

A Retrospective Study on Dermatophyte Infections In-Relation to the Age, Sex, Site of Infection and In Asmara, Eritrea

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ABSTRACT

Background: Diseases related to superficial skin fungal infections are becoming a leading cause of disability. Majority of skin diseases are caused by different types of Tinea that affect; the beard area, the scalp hair follicles and the surrounding skin, the trunk, the groin, the face, chin and lip, the hand, the webs of the toe and the nails. The prevalence and pattern of these diseases differs among countries because of sex, age, comorbid diseases, the skin type and site of an individual, occupation, climate/geographic area, level of immunity and socio cultural behavior. **Aim of the study:** The aim of study was to investigate the association between superficial fungal infections, and sex and area of infection and other determinants. **Patients and Methods:** A five year (2014 to 2018) retrospective study on the prevalence of superficial fungal skin infections and its determinants of outpatients who attended dermatologic Clinic at Halibet National Referral Hospital, Asmara, Eritrea was conducted. **Results:** During the past five years Period (2014, - 2018) the Dermatology clinic of Halibet Hospital had a total visit of 5524 outpatients with a superficial skin fungal/Tinea infections. Out of these outpatients head [77.5% (n=4280)]. It was found to be the highly infected area mainly in females 53.1% (n=2272). The results of the study showed a significant association between area of infection and sex (female) at p-value <0.000. Tinea skin fungal infections were found to be common in the highlands area of the country that is with cold climate than the areas with hot climate. The study revealed a significant association (p-value < 0.000) between area of infection and geographic location (residential area) of the study participants. The frequency of disease and comorbidity of different Tinea skin fungal infections was found to be higher in females than males and a significant association was also observed at p-value < 0.00. **Conclusion:** In Conclusion the study have revealed that the Tinea/superficial skin fungal infections are more common on the head and females. The results are significantly associated with female sex and cold climate or highlands area [geographic location (residential area)] at a p-value <0.000 and p-value < 0.000, respectively. The frequency of disease and comorbidity of different Tinea skin fungal infections was found to be higher in females than males and a significant association was also observed at p-value < 0.00.

Keywords: Dermatophytes, Sex, Climate, Tinea, Eritrea.

Vol No: 07, Issue: 01

Received Date: March 30, 2023

Published Date: April 10, 2023

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Citation: Qelit Y, et al. (2023). A Retrospective Study on Dermatophyte Infections In-Relation to the Age, Sex, Site of Infection and In Asmara, Eritrea. Mathews J Dermatol. 7(1):18.

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INTRODUCTION

Diseases related to superficial skin fungal infections are becoming a leading cause of disability. Majority of skin diseases are caused by different types of Tinea that affect; the beard area, the scalp hair follicles and the surrounding skin, the trunk, the groin, the face, chin and lip, the hand, the webs of the toe and the nails. The prevalence and pattern of these diseases differs among countries because of sex, age, comorbid diseases, the skin type and site of an individual, occupation, climate/geographic area, level of immunity and socio cultural behavior. The prevalence is affected by the condition of climate, where it is found to be higher in hot and humid climates. *T. rubrum* is the most common organism in the UK [1].

The signs and symptoms differ according to the disease presents itself depending on the type of Tinea and the site of infection.

A study conducted by Mazza (2018) revealed high prevalence of dermatophytes in females than males [2].

There is a misunderstanding in the differential diagnosis of skin diseases mainly between Tinea infections and annular rashes like eczema and psoriasis; whereas other infections like pityriasis versicolor occur over the trunk. Candida exists as a flexural rash in those who are at young and old aged, and immuno-compromised people (people with HIV/AIDS, Diabetes Mellitus, patients on antibiotics etc.).

The clinical appearance of ringworm depends mainly on three factors that include; type of hair invasion, level of resistance and degree of inflammatory response of the host [1]. It has various clinical presentations that include; seborrheic (scaling, often without noticeable hair loss; a pustular crusted pattern (either localized or more diffuse), 'black dot' (characterized by small black dots within areas of alopecia), a kerion, (an inflammatory mass) and a scaly, annular patch [4,5]. Majority of the skin infections are treatable. The common antifungal medications as an ointment, creams, tablets and other forms that include; clotrimazole, econazole, ketoconazole, miconazole, terbinafine etc [6].

There are certain antifungal systemic medications which are appropriate for Tinea capitis and onychomycosis [7]. According World Health Organization report, skin diseases are one of the major causes of morbidity and disability in sub-Saharan African countries [8]. A study that was conducted in Ghana, Gabon and Rwanda reported an overall prevalence of skin disease of schoolchildren was high that amounted to 34.6% and 42.0% in two Ghanaian studies, 45.8% in Gabon, and 26.7% in Rwanda [9]. Skin disease that include, cutaneous infections such as pyoderma and scabies are endemic in Africa [10]. The international public health initiatives have

been created to reduce the prevalence of high-morbidity skin diseases such as Buruli ulcers and lymphatic filariasis in Africa [11]. Most epidemiological studies on skin disease in the African region had contribution in identifying the gaps and reduction of disease burden by providing continuous medical education for physicians, community sensitization and public health campaigns. As time is evolving, fungal infections are increasing in prevalence. Superficial fungal infections are the most common type of infections.

