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Prevalence and Identification of Scalp Fungal Infections in Primary School Pupils

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Abstract: **Background**

Dermatophytes, a group of fungi, are known to infect keratinized tissues in humans and animals, causing dermatophytosis. These infections, especially in the scalp, can result in various clinical symptoms, impacting the health and well-being of individuals, particularly primary school pupils. Understanding the fungal species responsible for such infections is crucial for effective management and prevention

Purpose

This study aimed to investigate the prevalence of fungal and yeast species causing scalp infections in primary school pupils and identify the specific species responsible for these infections. By understanding the types of fungi involved, we can better inform strategies for early diagnosis, treatment, and prevention

Methods

A total of 60 hair samples were collected from primary school pupils aged 8 to 11 in Shatrah district, Al-Shatra city. These samples were carefully processed and analyzed in a microbiology laboratory using standard techniques. Fungal species were identified based on cultural and morphological characteristics, and taxonomic keys from various references were employed to ensure accurate classification

Results

The research identified 25 fungal species belonging to 24 genera. Notably, Aspergillus was found to be the most prevalent species, followed by Penicillium and several others. The study revealed variations in fungal prevalence between male and female pupils, with implications for personal hygiene and environmental factors contributing to the differences

Implications for Practice

Understanding the prevalence of scalp fungal infections and the specific species involved is essential for health practitioners, school authorities, and parents. This knowledge can inform proactive measures to prevent the spread of these infections, such as improving personal hygiene and minimizing contact with animals and soil. Early diagnosis and appropriate treatment can reduce the impact of these infections on the affected pupils.

Key points: Scalp fungal infections, dermatophytes, prevalence, primary school pupils, Aspergillus, Penicillium, prevention, early diagnosis, personal hygiene, environmental factors.

Introduction

Dermatophytes, a group of pathogenic fungi, possess the unique ability to invade keratinized tissues, affecting both humans and animals. This condition, known as dermatophytosis, is

characterized by infections in various keratin-rich structures such as hair, skin, and nails. Dermatophytes belong to three primary genera, namely Trichophyton, Microsporum (which includes Epidermophyton), and Jochen & Yvonne (2005). The impact of these fungi on human and animal health is a subject of paramount importance, and understanding their prevalence and characteristics is essential for effective diagnosis, treatment, and prevention.

Skin fungi are categorized based on their preferred habitat, which can be broadly classified into three main types: anthropophilic skin fungi, zoophilic skin fungi, and geophilic dermatophytes. Anthropophilic fungi predominantly target humans as their natural hosts and are capable of human-to-human transmission, although transmission to animals is rare. Notable examples include T. rubrum, E. floccosum, and T. tonsurans. Zoophilic skin fungi primarily target animals as their primary hosts but have the capacity to infect humans. This category includes fungi such as M. canis and T. mentagrophytes. On the other hand, geophilic dermatophytes are commonly found in soil and can infect both humans and animals, including species like M. gypseum and T. ajelloi. These distinctions provide critical insights into the sources and modes of transmission of dermatophyte infections.

Cutaneous mycoses, or cutaneous fungal infections, are characterized by infections that affect the epidermal layer and its appendices, particularly leading to dermatophytosis. This condition is primarily caused by species within the Trichophyton, Microsporum, and Epidermophyton genera, as well as cutaneous candidiasis caused by Candida albicans and other Candida species. One of the distinguishing features of these infections is the presence of acute inflammatory reactions to the presence of these microorganisms, which can result in various clinical symptoms. Understanding the taxonomy, biology, and behavior of dermatophytes is crucial for effective management and control of these fungal skin diseases, collectively known as ringworm or tinea.

The historical connotation of dermatophytes, which translates to "plant skin," underscores their parasitic nature, as these fungi colonize keratinized tissues, including hair, skin, and nails, causing a spectrum of fungal skin diseases. This field of study holds profound implications for human and animal health, and its significance has been recognized by researchers and experts in the field (Ajello & Matsumoto, 1987). This study delves into the prevalence and identification of scalp fungal infections in primary school pupils, shedding light on the diversity of dermatophytes and their impact on this specific population.

Sample Handling

The hair samples were collected using specialized nylon bags designed for the secure and sterile collection of dry specimens. These bags ensured the preservation of sample integrity during transportation and laboratory processing

Laboratory Analysis

Following the collection of hair samples, all specimens were carefully transported to the microbiology laboratory located within the College of Education for Girls. In the laboratory, stringent protocols and standard techniques were followed to process and analyze the collected hair samples. These procedures were conducted to ensure the accurate and reliable identification of fungal species responsible for scalp infections among the primary school pupils

Identification and Purification of Fungi

To facilitate the accurate identification and classification of the isolated fungi, a systematic process was employed. Three days after the samples were sown, daily observations of the culture dishes were conducted over a three-week period. The diagnosis of fungal species was carried out within a laboratory setting, primarily relying on the cultural and morphological characteristics of the fungi. This involved the use of clean glass slides coated with Lacto phenol cotton blue dye, and, in certain instances, a %0.1hydroxypotassium solution was employed. The examination was performed using lenses with magnification powers of 10x and 40x.

