

Epidemiological study of *Tinea corporis* in Al-Najaf City and the possible sources of infection

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ABSTRACT

Background and objectives. *Tinea corporis* is a common superficial fungal skin infection presenting complaints in daily practice that can lead to serious consequences caused by dermatophytes. This disease has a significant influence on public health and social life since its spread can be difficult to manage and has a high rate of recurrence. This study aims to determine the demographic characteristics and the possible source of infection with *Tinea corporis* in Al-Najaf City, Iraq.

Materials and methods. A cross-sectional study was conducted on 190 *Tinea corporis* patients from the 1st of April 2023 to the 31st of July 2023 in the three specialized hospitals in Al-Najaf city all these patients were subjected to a questionnaire developed by the researcher. The questionnaire includes 4 domains regarding sociodemographic characteristics, personal habits, housekeeping habits, and possible sources of infection of the participants.

Results. This study found that *Tinea corporis* affected both males and females equally in the study sample. While the age 20-29 and 30-39-years-old were the most highly affected (20% for each), the lowest was age ≥60 years old (7.1%). The possible source was the human-related possible source (31.1%), animal-related possible source (12.1%), soil-related possible source (5.8%), and among human-related possible source the household-related possible source was of 86.4%.

Conclusions. There was no domination of one gender upon the other regarding *Tinea corporis* infection. *Tinea corporis* affects post-puberty at the highest rates and the elderly at the lowest rates. The most possible source of infection was human-related and especially household-related.

Keywords: *Tinea corporis*, dermatophytosis, dermatology, skin diseases, possible source

Abbreviations

BMI – Body Mass Index

Cm – Centimeter

IQR – Inter Quartile Range

Kg – Kilogram

N – total population

n – subtotal population

SPSS – Statistical Package for the Social Sciences

INTRODUCTION

Fungi called dermatophytes can infiltrate keratinized tissues, leading to the superficial cutaneous illness known as dermatophytosis, which is also referred to as tinea or ringworm. The illness can be considered a zoonosis in a great deal of situations.

All dermatophytes linked with animals may indeed spread to humans [1].

Millions of individuals worldwide are afflicted by these infectious agents yearly; they often damage the hair, nails, scalp, and stratum corneum. Three ecological groupings of dermatophytes are identi-

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fied in the literature: anthropophilic, zoophilic, and geophilic [2]. Anthropophilic and zoophilic fungi are common etiologies of dermatomycoses, whereas geophilic fungi remain rare [3].

Over the past 100 years, there have been significant changes in the distribution of dermatophyte infections and the agents that cause them. These variations vary according to the region and are affected by many variables, including pharmacotherapy, socioeconomic status, seasonal immigration, expatriation, harsh weather, natural disasters, and climatic conditions. Other significant elements are altering lifestyles and personal cleanliness [4]. Dermatophytes are hence widespread in a variety of ecological settings. Human infections of all three types can result in dermatophytoses. Direct or indirect touch is how the dermatophytes are spread [5].

Dogs and cats are the most popular pets, and they might be the cause of zoophilic strains of *T. mentagrophytes* or *M. canis* infections [5]. Because tinea, also known as dermatophytosis, can affect the skin in a variety of places on the body, it is named differently depending on the affected location such as *Tinea unguium* on the nails, *Tinea capitis* on the scalp, *Tinea pedis* on the feet, *Tinea corporis* on the body and *Tinea cruris* on the groin [6].

Dermatophytosis affects between 20% and 25% of the population of the world, according to estimates, and its rates are increasingly growing. The majority of human infections are caused by around half of the forty dermatophyte species that have been identified. They are grouped into nine clades and arise from zoophilic, anthropophilic, and environmental origins, according to the most recent proposed taxonomy: Paraphyton, Guarromyces, Ctenomyces, Microsporum, Lophophyton, Arthroderma, Trichophyton, Epidermophyton, and Nannizzia are all examples of pathogens [7].

While the primary source of infection is typically considered to be from direct contact with infected humans or animals, the current study sheds light on novel and recent findings regarding possible sources of infection with *Tinea corporis* in Al-Najaf City, Iraq. This research is important for improving preventive strategies, target interventions and advancement in *Tinea corporis* research, which will contribute to the deeper understanding of *Tinea corporis* epidemiology. This study aimed to determine the demographic characteristics and the possible source of infection with *Tinea corporis* among study participants in Al-Najaf City, Iraq.

MATERIALS AND METHODS

Study setting and design

A cross-sectional study in which a sample was collected from the 1st of April 2023 to the 31st of July

2023 at Al-Sadir Medical City Hospital, Al-Hakeem General Hospital, and Al-Najaf Al-Ashraf Teaching Hospital in Al-Najaf City. These hospitals are located in Najaf City, Najaf Governorate, Iraq. They are governmental institutions that provide their services to Iraqi citizens. Najaf is located 160 km south of the capital of Iraq-Baghdad [8]. It occupied an area of 5,119 square kilometers and a population of 2,229,432 people [9]. Its weather is considered a hot desert climate [10].

