Origional Article

Estimating the Prevalence of Fungal Nail Infections and Potential Concerns for Central Disease Surveillance Hub in Pakistan

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Abstract

Nail fungal infections remained unnoticed during COVID-19 pandemic. Herein, we first-time reported national data acquired from 100 branches of IDC Pakistan against Aspergillus species, Penicillium species, Epidermophyton species, Candida species, Candia albicans, Trichophyton species, Bipolaris species or Unidentified fungal infections. Among 497 participants, 22.22% of infections were of Aspergillus species. However, 4.17% of infections were of Candida species and Epidermophyton. The penicillium and Candida albicans species were prevalent at 2.7% among suspected people. However the prevalence of bipolaris species were 1.38%. The unidentified species were also 1.38% among suspected patients, which is potential point of concern. Our results depicted higher level of nail fungal infections among females as compared to males. There is an urgent need for development of national strategies to monitor fungal infections and designing ways for prevention of fungal disease.

Keywords: Nail fungal infections, Epidermophyton, Mucormycosis, Candida species, and Candida albicans**,** Pakistan

1. Introduction

Fungal nail infections are major public health problem worldwide [1]. It has been reported that globally, each year; more than 300 million people of all ages suffer from serious fungal infections [2]. Due to rising global burden of diseases, the international funding on fungal infection related projects were limited, especially during the pandemic [3]. It has been reported that 185 countries had inadequate national data repository or no surveillance center for fungal infections [3]. Since decades the area of fungal disease has remained neglected due to negligence of healthcare professionals or policymakers in Pakistan. To date, more than 3.2 million people are living with fungal infections in Pakistan [4]. During the first four waves of SARS-CoV-2 infections during 2019-2022, out-patient department patient flow was deliberately reduced by health professionals causing negligence of other infections burden regionally [5].

During COVID-19 pandemic, 501 million people got infected with SARS-CoV-2 and 6.19 million people died of it [6]. During the pandemic high risk populations with previous history of travel were more concerned about SARS-CoV-2 transmission *via* fomites [7]. Abrupt usage of antibiotics for treatment of several ailments and shortage of medical equipment and supply increased global burden on economy. Un-necessary usage of antibiotics might lead to antimicrobial resistance [8]. During such a critical time frame, rising burden of fungal infections remained unnoticed. Of note, several studies reported incidence of Mucormycosis due to SARS-CoV-2 infections in various regions across the globe. Since 2019 in Pakistan, SARS-CoV-2 infection raised to the level of 1,526,829 infections causing 30,362 deaths [9]. Majority of the outpatient departments remained closed to avoid further spread, due to which multiple other diseases silently propagated. We aimed to examine the rising burden and prevalence rates of several fungal infections in Pakistan.

2. Methods and Settings

To determine human nail fungal infections during January 2019-April 2022, a cross sectional, multicenter study was conducted at Islamabad Diagnostic Center Pakistan. After pre-testing trained paramedical staff took the specimens for evaluation. The microbiological testing of the specimen samples were performed according to the standardized protocols of IDC. And ethical approval was obtained from 497 participants of the study. The study was approved by institutional review board and bioethical committee of IDC Pakistan.

3. Results

We aimed to estimate the Pakistan burden of nail fungal infections. To examine the national burden of prevailing fungal nail infections between January 2019 and April 2022 in Pakistan, a cross-sectional, multicenter study was conducted in Islamabad Diagnostic Center Pakistan (IDC), having 100 branches covering all major cities and rural areas of Pakistan. The analysis revealed that 27.7% of suspected fungal nail infections occurred in people of less than 30 years of age. However, 59.7% of the fungal nail infections were reported from people between 30 years to 60 years age group. While 12.5% of the fungal nail infections were reported among people of more than 60 years of age.

Among people of less than 30 year of age (25% were males and 75% were females) nail fungal infections, 55% were reported from Islamabad followed by 40% from Rawalpindi area. Among people of 30 to 60 years (30% males and 70% females) of age 60.4% of nail fungal infections were reported from Islamabad followed by 23.2% from Rawalpindi area. However, among people of more than 60 years of age (22% males and 78% females), 77.7% of nail infections were reported from Islamabad, followed by 22.2% from Rawalpindi. Among suspected patient samples 40.27% depicted fungal growth in nails. After pre-test counseling by professional paramedical staff the sample specimens were obtained from subjects after taking patients written consent. The entire test kits used in the study was placed according to manufacturer's instructions and respective diagnostics were performed in accordance to standardized international protocols. The study was approved by institutional review board and ethical review board of IDC Pakistan.

Among 497 suspected fungal cultures, 72 nail isolates were determined, as shown in Table 1. Aspergillus species followed by Epidermophyton, Trichophyton species and unidentified fungal species were common among subjects of <30 years of age. Aspergillus species followed by candida species, candida albicans, Penicillium species, Epidermophyton, and Bipolaris species were observed among people between 30 to 60 years of age. However among more than 60 years of age Aspergillus species were reported to cause nail fungal infections, as shown in Table 2. Among suspected people with nail infections, 22.22% of infections were of Aspergillus species. However, 4.17% of infections were of Candida species and Epidermophyton. The penicillium and Candida albicans species were prevalent at 2.7% among suspected people. However the prevalence of bipolaris species were 1.38%. The unidentified species were also 1.38% among suspected patients, which is potential point of concern. Our results depicted higher level of nail fungal infections among females as compared to males. Current study is critical for constructing novel mechanisms to prevent of fungal infections. This study is not only critical for national policy making or strategic organizations of Pakistan, but also provides guidelines for the accurate determination of fungal infections, surveillance and monitoring of fungal infections worldwide.

Declaration

Ethics approval and consent to participate:

The study has been approved by 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 the academic or research purposes.

Competing interests:

The authors have no conflict of interest.

Funding:

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Authors Contribution:

SRU performed all the experiments of the study. RU is principal investigator of the study. SRU and US conceived the study. SRU and US wrote manuscript

and analyzed the data study and contributed equally. AAK, ZA and ZZP assisted in data analysis. US finally approved the study and Co-PI of the study.

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