

Research Article

# Dermatomycoses in Pakistan; an urgent need for National Surveillance Programs

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## Abstract

Despite the rising burden of fungal infections across the globe, the World Health Organization's efforts remained questionable in fungal infection-related projects. Most of the developing countries consequently lost focus on the need for assessment and establishment of national surveillance set up or advanced technology hubs against mycological infections. The current study aimed to the determination of the local burden of cutaneous fungal infections in 2019-2021. Among 497 suspected fungal cultures, 22.5% depicted fungal growth. Among males, the prevalence of dermatomycosis was 0.75 times higher than in females. *Penicillium* species followed by *Epidermophyton* and *Candida* species were common among subjects of < 30 years of age. The *Aspergillus* spp, *Penicillium* spp, mucormycosis agents, and *Candida albicans* infections were more common among subjects 30 to 60 years of age. *Aspergillus* species were more commonly observed among patients > 60 of age. 22.2% of the fungal infections were *Penicillium* species, 9% of the infections were *Aspergillus* species, followed by 4.4% of *Epidermophyton*, mucormycosis, *Candida* species, and *Candida albicans* respectively. There is an urgent need for the establishment of national policy for the prevention of fungal disease.

## Introduction

Dermatomycoses (cutaneous fungal infections) are the leading cause for people visiting dermatology clinics [1]. It has been reported that around 1.6 million deaths were caused by fungal infections which were higher than the death toll of malaria [2]. The World Health Organization has no funded projects for targeting fungal infections [3]. Only less than ten countries across the world have national surveillance setup for fungal infections [3]. The COVID-19 pandemic has led to a concentration of human resources on SARS-CoV-2 testing and bias in the differential diagnosis. During the SARS-CoV-2 pandemic, more than 501 million people were infected with the virus causing 6.19 million deaths. Inappropriate use of antibiotics shortage of medical equipment or supply chain increased the burden on the economy. It is a matter of serious concern that the area of fungal diseases has remained neglected by healthcare professionals and policymakers for decades. There is an urgent need to establish a national policy for the prevention of fungal diseases. In Pakistan, around 3.2 million

people are living with fungal infections which may result in vision loss and are sometimes life-threatening [4]. During the recent waves of SARS-CoV-2 infections in Pakistan from 2019- to 2021, several diseases in the outpatient department have remained neglected by health professionals [5].

## Material and methods

The current study aimed to determine the burden of cutaneous fungal infections in Pakistan. To examine prevailing fungal cutaneous infections from January 2019-August 2021 in Pakistan, a cross-sectional, multicenter study was conducted in Islamabad, Rawalpindi, Lahore, Wah-Cantt, and Swat branches of Islamabad Diagnostic Center Pakistan. After pre-test counseling by trained paramedical staff, the specimens were obtained from study subjects. Tests were performed on 497 suspected patients with symptoms related to cutaneous fungal infections. The Sabaroud Dextrose Agar media (Oxoid UK) was used to culture fungal specimens. Soft or liquid material can be inoculated directly to the surface of the media by using a regular bacteriologic loop via a sterile applicator

### More Information

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stick or sterile pipit. Cutaneous samples were embedded in the agar, using tweezers or a probe. Afterward, plate reading is performed and in case of any positive growth, workup will be done immediately. For Species identification, standardized protocols are used. For *Candida*, in blood, urine, HVS, and other sterile body fluids, identify using Chromogenic media (*Candida* Chromogenic Agar-Condalab, Spain). It requires simple inoculation of the *Candida* colony on that chromogenic agar. It differentiates *Candida* on the basis of different colors. For Mold, (Lactophenol cotton blue-Diachem Pakistan) scotch tape was prepared for morphological identification. A drop of Lactophenol cotton blue is placed onto a clean glass slide. Small pieces of clear scotch tape are loop-backed on themselves with sticky sides out. The tip of the loop was held securely with forceps. And sticky side was firmly placed on the surface of the fungal colony, and the tape is gently removed. Afterward, the tape strip is opened up and placed on the drop of methylene blue at the glass slide, making sure that the entire sticky side adheres to the slide. Under the light microscope, slides were examined for the presence, shape, size, and attachment of conidia. For cutaneous or skin fungal infections, sampling was mostly performed from the Scalp area, hands, feet, and neck. The kits were placed according to the manufacturer's instructions at Islamabad Diagnostic Center, Pakistan. Informed consent was taken from all participants included in this study. The study was approved by the institutional review board of IDC Pakistan.

