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Open Access Journal of Mycology & Mycological Sciences
ISSN: 2689-7822

Risk Factors for Candidiasis among Patients Referred to Medical Mycology Laboratory of the Special Clinical of Kermanshah University of Medical Sciences

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Research Article

Volume 7 Issue 1

Received Date: December 05, 2023

Published Date: January 08, 2024

DOI: 10.23880/oajmms-16000181

Abstract

Introduction: Candidiasis is undoubtedly one of the most important and common diseases of opportunistic fungi in human. Factors such as: age, physiological changes, long-term use of antibiotics, diabetes, immune deficiency, cardiovascular disease can make a person prone to candidiasis. In this study, risk factors contributing to candidiasis in the patients referred to the mycology laboratory of the special clinic of Kermanshah University of Medical Sciences in 2013 to 2018 were investigated.

Methods: In a descriptive study, to show the effective factors in the development of candidiasis as an opportunistic fungal disease, all patients during 2013 to 2018 that referred to the mycology laboratory of the special clinic of Kermanshah University of Medical Sciences were examined. In this study, demographic characteristics such as age, gender, occupation, and residence were collected. The results of direct microscopic observation and mycological culture of patient samples were determined. The results were expressed as descriptive statistics.

Results: In this study, 26.98% of 541 people had cutaneous candidiasis, 72.08% had nail candidiasis, and 0.92% had systemic candidiasis. The most common species is Candida albicans. The highest frequency of skin candidiasis is related to the age group of 40-49 years (20.54%). It was more common in patients with a history of cardiovascular disease and diabetes and 47% of patients mentioned excessive contact with water. The highest frequency of nail candidiasis is related to the age group of 30-39 years and women. It is more common among housewives. It is more prevalent in patients with a history of cardiovascular disease and diabetes, respectively. 75% of patients with systemic mucosal candidiasis had immunodeficiency.

Conclusion: The most important factor in preventing candidiasis is public health. For age group of 20-29 years, when suffering from chronic diseases such as diabetes, cardiovascular and immunodeficiency disease.

Keywords: Candidiasis; Candida Species; Kermanshah

Abbreviations: KOH: Potassium Hydroxide; IC: Invasive candidiasis.

Introduction

The basis of fungal pathogenicity is based on the ability of the fungus to adapt to environmental conditions and resistance to the host's cellular defense. Fungal diseases are caused by an important group of molds and yeasts in the soil [1]. Candidiasis is undoubtedly one of the most important and common diseases of opportunistic fungi in human. Infection can be seen acutely, sub acutely or chronically in the skin, nails, vaginal mucosa, bronchi, lungs and digestive system. Sometimes it spreads and affects the kidneys, lungs, liver, heart, etc. The patient's reaction to the disease varies from a brief itch and inflammation to a chronic or acute purulent or granulomatous form. The most important cause of the disease is Candida albicans, which is a natural inhabitant of the digestive tract, oral mucosa and vagina, and humans often acquire it at birth when passing through the vaginal canal. In general, the clinical forms of candidiasis can be divided as follows which will have their own clinical symptoms according to the location of the involvement [1,2].

- Mucosal infections that include oral involvement, Broncho candidiasis, pulmonary candidiasis, vulvovaginitis and candida balanitis, gastrointestinal candidiasis, cutaneous candidiasis, chronic mucous.
- Skin diseases that include: Candidiasis of wrinkled areas of the body, diaper rash, candida granuloma.
- Systemic diseases that include urinary tract candidiasis, endocarditis, meningitis, toxic septicemia.
- Allergic diseases which include: candiditis, eczema, asthma and gastritis. factors such as age, physiological changes, long-term use of antibiotics, general disability and debilitating diseases, occupation, obesity and cardiovascular stasis, alcoholism and lack of vitamins C, B, A can make a person susceptible to candidiasis [2].

The prognosis of candidiasis, like other opportunistic infections, depends on the type and severity of the underlying disease or favorable conditions, and it varies from local to systemic treatments according to the location of the involvement [2]. Candida species are part of Yeast, yeast like organisms. Yeasts have a mucoid colony and create blastoconidia through budding. From the juxtaposition of blastoconidia or their elongation, pseudo mycelium is produced, and in some cases, true mycelium is produced. Pseudo hyphae in some yeast fungi is created under certain conditions such as reduced oxygen in the environment, reduced sugar, or in the presence of special proteins. Candidiasis caused by species of Candida and generally Candida albicans although in most cases, Candida albicans is the cause of various clinical forms, but in uncommon forms of the disease, such as endocarditis, other species are often involved [2]. These species are part of the natural flora of the skin, and mucous membranes and have very limited pathogenic power. All species can cause any of the clinical forms of candidiasis, but some of them are more isolated from certain forms of the disease [2]. The most important pathogens in candidiasis are: *C.glabrata, Candia albicans, C.guilliermondii, C.krusei, C.pseudotropicalis, C.parapsilosis, C.tropicalis* [1].

