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Risk Factors of Superficial Fungal Infections among Immunocompromised Patients in Thi-Qar Governorate during 2021-2022

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***Abstract*:** Worldwide, there are numerous fungi having the ability to invade different parts of the body, creating several infections in the skin, hair, and nails. *Candida spp*., dermatophytes, and Malassezia spp. are the main pathogenic fungal causes. In Thi-Qar Governorate, this study intended to estimate the risk factors of superficial fungal infections among immune-deficient individuals. This study was performed during November 2021 - July 2022. Using a random sampling strategy, a non-probability (convenience sample) of 500 samples was chosen.
Along with the medical clinics in the governorate, six healthcare facilities affiliated with the Thi Qar Health Department participated in this investigation. A questionnaire collected demographic information, risk factors, and disorders impairing immunity (such as diabetes, cancer, leukemia, genetic blood diseases, and renal failure). The average age of the study samples was 44 years. 62% of them were males, 38% were females, from urban areas were 346 (69.2%), unemployed were about 45.4%, and the majority of them 61.8 % were married. The results appear that the highest percentage (20.4%) of distribution of risk factors was found to be among answers about "Do you usually sweat excessively" while the lowest percentage 3 (0.6%) of distribution of risk factors was found to be " Have you traveled in the past two weeks". According to the study, patients with diabetes consisted the biggest number, 247 (49.9%), while those with renal failure made up the lowest percentage, 4.4%. The study concluded that most patients suffering from superficial fungal infections did not have sufficient awareness or knowledge of the risk factors for these fungi.

Keywords: Risk Factor, Superficial Fungal Infections, Immunodeficiency

I. INTRODUCTION

Several superficial fungal infections were worldwide affecting skin, hair, and nails. Dermatophytes, *Candida spp*., and *Malassezia spp*. are the main causative pathogenic agents (Demirseren, 2020). Only fully keratinized tissues have been penetrated by superficial mycoses, including the stratum corneum, hair, and nails (Gamage *et al*., 2020). These infections were responsible for several human illnesses, including invasions of internal organs and superficial skin infections, and systemic disease. These infections are primarily brought on by either a reduction in natural human defenses or opportunistic excessive exposure to the fungus (in immuno-compromised individuals), as in cancer patients. When cancer affects young people, it tends to be more destructive and has a lower chance of survival than when it strikes older people (Wahab *et al*., 2018), and diabetes causes 4% of deaths from all Chronic Noncommunicable diseases (Rahmah *et al.,* 2022). They can negatively impact a person's quality of life, and in certain instances, they might spread or become intrusive (Narasimhalu et al., 2016). Depending on the etiological agents involved and the area of the body affected, dermatophyte infections can present in various ways. Some of the clinical entities that are caused by Tinea such as Tinea capitis (scalp), T. cruris (groin), T. corporis (body), T. pedis (foot), T. manuum (hand), T. unguium (nail), and T. facies (face) (Ezomike et al., 2021). Approximately 50% of people have *Candida albicans* in their normal microbiota, which colonises in their oropharynx, gastrointestinal tract, and vaginal tract, as well as on the skin of healthy people's skin. *Candida albicans* is the typical cause of superficial Candida infections (Talapko et al., 2021). Pityriasis versicolor, seborrheic dermatitis, and folliculitis are associated with *Malassezia species* (Hay, 2013). The characteristics and prevalence of superficial fungal infections(SFIs) vary significantly among regions depending on geography, cultural background, and population migration trends. Climate (humidity, temperature), way of life, and engagement in activities of outdoor have all been connected to the occurrence of SFIs in many parts of the world (Tom et al., 2019). The three categories of topical antifungal medications include polyenes, azoles, and allylamines/benzylamines. In rare cases, oral medications like itraconazole, fluconazole, terbinafine, and griseofulvin can be administered as continuous or pulse therapy in certain situations (Fernandes et al., 2020). Improved hygiene,

Avoiding dampness and wearing non-occlusive clothing is essential for a successful course of treatment (Demirseren, 2020). The most important risk factors are immune system weakness and environmental exposure to spores or filaments. Up until a few years ago, it was believed that Candida spp. caused the majority of fungal infections, but with time, the most prevalent pathogens have changed (Pagano et al., 2011).

