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Article

An Overview of Fungal Infection Prevalence in Diwaniyah City, Iraq

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Abstract: In this study highlight on fungal infection as a pointedly growing shift in fungal infections has been ongoing. Isolation and identification results relived that from 300 specimens obtunded from patients with different infection, which identified fungal infections (68.5%) as the predominant etiology, followed by bacterial infections (25.5%), and mixed bacterial-fungal infections (18,6.0%).distribution of fungal pathogens reveals Microsporum spp. (43.6%) and Trichophyton spp. (42.2%) dominating the spectrum, collectively accounting for nearly 90% of cases, while Aspergillus niger (5.3%) and Coccidioides immitis (4.8%) .these finding confirmed that mycosis or fungal infection A major contributor to infectious diseases.

Keywords: Fungal infection, mycosis, pulmonary mycotic infection, skin infection.

1. Introduction

In the past, compared to other bacterial and viral pathogens, fungal infections were thought to be a rather rare cause of clinically significant illness. [1]. Following improvements in medical care and the HIV/AIDS pandemic, this trend changed in the second half of the 20th century as the number of immunocompromised patients vulnerable to opportunistic fungal infections rose. [2,3]. Previously thought to be uncommon sources of infection, fungi like Cryptococcus species have become significant contributors to invasive disease in hosts with compromised immune systems. [4]. These opportunistic fungal infections led to a rise in morbidity and mortality, significant difficulties in diagnosing and treating illnesses, and heightened epidemiologic awareness of fungal diseases. [5,6].

The range of fungi that have been found to cause human illness and the range of clinical manifestations linked to these infections have grown during the last ten years. HIV-associated cases of Cryptococcosis and other opportunistic fungal infections decreased as antiretroviral therapy (ART) advanced. However, illnesses brought on by fungal pathogens linked to healthcare, such as Candida species, Aspergillus species, and other molds, increased, largely as a result of significant increases in at-risk populations. [7,8,9]. While human-to-human transmission was uncommon in the past, with only occasional reports of fungal outbreaks, patient-to-patient transmission of some fungi has become more common in clinical settings, leading to a number of outbreaks related to healthcare. [10,11]. therefore, the aim of the study was to describe the epidemiology of fungal infections in Diwaniyah city \Iraq and appear the important these infections that increased during recent years

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2. Materials and Methods

Media

Sabouraud Dextrose Agar (SDA) the medium was used in cultivation of specimens which prepared according the manufacture company.

Collection of specimens

Thirteen hundred patient's specimens were gathered for this study (male, female) from the age 6 to 85 years' old who suffered from different disease, these including (sputum, swab, skin infection, and pulmonary infection), distributed between (115 from the scarping, 10 from ear, ,55 swab, 80 from sputum and 40 fluids These specimens from the medical site, such as Teaching Hospital in Diwaniyah, Outpatient clinics, during the periods (December 2023 – December 2024).

Skin scrapings, and hair were collected aseptically. The affected area was cleaned with 70% ethyl alcohol to remove dirt and environmental contaminants, such as bacteria, and allowed to dry completely. The periphery of the infection was scraped with a sterile scalpel to obtain the skin sample, while hair samples were collected using sterile scissors. The samples were placed on folded paper to prevent bacterial contamination by keeping the specimens dry. The paper was then folded and secured with a paper clip [12].

Direct examination

The diagnosis of infection is based on the demonstration of fungal components (branching and septate hyphae and spore) by direct microscopic inspection of the hair and skin and KOH (potassium hydroxide) mounting. The specimens were put on a clean slide flooded with drops of 10 % KOH warmed for 5 minutes, after which the slide was covered with cover slip was positioned and viewed under a low (10X) and high (40X) magnification microscope. [13].

Cultivation of fungal

The standard medium for the isolation of the human pathogenic fungi from clinical specimens is Sabouraud Dextrose Agar (SDA) with 250 mg/l chloramphenicol to suppress the development of rapidly dividing bacteria. each specimen was incubated at 25 and 37℃. Cultures were firstly examined after 7 days, then twice weekly for at least 3-4weeks before being considered negative [14].