Risk factors: clinical course of candidiasis are significantly influenced by the contributing factors and underlying disease of the patient. In general, there are categories of factors that disrupt the normal interaction between Candida and the host and lead to pathological symptoms. Age and gender, Physiological changes, diabetes, Immunosuppressive agents, cytotoxins, canners, catheter for intravenous injections, peritoneal dialysis, surgery, Long-term use of antibiotics, General disability and debilitating diseases, Iatrogenic factors and breaking the natural defense barrier, Occupation, Obesity, Avitaminosis [2].

According to this reports frequency of candidiasis as opportunistic fungal infection is different among patients with underlying diseases and normal conditions. So in a descriptive study, to show the effective factors in the development of candidiasis as an opportunistic fungal disease, all patients during 2013 to 2018 that referred to the mycology laboratory of the special clinic of Kermanshah University of Medical Sciences were examined. In this study, demographic characteristics such as age, gender, occupation, and underlying diseases were collected. The results of direct microscopic observation and mycological culture of patient samples were determined. The results were expressed as descriptive statistics.

Materials and Methods

The main goal of this research was to determine the risk factors of candidiasis in patients referred to the medical mycology laboratory of the special clinic of Kermanshah University of Medical Sciences during the years 2013 to 2018. In this study, all the patients referred to the mycology laboratory that had lesions suspected of candidiasis, firstly, their demographic characteristics and main risk factors in a questionnaire including: age, gender, occupation, season of visit, place of residence, location of lesion and effective underlying diseases were extracted and recorded. Then, patient samples were used for direct microscopic examination with potassium hydroxide (KOH), Giemsa staining, and cultured in special mycological culture medium such as subrodextrose agar with and without cyclohexamide and chloramphenicol. To identify fungal species from differential culture media such as Candida chrome agar and specific tests such as tube mass test, culture in corn mill agar media was investigated. At the end, the frequency of

favorable and effective conditions for contracting different types of candidiasis was determined. The recorded data were presented and analyzed using tables and graphs, and the results were expressed as descriptive statistics.

Results and Findings

Percentage	Total	Systemic	Nail	Skin	Form of disease	
13.67	39	1	34	4	F	0-9
	35	0	27	8	M	
3.69	7	0	2	5	F	19-Oct
	13	1	4	8	M	
16.08	66	0	51	15	F	20-29
	21	0	9	12	M	
23.65	104	0	87	17	F	30-39
	24	1	12	11	M	
15.89	53	1	36	16	F	40-49
	33	1	18	14	M	
9.42	41	0	33	8	F	50-59
	10	0	7	3	M	
14.04	51	0	45	6	F	60-69
	25	0	12	13	M	
3.51	12	0	8	4	F	70 and above
	7	0	5	2	M	
68.94	373	2	296	75	F	Total
31.05	168	3	94	71	M	
100	541	5	390	146	m/f	Sum total

Table 1: Distribution of the Frequency of Different forms of Candidiasis among the Clients to the Medical Mycology of the Special Clinic of Kermanshah University of Medical Sciences during the 2013 to 2018 According to Age and Sex (f: female, m: male).

The statistics obtained from table number 1 show that: The total number of candidiasis patients referred to the mycology laboratory of the special clinic of Kermanshah University of Medical Sciences during study was 541, of which 168 (31.05) were men and 373 (68.94) were women.

Among all candidiasis patients referred to the mycology laboratory of the special clinic of Kermanshah University of Medical Sciences during study, the highest frequency (23.65%) is related to the age group of 30 to 39 years and the lowest frequency (3.51%) is related to the age group 70 and above old. Other group age: 0 to 9 (13.69%), 10 to 19 (3.69%), 20 to 29(16.08%), 40 t0 49 (15.89%) 50 to 59 (9.42%) and 60 to 69 (14.04%).

Among the 541 people examined in the study, 146 people (26.98%) had skin candidiasis, 390 people (72.08%) had nail candidiasis, and 5 people (0.92%) had systemic candidiasis.

There were 146 people with skin candidiasis, of which 71 (48.63%) were men and 75 (51.36%) were women.