II. MATERIALS AND METHOD

Affiliated with the Thi-Qar Health Department, the study was carried out in (Al-Haboubi Teaching Hospital/Specialized Center for Oncology, Nasiriyah Teaching Hospital, Diabetes, and Endocrinology Center, Genetic Blood Diseases Center), in addition to the main health centre and the Alnamothagi Health Center in Qalaat Sukkar District, in addition to the medical clinics in the governorate. This study was conducted in November 2021- July 2022. A cross-sectional study was designed for this study with questionnaire items. This study includes 500 samples from patients with superficial fungi due to a weak immune system, such as cancer patients, diabetics, renal failure, patients who have genetic blood diseases, organ transplants, donors of one of their organs, and long-term users of steroids during the use of a convenience sample selected during the duration of the non-probability sampling methods. A designed questionnaire was created after a thorough examination of the relevant literature, and it was utilised as a data collection instrument that included socio-demographic characteristics, types of illnesses that may weaken the immune system, places where superficial fungal infections occur, and risk factors that increase the chance of developing superficial fungi.

Data was collected and analyzed using Excel and SPSS 25. Statistical analysis included frequency and percentage as a descriptive, while chi-square and ANOVA tests were analytical.

III. RESULTS AND DISCUSSION

Among the weakened immune system, superficial fungal infection was prevalent. According to the study, patients with diabetes made up the most significant percentage (49.4%), while those with renal failure made up the lowest percentage (4.4%), Figure (1).

Such results are approximate to a finding of the study by Rafat *et al.*, which reported that the percentage of frequency of fungal infection among diabetes mellites patients higher than other immunocompromised diseases patient was equal to 19.70% (25) (Rafat *et al*., 2020). These results may be due to differences in the prevalence of immunocompromised diseases in the community. Our results showed that the frequency of fungal infections has increased over time since they were greater than those reported by (Najem et al., 2016). These findings gave rise to the theory that SFI and High blood sugar levels are closely related (Romano et al., 2001).

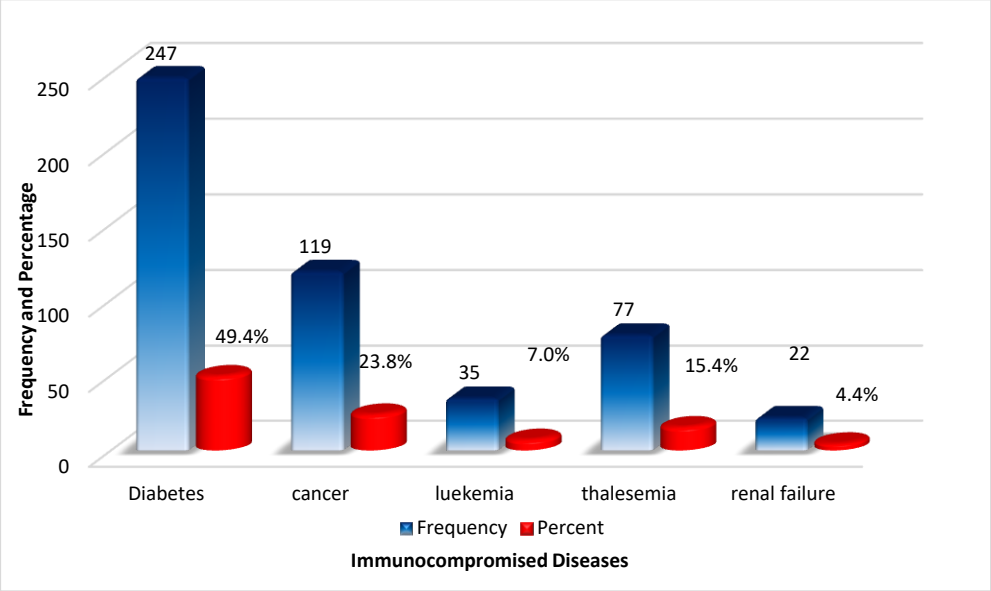

Figure 1: Distribution of superficial fungal infection among the immunocompromised patients.