The colony character, growth rate, surface and reverse color, and colony uniformity were all examined under the microscope. Originally, lacto phenol cotton blue was utilized for microscopic examination of positive fungal colonies [15,16].

3. Results and Discussion

From total of 300 clinical Specimen, were collected from suffered from different disease including (sputum, swab, scraping, hair and pulmonary), distributed between (115 from the skin infection, 10 from external ear infection, ,55 from Diabetic foot 120 from pulmonary infection, see Figure 1. The predominance of cutaneous specimens may be attributed to the high prevalence of dermatological conditions in tropical climates and among immunocompromised populations, as noted in recent Middle Eastern epidemiological studies [17]. The collection period from December 2023 to December2024 ensured seasonal variation was accounted for, an important consideration given known fluctuations in microbial prevalence across different seasons [18]. standardized collection protocols are essential for maintaining sample integrity, particularly for diverse specimen types requiring different handling conditions. For respiratory specimens like sputum and pulmonary Specimen, immediate refrigeration at 4°C and processing within 2 hours are recommended to prevent overgrowth of commensal flora [1]. Diabetic foot swabs require special attention to anaerobic conditions, given the polymicrobial nature of these infections [19]. The inclusion of multiple collection sites (Teaching Hospital in Diwaniyah and Outpatient clinics) enhances the generalizability of findings, though potential inter-center variability in collection techniques should be considered [20].

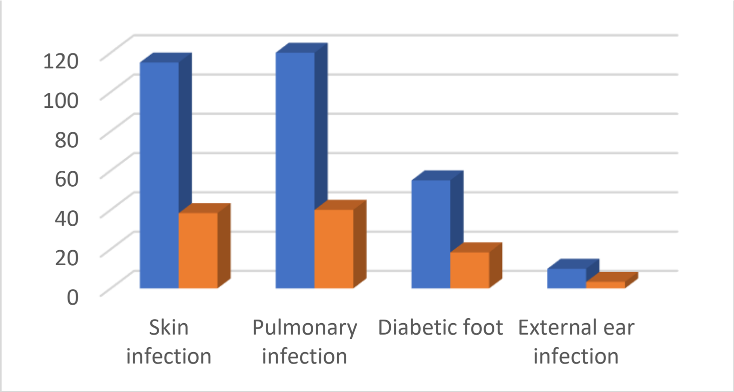


Figure 1. Distribution of patients according to site of infection
No. of specimen Percentage %

The diagnosis of causative agents in clinical infections remains a critical challenge in clinical microbiology, as evidenced by the findings of this study Figure 2, which identified fungal infections (68.5%) as the predominant etiology, followed by bacterial infections (25.5%), and mixed bacterial-fungal infections (6.0%). The high prevalence of fungal infections aligns with recent reports from tropical and subtropical regions, where environmental factors and increasing immunocompromised populations contribute to fungal pathogen emergence [21]. The relatively low percentage of mixed infections (6.0%) in this study contrasts with some hospital-based studies, possibly reflecting differences in patient populations or diagnostic sensitivity.

