Chronic suppurative otitis media and immunocompromised status in paediatric patients

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ABSTRACT

Introduction: The role of immunodeficiency in the development of chronic suppurative otitis media (CSOM), especially in paediatric populations, have yet to be fully elucidated. The purposesof this study is to investigate the association between immunocompromised status and CSOM among paediatric population in a tertiary hospital in Indonesia.

Materials and Methods: A cross-sectional study was performed by retrieving medical records of paediatric patients, with and without CSOM (age 0–18 years), visiting otorhinolaryngology (ENT-HNS) outpatient clinic in a tertiary hospital in Indonesia (2018-2020). We collected data on comorbidities causing immunosuppression such as HIV status, tuberculosis, and cancer.

Results: Among the 1018 included patients (50 immunocompromised children), HIV infection was the most common cause of immunodeficiency in the CSOM group (24 patients, 60%), and cancer in the non-CSOM group (10 patients, 100%). We found a significant association between immunocompromised hosts and CSOM (odds ratio 19.5 [95% confidence interval: 9.5–39.9], p<0.001).

Conclusion: Immunocompromised children with HIV, tuberculosis, or cancer may be more vulnerable to CSOM. Further research is required to explore the association between other immunocompromised conditions and CSOM in paediatric populations.

KEYWORDS:
Chronic suppurative otitis media, HIV, immunocompromised host, paediatrics, tuberculosis

INTRODUCTION

Chronic suppurative otitis media (CSOM), characterized by a persistent or intermittent discharge from the middle ear through perforated tympanic membrane, is a major cause of acquired hearing loss in children, afflicting more than half of the affected children. It is estimated that developing countries account for 90% of the global burden of CSOM, especially in Southeast Asia. Several factors may predispose children to CSOM, including poor living conditions, sanitation, and hygiene, as well as frequent and improper treatment of upper respiratory tract infections.[1] While immunocompromised patients are believed to be more vulnerable to chronic infections, the role of immunocompromised hosts either due to primary immunodeficiency, systemic comorbidities (e.g., HIV infection, cancer, diabetes, malnutrition), or immunosuppressive therapies, in the development of CSOM has yet to be fully understood.[2] Therefore, this study aims to explore the comorbidities causing immunocompromised state and investigate the association between immunocompromised status and CSOM among paediatric population in a tertiary hospital in Indonesia.

MATERIALS AND METHODS

A cross-sectional study was conducted by reviewing medical records of paediatric patients visiting the ENT-HNS outpatient clinic in a tertiary hospital in Indonesia between 2018 and 2020. The study protocol has been approved by the Health Research Ethics Committee, Faculty of Medicine Universitas Indonesia and Cipto Mangunkusumo National General Hospital (protocol number: 21-04-0376).

All paediatric patients aged between 0 and 18 years presenting to our outpatient clinic with CSOM or non-CSOM were included in the present study. CSOM was defined as a chronic ear infection characterized by a history of ear discharge lasting for more than two months and tympanic membrane perforation found on otoscopic examination. All types of CSOM such as tubotympanic (CSOM without cholesteatoma/safe type) and atticoantral (CSOM with cholesteatoma/dangerous type) were included in this study. Patients without any presence of tympanic membrane perforation were included in non-CSOM group. Data on the immune status of the patients were collected based on the diagnosis in the medical record. The immunocompromised status of the patients was categorized based on the comorbidity into tuberculosis, HIV infection, and cancer. The diagnosis of tuberculosis was based on the Indonesian National Guidelines of Tuberculosis,[3] and the diagnosis of HIV infection based on reactive immunoserological anti-HIV assays. All patients were included regardless on the disease type, disease status (e.g., WHO clinical stage or CD4 counts in HIV-infected patients, active or latent tuberculosis cases, or cancer stage), and treatment received. Due to data limitations, we were unable to record HIV markers such as CD4 counts and viral loads, as well as other immunocompromised conditions including primary immunodeficiency diseases, patients receiving

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Table I: Subject characteristics

Characteristics	Patients (n=1018)	%
Gender		
Male	583	57.3
Female	435	42.7
Age (years)		
0-5	711	69.8
>5-10	183	18.0
>10-15	89	8.7
>15-18	35	3.4
Non-CSOM	817	80.3
CSOM	201	19.7
Non-Immunocompromised	968	95.1
Immunocompromised	50	4.9