Regarding the age of study individuals, the highest percentage was found in those aged more than 45 years group at 56%, while the lowest was found in those of less than 15 years at 15.4%. On the other hand, the study found that the mean ± SD of patient age was 44.3 ± 20.1, while the median was 50 years, and the minimum and maximum ages 1-80 years are shown in Figure 2. These results are consistent with Rafat et al., who found that most patients surveyed were 54.74% in the 45-73 age group (Rafat et al., 2020) and an article by Cavayas et al.. A study was conducted, and the mean ± SD age of the

participants was found to be 48.5 ± 15.7. (Cavayas *et al.*,2018).

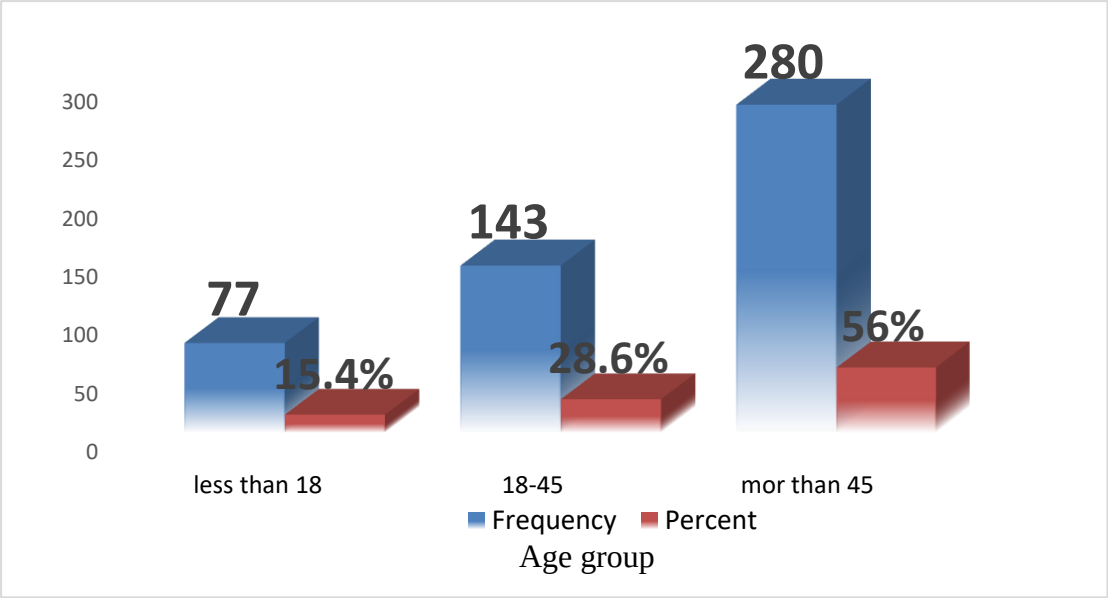

Figure 2: Distribution of the superficial fungal infection according to the age group

However, for the distribution of the study of superficial fungal infection according to gender, the study finds that the male percentage is about 62% more than the female percentage was 38% (Figure 3). This result is similar to the finding of several studies, like the study by Oladele et al., which found that male patients were 64.5% while females were 34.5%. (Oladele *et al.*, 2020), Moreover, a study by Narasimhalu et al. found that the ratio of the distribution of participant males was equal to 59%, comparable with females was 41%. (Narasimhalu *et al.*, 2016) This may be because they developed the conditions due to the nature of their employment, proximity to overcrowded people, and poor personal hygiene. In addition, many of them worked in physically demanding occupations such as farming.