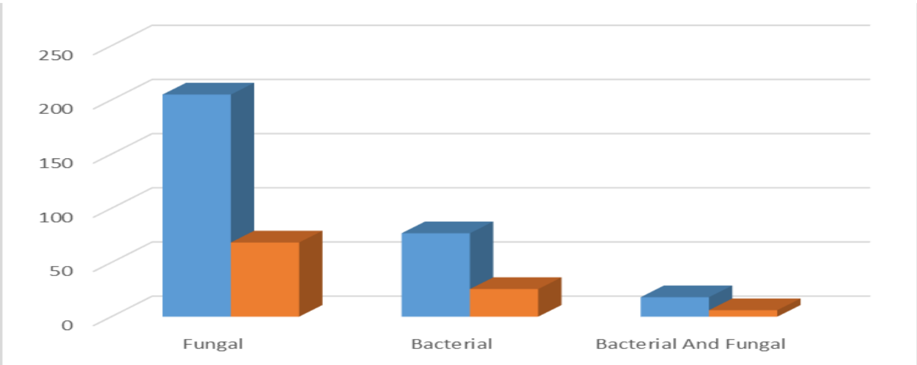


Figure 2. Frequencies of Fungal infections.
No. of specimen Percentage %

Fungal isolation

The current study included the collection of (115) specimens from patients suffering from fungal infections, including, sputum specimens (80, 26.67%), skin scrapping (75, 25.01%), hair fragments (40,3.33%), swabs from Diabetic foot (55. 18.33%), Plural specimens (40,3.33%), and Ear swabs (10, 3.33%) as in Figure 3.

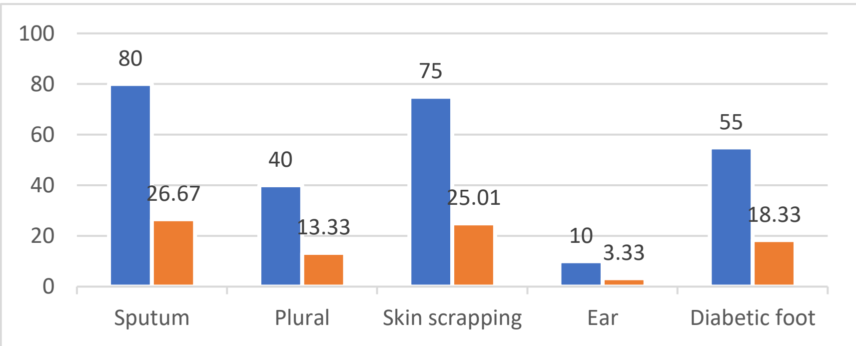


Figure 3. types and Frequencies of patient's Specimen

The frequency distribution of fungal infections presented in Figure 4, Table 1 reveals significant epidemiological patterns, with Microsporum spp. (43.6%) and Trichophyton spp. (42.2%) dominating the spectrum, collectively accounting for nearly 90% of cases, while Aspergillus niger (5.3%) and Coccidioides immitis (4.8%) represent less common but clinically significant pathogens. The high prevalence of dermatophytes (Microsporum and Trichophyton) aligns with global data from the [22]. , which identifies superficial fungal infections as the most common mycoses worldwide, particularly in tropical and subtropical regions where humidity and poor sanitation facilitate their transmission. Microsporum spp responsible for onychomycosis and athlete's foot, demonstrate increasing resistance to Terbinafine, as reported in multicenter surveys from Europe [23]. The relatively low frequency of Aspergillus niger contrasts with its prominence in hospital-acquired infections, particularly in immunocompromised hosts, where it contributes to invasive pulmonary Aspergillosis (IPA) and otomycosis; recent molecular studies highlight its resistance to amphotericin B due to upregulated efflux pumps [24].

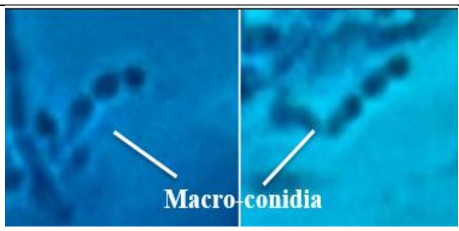
Coccidioides immitis, though rare in this dataset, remains endemic to arid regions like the southwestern United States and Central America, with climate change expanding its geographic range, as evidenced by a 300% increase in cases in Arizona over the past decade [25].

The negligible representation of Rhizopus (1.4%) may reflect under diagnosis of mucormycosis, which often presents acutely in diabetic ketoacidosis or post-COVID-19 patients, as observed during the 2021 Indian epidemic [26].