Among people with skin candidiasis, the highest frequency (20.54%) is related to the age group of 40 to 49 years and the lowest frequency (4.10%) is related to the age groups of 70 and above years. and other age groups 0 to 9 (8.21%), 10 to 19 (8.90%), 20 to 29(18.49%), 30 to 39 (19.17%) 50 to 59 (7.53%) and 60 to 69 (13.01%).

There were 390 people with nail candidiasis, of which 94 (24.10%) were men and 296 (75.89%) were women.

Among the patients with nail candidiasis, the highest frequency (25.38%) is related to the age group of 30 to 39 years and the lowest frequency (1.53%) is related to the age group of 10 to 19 years. Other groups: 0 to 9 (15.64%) 20 to 29 (15.38%) 40 to 49 (13.84%) 50 to 59 (10.25%) 60 to 69 (14.61%) and over 70 years old (3.33%).

There were 5people with systemic candidiasis, of which 3 (60%) were men and 2 (40%) were women. Among the patients with systemic candidiasis, the highest frequency (40%) is related to the age group of 40 to 49 years and 3 groups 0 to 9, 10 to 19 and 30 to 39 (20%) and other groups are 0%.

Total (percentage)	Systemic	Nail	Skin	Form Season
132	1	91	40	Spring
-24.39%				
149	2	106	41	Summer
-27.54%				
127	1	75	51	Fall (autumn)
-23.47%				
133	1	118	14	Winter
-2458%				
541	5	390	146	Total
-100%	-0.92%	-72.08%	-26.98%	(percentage)

Table 2: The Frequency of Different forms of Candidiasis among the Visitors Medical Mycology Laboratory of the Special Clinic of Kermanshah University of Medical Sciences during the 2013 to 2018 According to the Seasons.

According to the Table No. 2:

- ✓ The highest frequency of clients with candidiasis to the mycology laboratory was in the summer season (27.54%) and the lowest in the autumn (23.47%).
- ✓ The highest frequency of clients with skin candidiasis to the mycology laboratory was in autumn (34.93%) and the lowest in winter (9.58%).
- ✓ The highest frequency of clients with nail candidiasis to the mycology laboratory was in winter (30.25%) and the lowest in autumn (19.23%).
- ✓ The highest frequency of clients with systemic candidiasis to the mycology laboratory was in the summer season (60%) and the lowest in other seasons with (20%).

The most species of Candida that grew in the cultures of people with candidiasis is Candida albicans214 (39.55%). Other Candida spices with 155 isolated (28.65%), 162 (29.94%) of the cases had negative cultures. The lowest frequency is related to Candida galabrata with 10(1.8%).

The frequency of different job among the visitors to medical mycology laboratory of the special clinic of Kermanshah University of Medical Sciences during 2013 to 2018 according occupation housewife with (45%) had highest frequency and lowest farmer and rancher with (o.o3%) other job: Employee(13%), students (10%), free job (11%) and other or unemployed(18%).

Among those with skin candidiasis, the highest frequency is related to housewives (10 people with 27.02%) and the lowest frequency is related to farmers and ranchers (2 people with 5.40%).

Among those with nail candidiasis, the highest frequency is related to housewives (43 people with 75.71%) and the lowest frequency is related to farmers and ranchers (1 person with 1.42%).

The highest frequency among nail candidiasis patients is related to employees (2 people with 50%) and then students and freelancers (1 person with 25%).

Systemic	Nail	Skin	Form Underlying disease
2	230	135	Without underlying disease
0	6	0	Digestive
0	90	12	Cardiovascular
0	35	14	Diabetes
0	20	5	Rheumatismic
0	18	4	Thyroid
1	12	0	Pulmonary
0	4	3	Hepatic
2	16	10	Immunodeficiency
5	431	183	Total

Table 3: The Frequency of Different forms of Candidiasis among those Referred to the Medical Mycology Laboratory of the Special Clinic of Kermanshah University of Medical Sciences during 2013 to 2018 According to the Underlying Disease.

According to table No. 3 the number of risk factor was 619 but patients was 541.Because a patient may have more than one risk factor.367 patients (67.83% of patients were without risk factors. Cardiovascular risk factor with 102 case (18.85 %%) was the most frequent among patients. Diabetes ranked second with 49 cases (09.05%).

Total	Systemic	Nail	Skin	Forms Region
395	2	280	113	Kermanshah
-73.01%				
58	2	50	6	Other Cities
-10.72%				Of providence
48	1	40	7	Outside the province
-8.87%				
40	0	20	20	Village
-7.39%				
541	5	390	146	Total

Table 4: The Frequency of Different forms of Candidiasis among the Visitors to Medical Mycology Laboratory of the Special Clinic of Kermanshah University of Medical Sciences during 2013 to 2018 According to the Place of Residence.