Study Sample

One hundred ninety patients were diagnosed with *Tinea corporis* by dermatologists in the dermatology outpatient at the previously mentioned hospitals.

Sampling Method

A non-probability sampling method known as convenience sampling was used in this study.

Inclusion Criteria

Patients of both genders and ages who are visiting the dermatology outpatient clinic of one of the three hospitals in Al-Najaf City at the period of the study and were diagnosed with *Tinea corporis* are willing to participate in this study.

Exclusion Criteria

1. Patients who are unable or unwilling to adhere to the interview procedures, as their non-compliance may affect the validity of the data
2. Patients who suffered from another dermatologic condition other than dermatophytosis

Sample Size

A convenient sample size targeted 190 patients who attended dermatology outpatient clinics at the duration of the study and had been diagnosed with *tinea corporis* by a dermatologist.

Data Collection

The data was collected by interviews (face-to-face interviews) with people with *tinea corporis* for four months; forty days from each hospital using a researcher-designed questionnaire. This questionnaire included 4 sections: regarding sociodemographic characteristics of the study participants, personal habits, housekeeping habits, and possible source of infection [11-16]. A dermatologist recruited the information about the possible source of infection.

Statistical Analysis

A questionnaire was used to obtain the data. Code sheets are applied to store the answers to each question. Median, percentage, simple frequency, and inter quartile range (IQR) measures of the data

were reported. The Statistical Package for the Social Sciences (SPSS) version 29 was used for data analysis [17].

RESULTS

1. Distribution of *Tinea corporis* in the study sample according to Socio-demographic characteristics variables

The median and inter quartile rang of age were 30 years old and 18-42.25 respectively. The 20–29 and 30-39-year-olds had percentages that were the greatest of *Tinea corporis* rates (20% for each), while the lowest percentage (7.4%) was in the ≥ 60 year olds. 49.5% of them were male and 50.5% were fe-

male, the male-to-female ratio was almost equal; 34.2% with Body mass index (BMI) evaluated normal weight, 87.4% lived in urban areas, 27.4% had primary school education (or could read and write). The highest occupation frequency went with housewives accounting for 31.1%, while 45.8% went for occupations with no high risk of getting *Tinea corporis* or dermatophytosis. 62.6% of study participants were categorized with low socioeconomic status (Table 1).

2. Distribution of studies sample according to the possible source

The possible sources of infection were distributed among four possible sources (human-related,

TABLE 1. Distribution of *Tinea corporis* in the study sample according to socio-demographic characteristics variables (N=190)

Demographic Characteristics	Categories	N	%
Age (years)	<10	19	10
	10-19	35	18.4
	20-29	38	20
	30-39	38	20
	40-49	29	15.3
	50-59	17	8.9
	≥ 60	14	7.4
	Median (IQR)	30 (18-42.25)	
Sex	Male	94	49.5
	Female	96	50.5
Body mass index (Kg/m ²)	Underweight	11	5.8
	Normal weight	65	34.2
	Overweight	54	28.4
	Obese	60	31.6
	BMI (Kg/m ²); Median (IQR) (Range)	25.7 (21.9-29.9) (11.11-45.67)	
	Weight (Kg); Median (IQR) (Range)	75 (60-89) (5.0-139.0)	
Height (cm); Median (IQR) (Range)	168 (160-176) (58-186)		
Habitation type	Urban	166	87.4
	Rural	24	12.6
Education level	Illiterate	39	20.5
	Primary school	52	27.4
	Intermediate school	51	26.8
	High school	25	13.2
	College & Higher	23	12.1
Occupation field	Healthcare worker/ physician	3	1.6
	In contact with soil	5	2.6
	In contact with animals	2	1.1
	In an office	8	4.2
	Housewife	59	31.1
	Occupation contact with used clothes	2	1.1
Socioeconomic status	Low	119	62.6
	Middle	65	34.2
	High	6	3.2