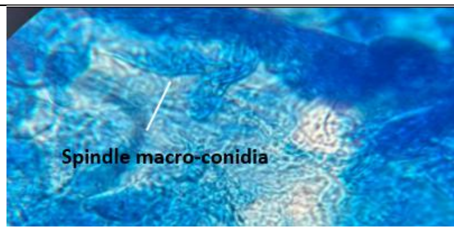
Candida albicans has emerged as a significant pathogen in diabetic foot infections (DFIs), particularly in chronic, non-healing ulcers. Recent studies report its isolation in 15–25% of microbiologically confirmed DFI cases, often as part of polymicrobial infections [27]. The fungus thrives in the glucose-rich environment of diabetic wounds, where hyperglycemia promotes biofilm formation through upregulated expression of adhesions (Hwp1, Als3) and extracellular matrix components (β-glucan, chitin) [28], [29]. Diabetic neuropathy and vascular insufficiency further exacerbate susceptibility by impairing local immune responses, allowing C. albicans to transition from commensal to invasive states, see Figure 4.

Table 1. Frequencies of Fungal species.

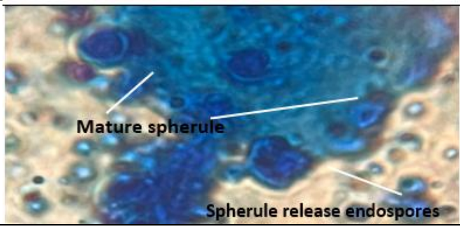
Fungal species	No.of isolates	%
Aspergillus niger	11	5.36 %
Coccidioides immitis	10	4.87%
Microsporum spp	90	43.9%
Rhizopus sp	3	1.46%
Candida albicans	3	1.46%
Trichophyton spp	88	42.95%
Total	205	100%

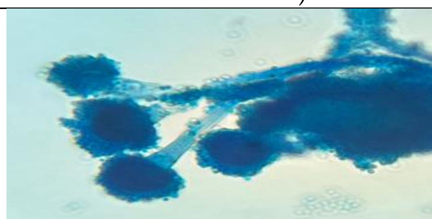


Trichophyton spp. (Lacto phenol Cotton Blue Stain 40x)



Microsporum spp.(Lacto phenol Cotton Blue Stain 40x)