Kermanshah with 397 cases (73.38%) had the highest frequency among clients. Other cities of province with 62 cases (11.46%) as second rank.

Among the total number of candidiasis sufferers, 225 people (41.58%) mentioned a history of excessive contact with water.

Among the people with skin candidiasis, (21.05%) mentioned contact with contaminated water, (10.52%) mentioned using a gym and (68.42%) mentioned no contact with contaminated places.

Among the nail candidiasis sufferers, (3.30%) came into contact with contaminated water, (1.66%) used a gym, came into contact with an animal (1.66%), (8.33%) came into contact with soil, and (85%) mentioned the lack of contact with the contaminated place. A person with systemic candidiasis mentioned contact with contaminated water.

Among the patients with skin candidiasis, 257 people (47.50%) of patients had a history of illness less than 6 months.84 people (15.52%) between 6 and 15 months, and 200 people (36.96%) more than 15 months.

Discussion

In this study, conditions favoring candidiasis among patients referred to the medical mycology laboratory of the special clinic of Kermanshah University during 2013 to 2018 were investigated. In this study, 26.98% of 541 people had cutaneous candidiasis, 72.08% had nail candidiasis, and 0.92% had systemic candidiasis. The most common species is Candida albicans. The highest frequency of skin candidiasis is related to the age group of 40-49 years (20.54%). It was more common in patients with a history of cardiovascular disease and diabetes, and 47% of patients mentioned excessive contact with water. The highest frequency of nail candidiasis is related to the age group of 30-39 years and women. It is more common among housewives. It is more prevalent in patients with a history of cardiovascular disease and diabetes, respectively. 75% of patients with systemic mucosal candidiasis had immunodeficiency.

In a study conducted in Isfahan, it has been shown that out of 182 species isolated from patients with candidiasis, 25.2% and 74.8% were from women, and the age group of 21-30 years had the highest number of cases and the age group of 71-80 years had the lowest number of cases [3]. In this study, 26.98% had skin candidiasis, 72.08% had nail candidiasis, and 0.92% had systemic candidiasis. In a study conducted in Isfahan, 54% had nail candidiasis, 6% had skin candidiasis, and the incidence it is 20.30% for vaginal candidiasis [3]. The lack of referral of patients with vaginal candidiasis to the mycologist's laboratory and their experimental treatment is the reason for the low percentage of patients with mucosal candidiasis in this study. Among those suffering from skin candidiasis, the highest rate of infection is among the age group of 40-49 years and the lowest frequency (4.10%) is related to the age groups of 70 and above years. Also, the rate of infection among men is more than women. In a study conducted in Urmia on diabetic patients with cutaneous candidiasis, it showed that the highest rate of infection was in the age group of 70 years and older, which is contrary to the findings of a recent study. It has been women. In patients with nail candidiasis, the highest frequency is related to the age group of 60 to 69 years and the lowest is related to the age group of 10 to 19 years [4]. Also, the incidence rate of women is 4 times that of men. In a study conducted in Tehran, the incidence rate in women is 4 times that of men and in previous studies it is 2 to 3 times higher and in the fourth, fifth and sixth decade [5,6]. Life is the most conflicting and it seems that increasing age is effective in the occurrence of disease, which was also seen in a recent study [5]. In patients with systemic candidiasis, the results are not reliable due to the small number of patients studied. Out of 4 affected people, 2 people were in the age group of 40 to 49 years, 1 person was in the age group of 30 to 39 years, and one person was in the age group of 10 to 19 years. And 3 people were male and 2 persons were female.

In the study, the highest frequency of clients with candidiasis to the mycology laboratory was in summer

(27.54%) and the lowest in autumn (23.47%), and no significant difference can be seen between them. During this study and the results obtained from the culture, 39.55% of Candida albicans culture was found, 28.65% of Candida species and 1.8% of Candidagalabrata. In a study in Tehran, the highest frequency of Candida albicans among patients with candidiasis was 66% and the frequency of Candida glabrata was 6.1% [7]. The highest frequency among people with skin candidiasis is related to housewives with 27.02% and the lowest frequency is related to farmers and ranchers with 5.40%. In patients with nail candidiasis, the highest frequency is related to housewives with 75.71% and the lowest frequency is related to farmers and ranchers with 1.42%. These statistics show that housewives suffer from nail candidiasis more than other occupations. In a study conducted in Kermanshah, nail candidiasis was more common in housewives [8]. 2 out of 5 patients with systemic candidiasis were employees, which cannot be judged due to the small number of patients. In patients with skin candidiasis, 73.77% did not mention any history of previous disease and 07.65% had a history of diabetes. Among those with nail candidiasis, 53.36% had no history of underlying disease, 20.88% had a history of heart disease, and 08.12% had a history of diabetes. In a study that was conducted in patients with Candida skin infections. The disease is more common in poorly controlled diabetic patients [4]. In another study conducted on patients with vulvovaginal candidiasis, uncontrolled diabetes mellitus is a favorable factor in candidiasis [9].

