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The Epidemiologic and Sociodemographic Features of Superficial Fungal Infection Among Children in East Java Suburban Public Hospital

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ABSTRACT

Background: Superficial fungal infection is a common skin disease among children, causing morbidity and reducing quality of life**.** The disease's prevalence and etiological agents change with geographic area, age, humidity, and sex. The data on this matter is still limited in Indonesia. **Purpose:** To determine the current epidemiologic and sociodemographic features of superficial fungal infection among children. **Methods:** This descriptive study examined all the pediatric inpatients and outpatients at the Department of Dermatology and Venerology of East Java suburban Public Hospital in Indonesia from 2016 to 2020 who met the inclusion criteria. **Result:** From 2016 to 2020, the number of fungal infection patients was 12.3% (n = 175) among 1,427 dermatology patients. Pityriasis versicolor (PVC) is the most common fungal skin disease (4.1%), followed by tinea capitis (2.2%), tinea cruris (1.6%), and tinea corporis (1.4%). Subjects aged 6 to 12 years old were the most likely to be infected with a fungus. Boys were more likely to develop this infection. **Conclusion**: From 2017 to 2020, there was a downward trend in children's superficial fungal infections. Pityriasis versicolor (PVC) is a fungal skin ailment that cause the most cases compared to other fungal infections. Boys and children between the ages of 6 to 12 years old were the most susceptible to fungal infection.

Keywords: *skin infection, pediatric, childhood, fungal infection*.

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INTRODUCTION

Superficial fungal infections came from both dermatophytes genera (*Microsporum*, *Trichophyton*, and *Epidermophyton*) and non-dermatophytes (pityriasis versicolor, cutaneous candidiasis, tinea nigra, black piedra, and white piedra).[1] Dermatophyte relies on keratin, a protein found in skin, hair, and nails.[2] Tinea infections are named after the latin names of the anatomical sites of infection, such as tinea capitis (scalp), tinea corporis (body), tinea manuum (hand), tinea cruris (groin), tinea pedis (foot) and tinea unguinum (onychomycosis) (nail).[3] According to a couple studies, the disease affects roughly 20% to 25% of people worldwide.[4,5] Another study stated that dermatophytes at least infect 10-15% of the human population once in their lives.[6] On the other hand, pityriasis versicolor and candidiasis are the two commonest non-dermatophytes caused by *Malassezia furfur* and *Candida* spp, respectively. Different from tinea, *Candida* spp. can also attack the mucosa.[7,8] The disease is quite frequent in kids, with tinea capitis being the most common superficial fungal infection among children in primary school, besides superficial skin infections caused by pediculosis.[4,9] School-age children are predisposed to fungal infections due to poor personal cleanliness, frequent human interaction, poor environmental sanitation, overcrowding, and low socioeconomic condition.[4] Furthermore, the warm and humid climate exacerbates the fungal growth.[10] Tinea capitis and tinea corporis are the most prevalent in prepubescent children. Meanwhile, tinea pedis, tinea cruris, and tinea unguium (onychomycosis) are more common in adolescents.[11] According to studies from East and Southern Africa, the prevalence of superficial

skin fungal infections among kids in impoverished nations ranges from 20%-90%.[12] Among all pediatric skin disorders, 7-15% are superficial fungal infections.[13]

Superficial fungal skin disease causes morbidity and lower the quality of life of those affected, resulting in a serious public health issue that leads to low school attendance among schoolchildren in low- and middle-income nations.[4] Superficial fungal skin disease causes morbidity and lower the quality of life of those affected, resulting in serious public health issue that leads to low school attendance among schoolchildren in low- and middle-income nations. In a single study, children with tinea capitis have a lower quality of life.[14] Indonesia is still burdened by skin diseases.[15] Therefore, there are several studies conducted regarding superficial fungal infection in Indonesia. However, almost all of them are limited to their hospital area and are not up to date.[16] Furthermore, it has been proven that the prevalence and etiological agents change with geographic zone, age, humidity, and sex from time to time.[4,5,13,17] It is critical to understand the current epidemiological condition of superficial fungal infection in children, especially in terms of sociodemographic characteristics. Thus, this study was performed to determine the current epidemiologic and sociodemographic features of superficial fungal infection among children in a public hospital in Ponorogo, suburban area of East Java, Indonesia.