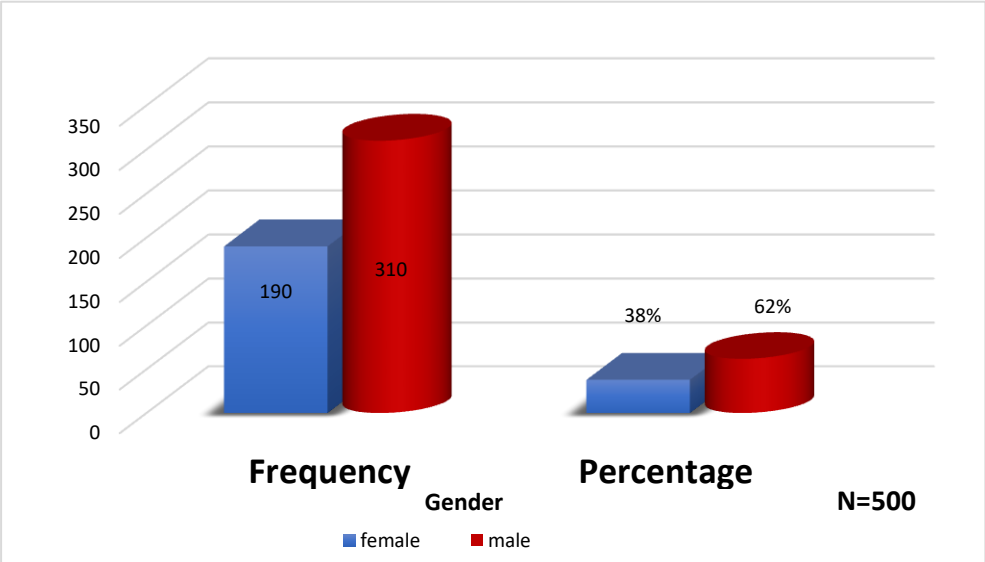

Figure 3:Distribution of the superficial fungal infection according to gender.

According to the distribution of the superficial fungal infection according to marital status. the result shown in Figure (4) the higher percentage found among married patients was 61.8%. In comparison, a lower percentage among divorce patients was 1.6%. This result is similar to the finding of a study done by (Karuniawati *et al*., 2021), who found that married patients were higher than others 77.7% (445) (Karuniawati *et al*., 2021). These results may be due to social habits among the participants, with married participants frequently contracting surface fungal infections due to their close contact and use of personal equipment, comparable to divorced and widowed participants.

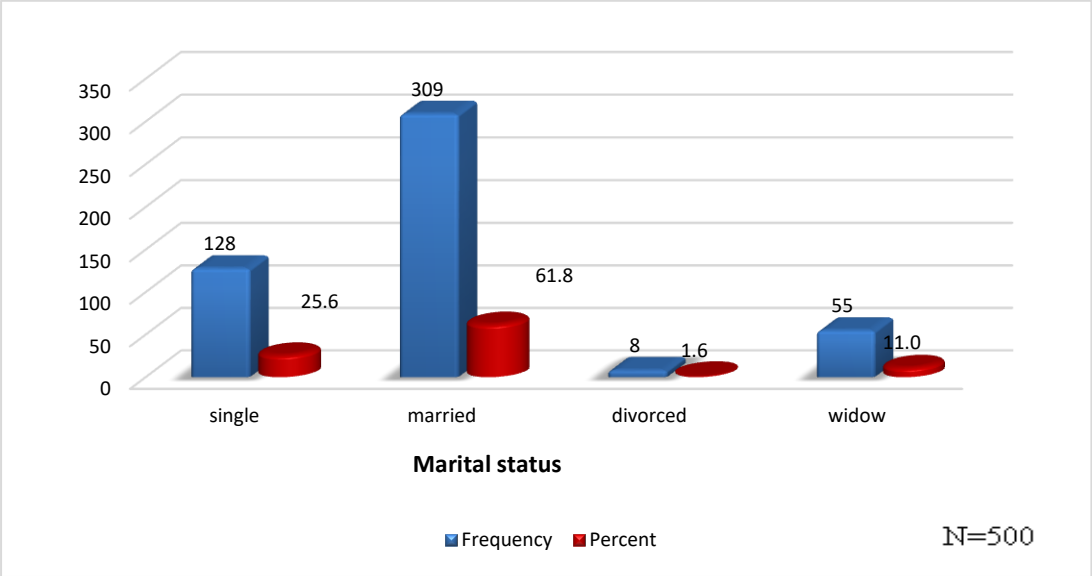

Figure 4: Distribution of the superficial fungal infection according to the marital status

Figure (5) 's findings concerning the distribution of the superficial fungal infection according to residence. The result reports that the higher percentage among urban patients was 69.2%, comparable to rural patients at 30.8%. This result is approximately close to the study done by Dawa et al., which indicates a higher percentage of respondents from urban areas, 52.2% (Dawa *et al*., 2021).