In patients with systemic candidiasis, 2 out of 5 (40%), people were immune compromised, and in a study conducted in Sari and Babol on patients hospitalized in ICU, in patients with immunodeficiency and hospitalized in 64.75%. The percentage of fungal species isolated from the wing was Candida albicans, and Candida is one of the most important microbial factors in endangering the lives of immune compromised patients. The respiratory system is one of the most important sites of conflict in these patients [10]. Among all those with candidiasis 41.58% percent mentioned a history of excessive contact with water. In patients with skin candidiasis, 47.36% had excessive contact with water. In patients with nail candidiasis, 47.50% had a history of excessive contact with water, and one patient with systemic candidiasis mentioned excessive contact with water. In a study conducted in Tehran, it was found that yeast onychomycosis infection is seen in people who have more contact with water, which is consistent with the findings of a recent study [5]. In patients with skin candidiasis, 21.5% mentioned contact with contaminated water, 10.52% used gym and 68.42% did not contact contaminated place. In nail candidiasis, 3.30% mentioned contact with contaminated water, 1.66% used gym. 1.66% mentioned contact with animals, 8.33% contact with soil and 85% no contact with contaminated places. It can be concluded that contact with water among other contaminated places has the most relationship with skin candidiasis.

Among all patients with candidiasis, 83.73% of the patients lived in the city and 7.39% lived in the village. In patients with skin candidiasis, 81.50% lived in the city and 13.69% lived in the village. In patients with nail candidiasis, 84.61% lived in the city and 5.12% lived in the village. And all the patients with systemic candidiasis lived in the city. It seems that due to the high number of people who refer from the city, the percentage of patients living in the city is higher than the village. And there is a stronger relationship between skin candidiasis and living in the village than nail candidiasis.

In study about oral candidiasis, Risk factors include impaired salivary gland function, drugs, dentures, high carbohydrate diet, and extremes of life, smoking, diabetes mellitus, Cushing's syndrome, malignancies, and immunosuppressive conditions. Management involves taking a history, an examination, and appropriate antifungal treatment with a few requiring samples to be taken for laboratory analysis. In certain high risk groups antifungal prophylaxis reduces the incidence and severity of infections. The prognosis is good in the great majority of cases [11]. Candiduria is commonly seen in hospitalized patients and most of the patients are asymptomatic, but it may be due to cystitis, pyelonephritis, prostatitis, and epididymo-orchitis or disseminated candidiasis. Major risk factors are diabetes mellitus, indwelling urinary catheters, use of broad-spectrum antibiotics, urinary obstruction, and admission to intensive care units [12].

Candida albicans remains the predominant cause of invasive candidiasis (IC), accounting for over half of all cases, but Candida glabrata has emerged as the second most common cause of IC in the United States [13]. And in other research in dicated that, Risk factors for invasive Candida infection included demographic factors, comorbid conditions, and medical interventions. Although demographic factors do not play a role for the development of invasive Candida infection, comorbid conditions (eg: HIV, Candida colonization) and medical interventions have a significant impact. The risk factors associated with the highest risk for invasive Candida infection were broad-spectrum, blood transfusion, Candida colonization, central venous catheter, and total parenteral nutrition. However, dependence between the various risk factors is probably high [14].

But Invasive candidiasis (IC) is a major cause of morbimortality in children. Clinical characteristics such as male sex stay in the intensive care unit, and thrombocytopenia; comorbidities such as cardiological disease and renal insufficiency; and risks such as mechanical ventilation and

dialysis were associated with increased mortality [15].

Conclusion

Candidiasis is an opportunistic fungal infection. The most important factors are immunodeficiency, diabetes, cardiovascular diseases, excessive use of antibiotics in living conditions, high contact with water, and work can play a role in its frequency. Public and academic information reduces the risk of candidiasis.

Acknowledgments

This manuscript drowns from Kiana Ghasemi thesis No 91428 in school of medicine Kermanshah University of medical sciences

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