METHODS

This study was a descriptive study using a retrospective method conducted at the East Java suburban Public Hospital, Indonesia. The study population was all inpatients and outpatients treated in the Dermatology and Venereology Department. The data was secondary obtained from medical records from January 1, 2016, to December 31, 2020.

The data collected included the patients' diagnosis, age, and gender. The inclusion criteria used in this study were <18 years old with a diagnosis of superficial fungal infection based on history taking, physical examination, and KOH examination. Exclusion criteria were incomplete data, including patient and diagnosis data. The collected data were then entered into a Spreadsheet Excel, and grouped based on diagnosis. The information has been grouped into tables according to the diagnosis, then analyzed descriptively and sorted based on the most frequent diagnoses. The study protocol has been approved by the Health Research Ethics Committee of Dr. Harjono S. Ponorogo General Hospital (Ref: 352021K1114 62021110600001/ XI/ KEPK/ 2021).

Table 1. The prevalence of superficial fungal infection among all children

Disease	Year					Total (%) (N= 1.427)
	2016 (%) (N= 315)	2017 (%) (N= 433)	2018 (%) (N= 332)	2019 (%) (N= 242)	2020 (%) (N= 105)	
Candidiasis	4 (0.3)	7 (0.5)	2 (0.1)	2 (0.1)	1 (0.1)	16 (1.1)
Pityriasis versicolor	22 (1.5)	18 (1.3)	9 (0.6)	8 (0.6)	2 (0.1)	59 (4.1)
Tinea corporis	6 (0.4)	10 (0.6)	4 (0.3)	1 (0.1)	0 (0.0)	21 (1.4)
Tinea capitis	4 (0.3)	5 (0.4)	8 (0.6)	9 (0.6)	5 (0.4)	31 (2.2)
Tinea cruris	6 (0.4)	7 (0.5)	6 (0.4)	0 (0.0)	4 (0.3)	23 (1.6)
Tinea pedis	0 (0.0)	2 (0.1)	2 (0.1)	2 (0.1)	3 (0.2)	9 (0.6)
Tinea facialis	3 (0.2)	7 (0.5)	3 (0.2)	1 (0.1)	1 (0.1)	15 (1.1)
Tinea manuum	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Tinea pedis	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)
Total	45 (3.2)	57 (4.0)	34 (2.4)	23 (1.6)	16 (1.1)	175 (12.3)

N : number of patients with skin disease

Table 2. Superficial fungal infection among children according to age

Age group	Total (%)
1-29 day	6 (3.4)
1-24 month	20 (11.4)
3-5 year	37 (21.1)
6-12 year	59 (33.7)
≥ 13 year	53 (30.3)

Note: Age chategorized according to Kail (2015)[18]

Table 3. Superficial fungal infection among children according to sex

Sex	Total (%)
Male	105 (60.0)
Female	70 (40.0)

RESULT

From 2016 to 2020, fungal infection accounts for 12.3% (n = 175) of 1,427 patients with skin diseases. The fungal infection increased from 2016 to 2017, but it continued to decrease until 2020. The most common fungal skin disease type was pityriasis versicolor (PVC) (4.1%), followed by tinea capitis (2.2%), tinea cruris (1.6%), and tinea corporis (1.4%) (Table 1). The result showed that between 2016 and 2020, the most fungal skin diseases affected 6-12-year-old patients (33.7%). Meanwhile, patients with age ≥13 years old (30.3%) and 2-5 years old (21.1%) were the second and third patients with the most fungal skin infections (Table 2). Furthermore, more male patients were infected with fungal skin diseases (60.0%) compared to females (40.0%) from 2016 to 2020 (Table 3).