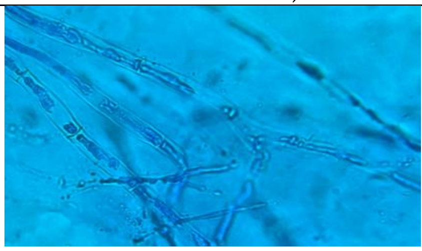
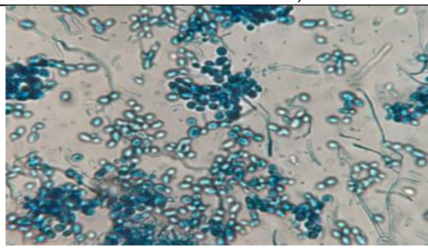
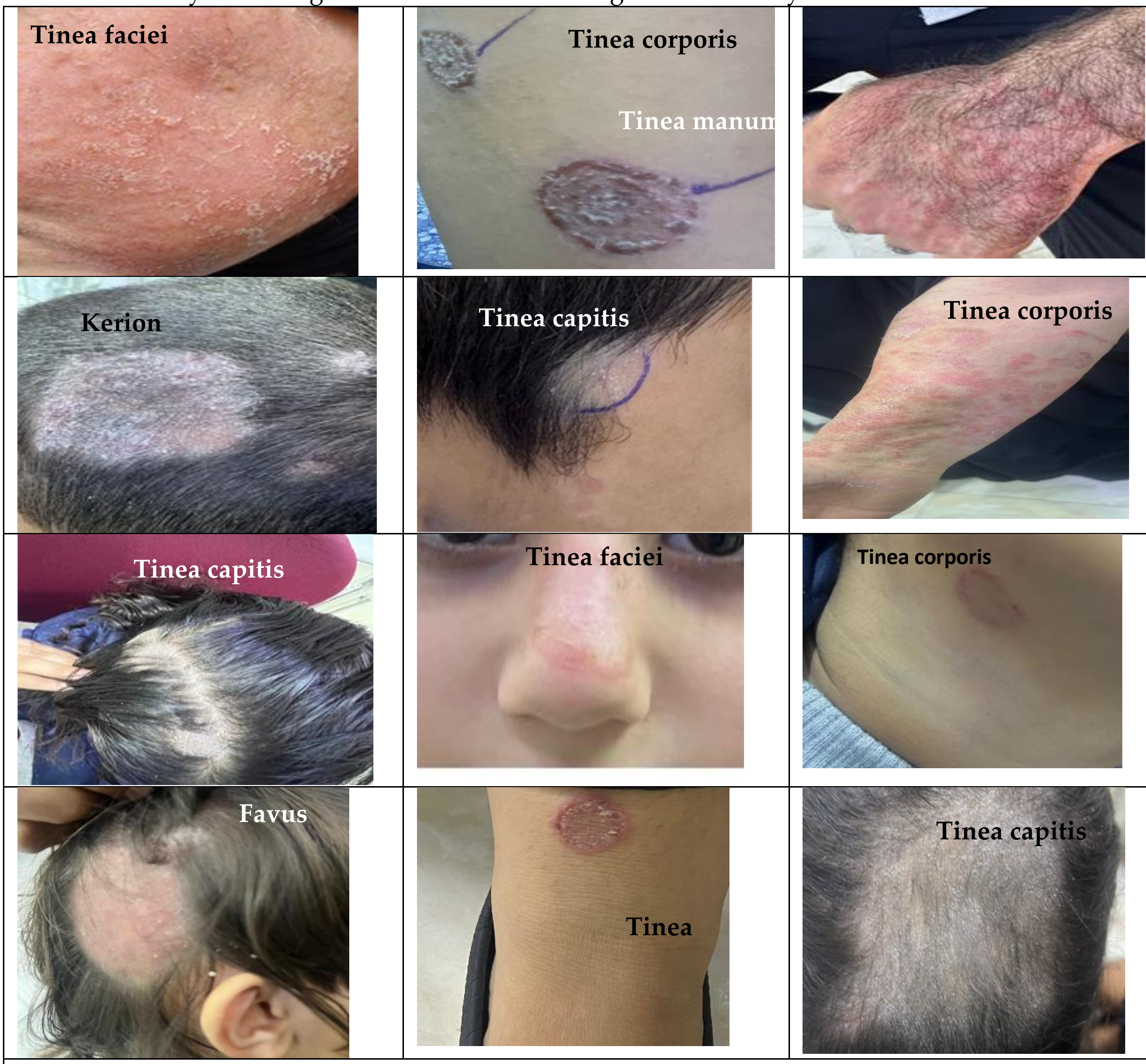
Coccidioides immitis (Lacto phenol Cotton Blue Stain 40x)	*Aspergillus niger* (Lacto phenol Cotton Blue Stain 40x)
	
Rhizopus spp. (Lacto phenol Cotton Blue Stain 40x)	*Candida albicans* (Lacto phenol Cotton Blue Stain 40x)

Figure 4. Fungal species.

Figure 5 is clinical presentations and diagnosis of fungal infections, some of which They failed to grow in vitro but were diagnosed clinically and on direct examination.



Dermatophytosis infection

Figure 5. Clinical presentations of fungal infections.

4. Conclusion

We have tried to describe and give a ballpark estimate of the size of each fungal disease in this article. To improve patient outcomes, there is a clear target to close the diagnostic gap between estimated burden and recorded case numbers. The need for public health initiatives to lower the incidence and mortality of these infectious diseases is highlighted by the realization that fungal infections are a significant cause of death for a number of conditions.

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