrophy

A history of allergic conditions, particularly allergic rhinitis, was also identified in some patients with adenoid hypertrophy in this study. This finding is consistent with Alam et al. (2022), which demonstrated an association between allergic conditions and adenoid hypertrophy. Allergic rhinitis can cause chronic inflammation of the nasal mucosa as a result of repeated allergen exposure. Theoretically, this inflammatory state may be associated with increased activity of lymphoid tissue in the nasopharynx, including the adenoids.

In addition to allergic rhinitis, some patients had other atopic conditions, such as atopic dermatitis and asthma. However, the relationship between these conditions and adenoid hypertrophy requires further investigation. In this study, atopic dermatitis and asthma were recorded only as conditions identified in patients, without assessment of inflammatory biomarkers or immunological mechanisms. Therefore, interpretation of the involvement of these atopic conditions should be made cautiously. Several studies have suggested that allergic conditions may be associated with airway inflammatory disorders through immune-system activation. However, whether specific allergic conditions are independently associated with adenoid hypertrophy remains uncertain and requires analytical studies with comparison groups.

Local Infectious Conditions and Congenital Abnormalities

In addition to respiratory tract infections and allergic conditions, this study identified other conditions among patients with adenoid hypertrophy, including dental abscess, Down syndrome, and congenital CMV infection. These conditions have been less frequently discussed in studies of adenoid hypertrophy, making their presence findings that warrant further attention. From a theoretical perspective, dental abscess may be associated with inflammatory disturbances in the head and neck because of the close anatomical relationship between the oral cavity and upper respiratory tract. However, this study did not evaluate the causative bacteria of the dental abscesses or the temporal relationship between dental infection and adenoid enlargement. Therefore, dental abscess can only be regarded as a condition identified among patients with adenoid hypertrophy and cannot be concluded to be a causal factor.

In patients with Down syndrome, the presence of adenoid hypertrophy may be associated with airway anatomical characteristics and immune-system alterations that increase susceptibility to respiratory disorders. Several studies have shown that children with Down syndrome have a higher risk of upper airway disorders, including sleep-related obstruction (Ghezzi et al., 2024). However, this study did not specifically analyze the relationship between Down syndrome and adenoid hypertrophy; therefore, further research is required to clarify this relationship.

Congenital CMV infection was also identified in a small proportion of patients in this study. The literature indicates that CMV infection can involve lymphoid tissue and induce chronic inflammatory responses. However, the mechanism by which CMV may contribute to adenoid hypertrophy has not been extensively described and requires stronger clinical evidence. Therefore, the finding of congenital CMV infection in this study may provide a basis for further research but cannot be used to establish a causal relationship.

Study Limitations

This study had several limitations. First, the use of medical-record data and interviews with patients' guardians may have resulted in information bias, particularly regarding previous disease histories that depended on respondents' recall. Second, the descriptive study design could only describe the distribution of factors identified among patients with adenoid hypertrophy and could not establish causal relationships. In addition, the sample size was relatively small, and no control group was included; therefore, it could not be determined whether the identified factors occurred more frequently in children with adenoid hypertrophy than in children without adenoid hypertrophy. The analysis was also limited to univariate analysis and therefore could not determine which factor had the strongest association with adenoid hypertrophy.

Clinical Implications and Future Research

The findings of this study provide a description of various conditions identified among pediatric patients with adenoid hypertrophy at Prof. Dr. Margono Soekarjo Hospital. This information may serve as a basis for healthcare professionals to conduct a more comprehensive assessment of infection history, allergic conditions, and other medical conditions in children presenting with symptoms of nasopharyngeal obstruction. Further studies using analytical designs, such as case-control or cohort studies, are needed to evaluate the relationships between these factors and adenoid hypertrophy. Future research

may also incorporate laboratory examinations or inflammatory biomarkers to provide a more comprehensive understanding of the biological mechanisms underlying the relationships between associated factors and adenoid hypertrophy.

CONCLUSION

The associated factors identified among children with adenoid hypertrophy at Prof. Dr. Margono Soekarjo Hospital were categorized into patients with one factor and those with two factors. The factors identified included allergic rhinitis, recurrent upper respiratory tract infection, dental abscess, congenital CMV infection, and atopic dermatitis. Some patients had two associated factors, including Down syndrome with recurrent upper respiratory tract infection, atopic dermatitis with recurrent upper respiratory tract infection, asthma with recurrent upper respiratory tract infection, and congenital CMV infection with recurrent upper respiratory tract infection.

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