DISCUSSION

Fungal infection constitutes 12.3% of patients with skin disorders in this study. The fungal infection amongst others varies depending on each study, including Sheiladji and Zulkarnain in 2016 (8.13%), Lopez *et al.* in 2020 (25.61%), Kiprono *et al.* in 2015 (22.6%),Vakirlis *et al.* in 2017 (2.4%), and García *et al.* in 2020 (0.9%).[14,17-20]

The decreasing trend of superficial fungal infections from 2017 to 2020 probably results from the gradual establishment of national health insurance, which is mandatory for all Indonesian residents. The national health insurance had a particular scheme where a patient with certain diseases had to be successfully treated in a primary health facility. If there are complications or the disorders are classified as referable ones, the doctor can refer the patient to secondary or tertiary healthcare facility. There is a high probability that most superficial fungal infection patients could be successfully treated in primary healthcare.[16]

Pityriasis versicolor appeared as a fungal skin disease with the most cases out of other types of fungal infection (4.1%), followed by tinea capitis (2.2%), tinea cruris (1.6%), and tinea corporis (1.4%). Similarly, Yotsu *et al.* (2018) and Fulgence *et al.* (2013) found PVC as the most common fungal infection in children.[20,21] Another study conducted in the Indonesian population found PVC to be the most frequent etiology (28.3%).[16] Many prior studies either showed a low prevalence of PVC or did not include it as a diagnosis, owing to the condition's minor symptoms.[5,20,22] There was a slight difference with Oke *et al.* (2014), who reported tinea capitis as the most frequent infection, with a prevalence of 26.9%, followed by PVC (4.4%)[5] As observed by Kipronoet al (2015) Tinea capitis was also the pediatric skin fungal disease who appeared the most.[23] Haircuts at local barbers, poor personal hygiene, short hair that favors transmission from one scalp to the other, and increasing frequent interaction with playmates at school and younger siblings at home could account for the prevalence of tinea capitis among children.[5]

Furthermore, most fungal skin diseases affect 6-12-year-old patients (33.7%). Meanwhile, patients aged ≥13 years old (30.3%) and 2-5 years old (21.1%) are the second and most of infections patients with most fungal skin infections. There is a slight difference with Fulgence *et al.* (2013), who found that tinea capitis was the most common in youngsters aged 9-12 years old. Children in these age groups are the most energetic, particularly in playgrounds, and are thus more prone to contact with fungal pathogens.[21] On the other hand, Lopez *et al.* (2020) reported most fungal infections occurred in 5-9-year-old children.[24] Slightly different, Sheiladji and Zulkarnain (2016) discovered that 5-14-year-old children suffered the most in skin fungal infection.[16] Yotsu *et al.* (2018) discovered that younger children had a higher prevalence of tinea capitis, a disorder that heals naturally with age. On the other hand, older children showed a higher prevalence of pityriasis versicolor, a surface fungal illness caused by *Malassezia* yeasts, which are predominantly lipophilic. Because skin lipid secretion rises with age, older children are more susceptible to this infection, while the opposite is true for tinea capitis susceptibility.[20] Unfortunately, this study did not mention the cut-off age between the older and younger children.

From 2016 to 2020, there were more male patients affected fungal skin diseases (60.0%) than females (40.0%). Another study conducted in Indonesia by Sheiladji and Zulkarnain (2016) reported that boys are more likely to suffer from superficial fungal infection among children (56.8%) than girls (43.1%).[16] This finding is also in line with Oke *et al.* (2014) and Yotsu *et al.* (2018), who found fungal skin infections were significantly more common in men than women.[5,20] It is uncertain how gender influences susceptibility to fungal infections. However, this might be attributed to boy's closely cut hair and more intense personal contact with each other, such as during play and visiting the barbershop, encouraging transmission.[20] Boys are less interested in personal hygiene and grooming.[5] Boys also tend to have a higher metabolism than girls, resulting in excessive sweating.[16] All of those factors can increase the likelihood of fungal growth.

The limitation of this study is the difficulty to count the prevalence of each type of superficial fungal infection among children. It is difficult to identify the

entire population of pediatric patients. This study did not include the distribution of dermatophyte isolates according to age and gender grouping and the clinical pattern of superficial skin infections. Future research may be able to correct the shortcomings of this study.

There was a decreasing trend of superficial fungal infections in children from 2017 to 2020. The most common type of superficial fungal infection among children is pityriasis versicolor. This disease is more frequent in 6-to 12-year-old male patients.

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