CSOM, chronic suppurative otitis media

Table II: Characteristics of immunocompromised patients

Comorbidity	CSOM	Non-CSOM	Total
HIV	24	0	24
Tuberculosis	6	0	6
Cancer	10	10	20
Total	40	10	50

CSOM, chronic suppurative otitis media; HIV, human immunodeficiency virus

Table III: Association between immunocompromised hosts and CSOM in the study population

	Non-immunocompromised	Immunocompromised	Total	*p* value	OR	CI 95%
Non-CSOM	807	10	817	<0.001[a]	19.5	9.5-39.9
CSOM	161	40	201			
Total	968	50	1018			

[a]Chi-square, statistically significant. CI, confidence interval; CSOM, chronic suppurative otitis media; OR, odds ratio

immunosuppressive therapy, organ recipients, malnutrition, and hematological diseases. All data were collected and analyzed using SPSS 23.0 (SPSS Inc., Chicago, IL).

RESULTS

A total of 1018 patients participated in this study (583 boys [57.3%] and 435 girls [42.7%]). More than half of the patients were aged between 0 and 5 years (69.8%), while only 3.4% were aged between 15 and 18 years (Table 1). During the study period, 201 CSOM patients (19.7%) and 817 non-CSOM patients (80.3%) visited our clinic (Table I). About 50 patients were immunocompromised (40 in the CSOM group and 10 in the non-CSOM group; Table II). Among the 40 immunocompromised children in the CSOM group, HIV infection was the most common cause of immunodeficiency (60.0%), followed by cancer (25.0%) and tuberculosis (15.0%). Meanwhile, all immunocompromised children in the non-CSOM group suffered from cancer. We found that an immunocompromised state was associated with a higher odd of CSOM (OR 19.5 [95% CI: 9.5–39.9]; p<0.001; Table III).

DISCUSSION

CSOM is a multifactorial disease involving complex interactions between the hosts, bacterial agents, and environmental factors. The present cross-sectional study sheds light on the role of immunity on the development of CSOM in paediatric patients, where immunocompromised children were found to be more vulnerable to CSOM. This indicates that both innate and adaptive immune system plays a vital role in the defense against CSOM pathogens.[4] In immunocompromised hosts, the innate and adaptive immune systems are unable to exert immune response against pathogens, resulting in pathogen escape and replication.[5]

In the present study, we found that more than half of the immunocompromised children in the CSOM group suffered from HIV infection. Our findings further reinforced Indonesia's position as one of the hotspots for HIV in the region, afflicting about 3200 children in 2020 alone.[6] Such condition may result from the destruction of CD4+ T cells by the HIV, thus resulting in diminished functional ability of CD4+ T cells to respond to infections leading to the acquisition of opportunistic infections including CSOM. Therefore, early detection and prompt antiretroviral treatment in these populations are paramount in preventing the development of opportunistic infections. In this regard, Hallbauer et al. suggest that patients presenting with chronic otorrhea should be evaluated for HIV and be promptly treated with antiretroviral therapy.[7]

Other comorbidities causing immunosuppression observed in our CSOM cohort were cancer and tuberculosis. Immunodeficiency in cancer may result directly from the invasion of the cancer cells to the bone marrow–halting the production and development of white blood cells[8], and indirectly from immunosuppressive therapies.[9] Meanwhile, immunosuppression in tuberculosis is mediated by immune

dysregulation involving regulatory T cells.[10] Altogether, these indicate that immunocompromised children with HIV infection, cancer, or tuberculosis should be closely monitored to prevent the occurrence of chronic infections including CSOM, which may result in debilitating complications leading to morbidity and poor quality of life.

This study is limited by the fact that other immunocompromised conditions such as primary immunodeficiency diseases, patients receiving immunosuppressive therapy, organ recipients, malnutrition, and hematological diseases were not considered due to data limitations. In addition, the cross-sectional design implies that causations between variables could not be explained. Further large, high-quality studies exploring the role of other immunocompromised conditions in the development of CSOM in paediatric populations are warranted.

CONCLUSION

In conclusion, our findings indicate that immunocompromised children with HIV, tuberculosis, or cancer may be at a higher odd of developing CSOM, suggesting that these populations should be closely monitored to prevent potential debilitating complications. Further research exploring the association between other immunocompromised conditions and CSOM in paediatric populations are warranted.

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