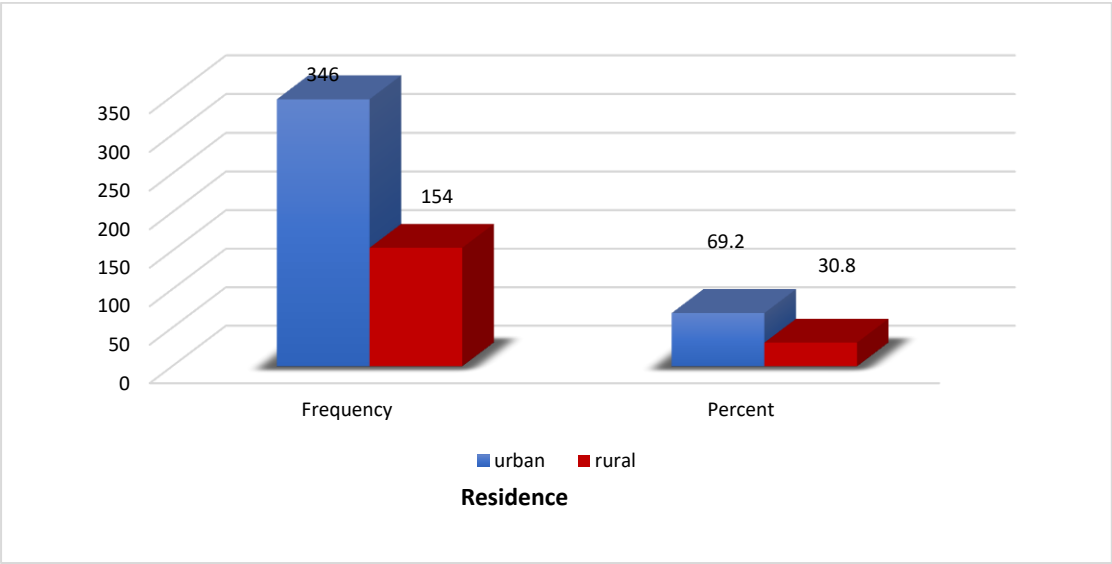

Figure 5:Distribution of the superficial fungal infection according to residence

Table(1) shows the distribution of answers from the study population about risk factors contributing to fungi infection. The results appear that the highest percentage (20.4%) of distribution of risk factors was

found to be among answers about "Do you usually sweat excessively" while the lowest percentage (0.6%) of distribution of risk factors was found to be " Have you traveled in the past two weeks."

The study found that many of the risk factors that immunocompromised patients may be exposed to, but the biggest risk factor that these patients suffer from is excessive sweating. This result was consistent with the study by Singh *et al.,* which found that fungal infection is associated with overcrowded and worm and humid clement (Singh *et al*., 2016). This result may be due to low knowledge of patients about risk factors associated with a fungal infection, how it occurs, and treatment.

While the least factor is traveling to other areas where fungi are likely abundant, this may be due to the patient's health condition that does not allow him to travel to other places.

Table 1: Distribution of risk factors associated with superficial fungal infection in the study population.

	Questions	**Response**	**Frequency**	**Percent**
1.	Do you do some sports?	Yes	7	1.4
		No	493	98.6
2.	Do you swim in public baths for at least two-week?	No	500	100.0
3.	Do you usually use closed shoes	Yes	30	6.0
		No	470	94.0
4.	Have you suffered in the past from severe trauma to the fingernails or toenails?	Yes	5	1.0
		No	495	99.0
5.	Do you usually sweat excessively?	Yes	102	20.4
		No	398	79.6
6.	Do you have previous fungal infections?	Yes	5	1.0
		No	495	99.0
7.	Do you keep one of the following pets?	Dogs	3	.6
		Cats	23	4.6
		sheep	15	3.0
		horses	1	.2
		goats	1	.2
		Bird	60	12.0
		Cow	30	6.0
		NO	365	73.0
		Buffalo	2	.4
8.	Have you traveled in the past two weeks?	Yes	3	.6
		No	497	99.4

IV. CONCLUSIONS

Globally, superficial fungal infections continue to be a hazard to public health. The findings showed that men are more likely than women to develop fungal infections. Diabetes was a prevalent risk factor for SFIs. The study concluded that the majority of patients suffering from superficial fungal infections do not have sufficient awareness or knowledge of the risk factors for these fungi.

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