Throughout the entire African continent Tinea capitis is the primary clinical presentation of dermatophytosis in children. Tinea capitis affects more than 20% of school-age children in West Africa, while the prevalence ranges 10% to 70% in the remaining regions of Africa. In spite of the epidemiological studies that have been primarily conducted on particular patient groups that are not representative of the general population, the presence of Tinea corporis in adults is the most frequent indicator of dermatophytosis. Predominance of anthropophilic dermatophytes mainly *T. violaceum*, was observed in the North and East of Africa, whereas *T. soudanense* and *M. audouinii* were dominant in the Western and Central regions of the continent. Interestingly, the zoophilic species, *M. canis*, has recently emerged in North and East Africa. Optimization of both mycology diagnosis capacities and epidemiological methodology would provide insight into the role that climate and other global aspects of the human environment on the epidemiology of dermatophyte [10]. An epidemiological and aetiological study on Tinea pedis and onychomycosis in Algeria (2006), documented a prevalence of Tinea pedis and onychomycosis as 63.6% and 17.7% out of the superficial fungal infections, respectively [12]. A 27 months retrospective analysis study of onychomycosis in Turkey documented toenail onychomycosis in co-morbidity with Tinea pedis infection in 25.3% of patients and the commonly identified agent *T. rubrum*, in 35.1% of the patients, followed by *T. mentagrophytes*, in 24.6%. Toe nail onychomycosis in association with fingernail onychomycosis was also identified in 4.9% of the patients. The study documented high prevalence of nail infection in female patients (50.9%) than males with 49.1%, as well as [13].

Aim of the study

The aim of study was to investigate the association between superficial fungal infections, and sex and area of infection and other determinants.

PATIENTS AND METHODOLOGY

Study design and area

A five years (2014 to 2018) hospital based retrospective clinical card/record review study was conducted to

investigate the association between superficial fungal infections, and sex, area of infection and other determinants of outpatients who attended Halibet National Referral Hospital, Dermatologic Clinic and Asmara, Eritrea.

The following key words were used for searching the electronic databases: Dermatophytes, Age, Sex, Site of Fungal Infection, Tinea, Africa, and Eritrea.

Data processing/Data entry

Data cleaning was performed to check for accuracy, consistency and for avoidance of missed values during data collection and entry. The collected data was entered into Microsoft excel and finally was exported to SPSS.

Data analysis

The collected data was analyzed using SPSS version 22. After analysis data was presented using descriptive statistics, frequency, percentage, mean and standard deviation. Then the variables were presented in tabular form.

RESULTS

Distribution of general skin disease and Skin fungal infections:

During the past five years Period (2014-2018) the Dermatology clinic of Halibet Hospital had a total visit of 5524 patients who had a superficial skin fungal/Tinea infections.

As it is indicated in the study results in the past five years the trend of skin diseases was observed to increase from 956 in 2014 to 1219 in 2018 (Table 1).

Table 1. Epidemiologic data, patients who visited the dermatology clinic from: 2014 -2018.

Year	Patients with Skin Fungal Infection (Frequency; N)	Patients with Skin Fungal Infection (Percent; %)
2014	956	17.3
2015	1046	18.9
2016	1082	19.6
2017	1221	22.1
2018	1219	22.1
Total	5524	100

Association between site of infection and sex: 2014–2018

Out of those who had superficial skin fungal infections the head was found to be the highly affected area mainly in females 53.1% (n=2272). Even in the general data study of the participants head was observed to have the highest prevalence 77.5% (n=4280). Superficial skin fungal infections were identified in many females than males. The results of the study showed a significant association between area of infection and sex (female) at p-value <0.000. The skin fungal infection of groin (Tinea cruris) was found to be 100% (n= 78) in males (Table 2).

Table 2. Association between sites of infection and sex.

Characteristics	Frequency (N)			P-Value
	Male	Female	Total	
Area of Infection				
Body	349 (60.1%)	232 (39.9%)	581(10.5%)	P<0.000
Face	137 (42.8%)	183 (57.2%)	320(5.8%)	
Groin	78 (100.0%)	0 (0.0%)	78(1.4%)	
Hand	91(59.9%)	61(40.1%)	152(2.8%)	
Head	2008 (46.9%)	2272 (53.1%)	4280(77.5%)	
Foot	69 (61.1%)	44 (38.9%)	113(2.1%)	
Total	2732 (49.5%)	2792 (50.5%)	5524	

Association between site of infection and geographic residence area: 2014–2018

Tinea skin fungal infections were found to common in the highlands area of the country that possess a cold climate that include mainly Zoba Maekel, Anseba and Debub, than

the areas with hot climate mainly western (Gash-Barka) and Eastern lowlands of the country. The study revealed a significant association (p -value < 0.000) between area of infection and geographic location (residential area) of the study participants (Table 3).