## Results

The analysis revealed that 63.2% of suspected cutaneous infection patients were recruited only from Islamabad, followed by 22.4% from Rawalpindi, 10.2% from Lahore, and 2% from Wah-Cantt and Swat respectively. Among suspected patient samples 22.5% depicted fungal growth. Among 497 suspected fungal cultures, 49 cutaneous scrapping isolates were determined, *Penicillium* species followed by *Epidermophyton* and *Candida* species were common among subjects of < 30 years of age. The *Aspergillus*, *Penicillium*, mucormycosis, and *Candida albicans* species infections (Figure 1) were more common among subjects 30 to 60 years of age. *Aspergillus* species infections were more commonly observed among patients > 60 of age. 22.2% of the fungal infections were *Penicillium* species, 9% of the infections were *Aspergillus* species, followed by 4.4% of *Epidermophyton*, mucormycosis, *Candida* species, and *Candida albicans* respectively. Among males, the prevalence of dermatomycosis was 0.75 times higher than in females.

## Discussion

In the current study, the patients with mucormycosis had no previous history of SARS-CoV-2 infection and diabetes. Of note, among COVID-19 infected patients with a previous history of diabetes, several reports of mucormycosis infections have been reported from Pakistan and its

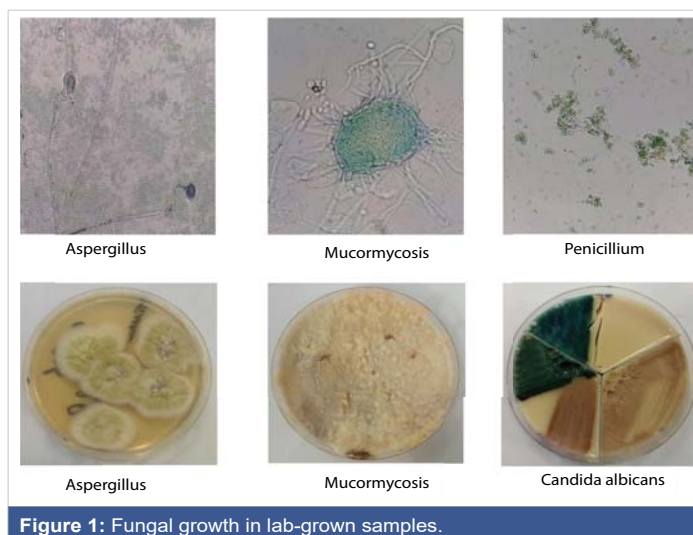


Figure 1: Fungal growth in lab-grown samples.

neighboring country India. There have been several outbreaks of mucormycosis during the recent COVID-19 delta variant outbreak in India, which has devastatingly affected countries economy and health sector. The current study is critical for not only the policy-making strategic organizations of Pakistan but also a torchbearer for accurate determination of fungal infections and accurate surveillance and monitoring of fungal infections across the world. The rising burden of cutaneous fungal infections has been a persistently neglected public health problem for decades. This phenomenon remained more pronounced during the global surge of COVID-19 cases when physicians and scientists across the globe were focused on identifying ways to treat or cure SARS-CoV-2 infections [6-13]. The current study is the torchbearer for strategic organizations to develop measures to prevent the future spread of cutaneous fungal infections not only the urban areas but also in rural areas across the globe. One of the limitations of our study is that no data was obtained from the rural areas of Pakistan. One of the major possibilities is the nonavailability of resources for the general public in rural areas for prospective diagnostic tests or proper medications.

## Declaration

**Ethics approval and consent to participate:** The study has been approved by the ethical review board of Islamabad Diagnostic Center Pakistan, and informed patients' concern was obtained.

**Consent to publication:** All authors approved the submission of the manuscript for publication

**Availability of data and material:** The data is available and can be used for academic or research purposes.

**Competing interests:** The authors have no conflict of interest.

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**Authors contribution:** SRU is the principal investigator of



the study. SRU and US conceived the study. SRU performed all the experiments of the study. SRU and US wrote the manuscript and analyzed the data. ZZZP and ZA assisted in data analysis. The US finally approved the study and Co-PI of the study.

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