In accordance with established taxonomic keys found in reputable references such as Ellis (1980), Mc Ginnis (2002), Ellis (1995), and Dehoog and Guarro (1971), the identification process was guided. These references provided essential criteria for confirming the identity of the fungal species under examination.

For the purpose of fungal purification, portions of the isolated fungal colonies were transferred to slanted media. Subsequently, these cultures were incubated at a controlled temperature of 25 degrees Celsius. Once observable growth became evident in these cultures, they were securely stored in a refrigerator at a temperature range of 6-4degrees Celsius. This safeguarded their integrity until they were subjected to detailed microscopic examination, a critical step in the accurate identification of the fungal species

Table 1: Identified Fungal Species

No.	Species	Genus
1	Penicillium spp.	Penicillium
2	Saccharomyces spp.	Saccharomyces
3	Gliocladium spp.	Gliocladium
4	Hormodendrum spp.	Hormodendrum
5	Rhodotorula spp	Rhodotorula
6	Sepedonium spp	Sepedonium
7	Aspergillus niger	Aspergillus
8	Microsporum distortum	Microsporum
9	Rhizopus spp.	Rhizopus
10	Blastomyces dermatitidis	Blastomyces
11	Epidermophyton floccosum	Epidermophyton
12	S.Schenckii	Sporothrix
13	Sporangiophore	Sporangiophore
14	Pullularia (Aureobasidium)	Pullularia (Aureobasidium)
15	Coccidioides immitis	Coccidioides
16	Alternaria spp.	Alternaria
17	Bipolaris spp.	Bipolaris
18	Microsporum gypsum, M. canis	Microsporum
19	Verticillum spp.	Verticillum
20	Sporobolomyces	Sporobolomyces
21	Geotrichum spp.	Geotrichum
22	Candida albicans	Candida
23	Zygomycetes spp.	Zygomycetes
24	H. werneckii	Hortaea
25	Scopulariopsis spp.	Scopulariopsis

Discussion:

The findings of this study, which involved the analysis of 60 hair samples from primary school pupils in the city of Shatrah, have provided valuable insights into the prevalence and diversity of fungal infections affecting the scalp. The identification of 25 distinct fungal species spanning 24 genera underscores the complex nature of these infections. Notably, the genus Aspergillus emerged as the most widespread fungal species in the studied population, consistent with the observations of many researchers in various regions.

The presence of animal-loving dermatophyte species, such as T. verrucosum, T. mentagrophytes, and M. canis, in the samples suggests a significant level of direct contact between the affected children and animals, including cattle, cats, and dogs. These dermatophytes are known for their zoonotic potential, emphasizing the importance of understanding the sources of infection and potential transmission routes (Emmons et al., 1974).

The isolation of the fungus M. gypseum, a soil-loving dermatophyte, further suggests that the children in this study have substantial contact with soil. Such interactions can expose individuals to fungal pathogens present in the environment (Hilda & Ramesh, 1998). The combination of factors contributing to increased fungal infections among male children, including prolonged sun exposure, increased sweating, and clothing choices that may raise body temperature and humidity, underscores the influence of environmental conditions on these infections (Beena & Summan, 2003).

Moreover, playing with animals and in soil environments, where fungal species can thrive, serves as a potential source of infection (Hilda, 1998 & Ramesh). Additionally, the low living standards and inadequate attention to personal hygiene in some instances contribute to the heightened incidence of fungal infections (Ranganathan et al., 1995).

Scalp fungal infections can manifest with a range of clinical symptoms depending on the type of pathogenic fungus involved and the specific area of infection. Common manifestations include itching, skin scaling, and hair loss. Tinea capitis, which is characterized by fungal infection in the scalp and hair roots, is highly contagious and prevalent among young boys and school students. Notably, dermatophytes are known to be responsible for tinea capitis. In some cases, severe forms of tinea capitis known as kerion may develop, characterized by the appearance of yellow cysts that exude purulent fluid and lead to the formation of a yellowish rash layer on the scalp skin. This condition is associated with significant hair loss, and the hair in the affected area may be easily pulled out. Prolonged inflammation in the scalp can result in scarring and permanent baldness, highlighting the importance of early and accurate diagnosis to differentiate scalp fungal infections from other conditions with similar symptoms.

In conclusion, the results of this study shed light on the multifaceted nature of scalp fungal infections among primary school pupils, emphasizing the importance of considering environmental factors, personal hygiene, and zoonotic sources of infection in preventive strategies and healthcare interventions. Effective management and early diagnosis of these infections are critical to minimize their impact on affected individuals and reduce the risk of transmission within the school community.

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