Table 3. Association between site of infection and Geographic Area.

Characteristics	Frequency (N)			P-Value
	Highland (Maekel, Anseba and Debub)	Western and Eastern Low Land (GB, SKB and DKB)	Total	
Area of Infection				
Body	538 (92.6%)	43 (7.4%)	581(10.5)	$P < 0.000$
Face	302 (94.4%)	18 (5.6%)	320(5.8%)	
Groin	69 (88.5%)	9 (11.5%)	78(1.4%)	
Hand	141 (92.8%)	11 (7.2%)	152(2.8%)	
Head	4146(96.9%)	134 (3.1%)	4280(77.5%)	
Foot	107 (94.7%)	6 (5.3%)	113(2.1%)	
Total	5303 (96.0%)	221(4.0%)	5524	

Association between number of skin diseases and sex: 2014-2018

The frequency of disease and comorbidity of different Tinea skin fungal infections was found to be higher in females 50.5% (N= 2783) than males 49.5% (N=2732) a significant association was also observed at p -value < 0.00 (Figure 1).

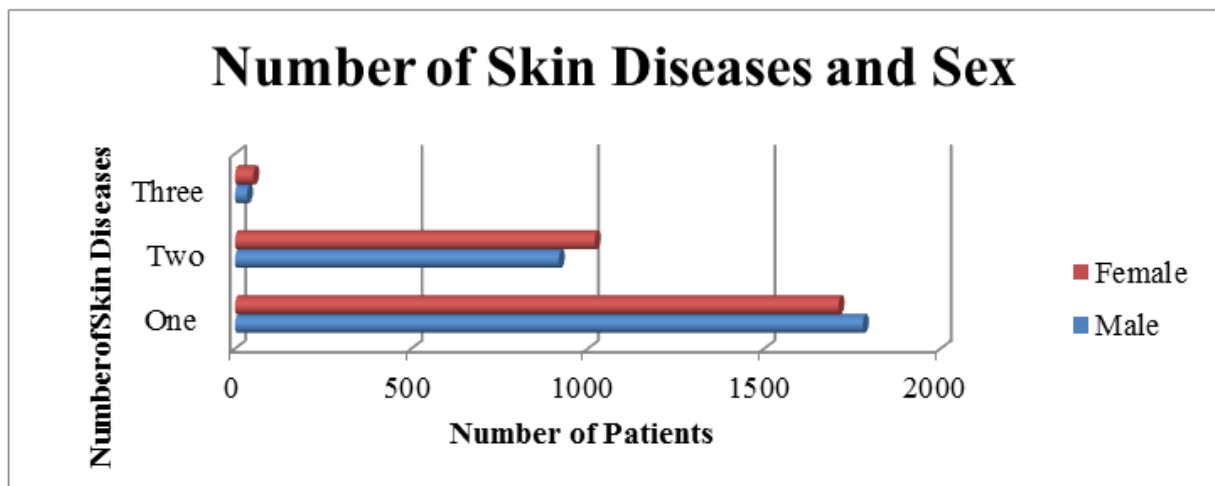


Figure 1. Multiple Tinea infection and sex

DISCUSSION

The study analyzed clinical cards of 5524 patients who had a superficial skin fungal/Tinea infections and attended Halibet Regional Referral Hospital, Dermatology Clinic, in the five years (2014-2018). Out of those who had superficial skin fungal infections the head was found to be the highly affected area mainly in females 53.1% (n=2272). Even in the general data study of the participants head was observed to have the highest prevalence 77.5% (n=4280). Superficial skin fungal infections were identified in many females than males. The results of the study showed a significant association between area of infection and sex (female) at p -value < 0.000 . The skin

fungal infection of groin (Tinea cruris) was found to be 100% (n= 78) in males.

In the present study the rate of head skin infection was higher in females than males (53.1%; $p < 0.000$) which has a significant association. The results of this study comply with the study results of an epidemiological survey that was conducted in Syria by Ismail and Al-Kafri (2016) and Ethiopia which showed a high prevalence of head skin fungal infections (*Tinea capitis*) in female children [14,15].

Out of the total cases Tinea corporis was found in 10.5% (N= 581) with a significant difference between males (60.1%)

and females (39.9%), most of the cases with body infections were found to be infants and children (0 to 13 years of age) with a significant association (54.9%; $p < 0.000$). Even though the prevalence rate obtained in this study was lower as compared to that of Syria; in this current study most cases were observed in infants and children (54.9%) as compared to a study in Syria that showed most cases in (87.7%) in adults [14]. From the clinically diagnosed patients with Tinea skin fungal infection 3.4%, were diagnosed as cases with Tinea manuum. This result is similar with the study findings that were reported in Syria as of the cases that were clinically diagnosed and positively identified by direct examination [14].

In the general study population head skin fungal infection was observed to be highly prevalent (77.5%). The study results also revealed that head skin fungal infection in females was with a higher prevalence of 53.1%. A study on the aetiology of Tinea capitis in school children in Kenya documented a prevalence of 54% in females which is similar to this current study finding with 52.8% [16]. The study results showed a significant association between skin fungal (site of infection) and females (sex) at p -value < 0.000 at head, body, face, hand, leg and groin. This current study is in line with a study that reported a significant association between site of infection and sex (female) in all leg, face, hands and groin [17].

Tinea skin fungal infections were found to be common in the highlands area of the country that possess a cold climate that include mainly Zoba Maekel, Anseba and Debub, than the areas with hot climate mainly western (Gash-Barka) and Eastern lowlands of the country. The study revealed a significant association (p -value < 0.000) between area of infection and geographic location (residential area) of the study participants. Eritrea is a country with four seasons. Based on the climate, the country is divided into three regions. Eritrea is a land of contrasts with land rising from below sea level to 3,000 meters above sea level. There are three major physiographic zones: the Western Lowlands (Gash-Barka), the Central and Northern Highlands (Zoba Maekel, Anseba and Debub) and the Eastern Lowlands (also referred to as the coastal Plains) that include; Semenawi-keih Bahri and Debubawi-keih Bahri. Temperature varies with altitude: the mean annual temperature ranges from 16°-18°C in the Highlands to 28°C and in the Lowlands to more than 30°C in the Coastal Plains. Most of the Western Lowlands and Coastal Plains are associated with hot and dry climatic conditions, while the Highlands are relatively cool. The study results showed a higher prevalence of Tinea skin fungal infections in the highlands (Zoba Maekel, Anseba and Debub) with a cold climate than the western lowlands (Gash-Barka) and Eastern Coastal areas with a hot climate. The study also

showed a significant association (p -value < 0.000) between head Tinea skin fungal infections (body area of infection) and highland areas with cold climate (geographic location) of the study participants. From all the sites of the body, skin fungal infections of the head were the predominating superficial skin fungal infection 77.5% (N=4280). Out of these 96.9% (N=4146) and the second highly prevalent was skin fungal infections of the body area 10.5% (N=581), which are mainly from the highland area (Zoba Maekel, Anseba and Debub) that possess a cold climate. The study result also showed a significant association between the highland geographic area and head fungal infection. Therefore, the present study has consistency with a study in Syria that indicated the seasonal increase of prevalence of Tinea corporis during winter and autumn which are months with cold season [14].

The frequency of disease and comorbidity of different Tinea skin fungal infections was found to be higher in females 50.5% (N= 2783) than males 49.5% (N=2732) a significant association was also observed at p -value < 0.00 . Considering the frequency of comorbidity of skin fungal infections among the study participants, the study results showed that majority (63.3%) had one type, 35.1% had two types and 1.6% had three types. The frequency of disease and comorbidity of different Tinea skin fungal infections was found to be higher in females 50.5% (N= 2783) than males 49.5% (N=2732) a significant association was also observed at p -value = 0.007 being a female and getting more than one Tinea skin fungal infection as comorbidity. The above study results are consistent with a study on prevalence and etiologic agents of dermatophytosis among primary school children in Ethiopia that documented a single, and a comorbid of two and three infections of Tinea capitis, Tinea corporis and Tinea unguium that shows a significant association between multiple disease occurrence and sex [15].

CONCLUSION

In Conclusion the study have revealed that the Tinea/superficial skin fungal infections are more common on the head and females. The results are significantly associated with female sex and cold climate or highlands area [geographic location (residential area)] at a p -value < 0.000 and p -value < 0.000 , respectively. The frequency of disease and comorbidity of different Tinea skin fungal infections was found to be higher in females than males and a significant association was also observed at p -value < 0.00 .

ACKNOWLEDGEMENTS

The author would like to thank to Mr. Elias Teages Adgoy (Department Head of Community Medicine and Primary Health Care Orotta College of Medicine and Health Sciences), the members of Halibet National Referral Hospital,

Dermatologic Clinic, Asmara, the State of Eritrea.

ETHICAL CONSIDERATIONS

Ethical approval for the research was obtained from Eritrea Institute of Technology Research and Postgraduate Studies, Mai-Nefhi, Eritrea

CONFLICTS OF INTEREST

The authors declare that there are no competing interests.

FUNDING

The author acknowledges the college of Sciences for funding the research.

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