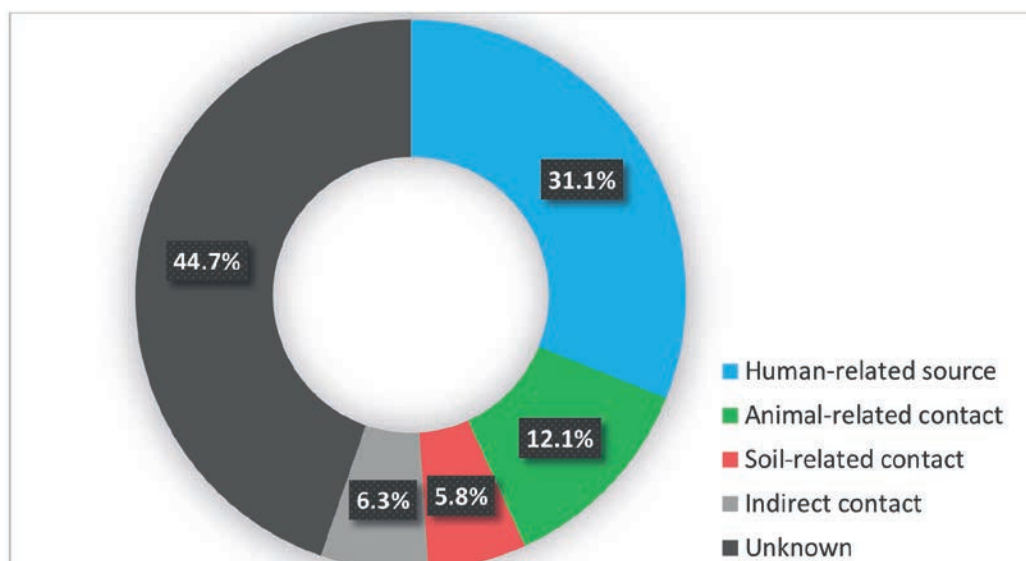


FIGURE 1. Distribution of studies sample according to the possible source (N=190)

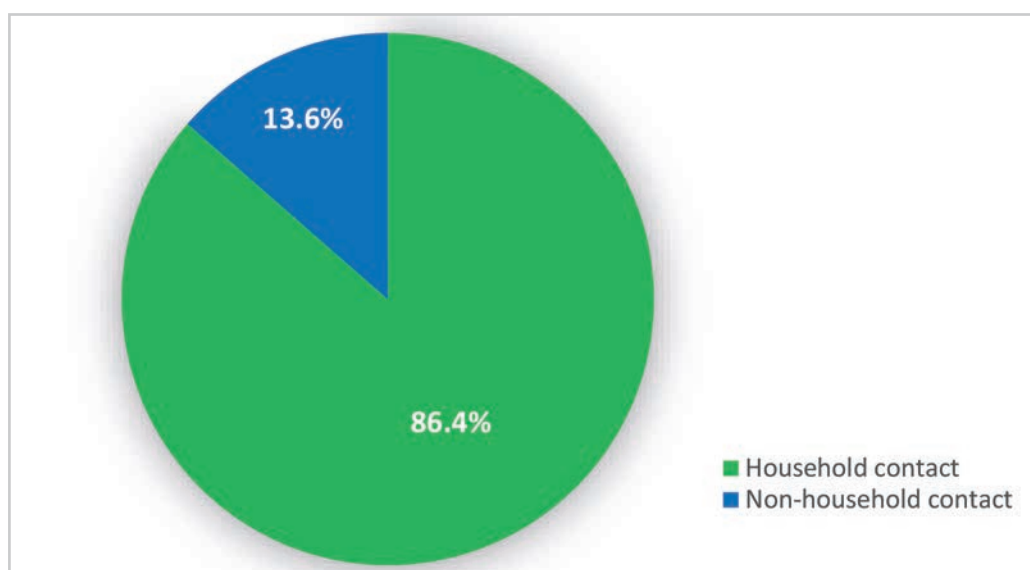


FIGURE 2. Proportion of household human-related possible source of *Tinea corporis* participants within the human-related possible source of infection (N=59)

animal-related, soil-related, or indirect contact source) that counted for 105 participants, (55.3%) but there were 85 participants (44.7%) with unknown possible sources of infection. The human-related source was the major possible source for all the study participants accounting for 31.3% (n=59), followed by the animal-related source accounting for 12.1% (n=23) (Figure 1).

The human-related possible source distributed between the household human-related possible source (86.4%) and non-household human-related possible source (13.6%) (Figure 2).

3. Some personal and housekeeping habits of the study sample

On the personal habits side, 23.1% (n=44) of participants owned animals, 45.3% (n=86) were sharing clothes or towels, 18.9% (n=36) were cigarette smok-

ers while on the housekeeping habits side, 83.7% (n=159) declared that their rooms had windows that were regularly opened for ventilation and 55.3% (n=105) allowed sunlight to enter directly indoors. 34.7% (n=66) of the study sample are always using vacuum cleaners during indoor cleaning and 87.4% (n=166) of them expose their mattresses and sheets to sunlight directly (Table 2).

DISCUSSION

In this study, the age groups 20-29 and 30-39 years old are the *Tinea corporis* most affected age groups with 38 (20%) for each, and the least affected age group was ≥ 60 years old, and this is similar to a study conducted in Kirkuk city in 2020 [18] and in Iran [19], and close to a study that conducted in Ethiopia where a 25-44 age group is the highest

TABLE 2. Some personal and housekeeping habits of the study sample (N=190)

Personal habits		N	%
Owning pet		32	16.8
Owning farm animal		12	6.3
Sharing clothes or towels		86	45.3
Engaging gym activities		11	5.8
Cigarette smoking	Current smoker	36	18.9
	Former smoker	6	3.2
	Nonsmoker	73	38.4
	Passive smoker	75	39.5
Housekeeping habits		N	%
Opening rooms' windows for ventilation		159	83.7
Windows allow direct sunlight to enter indoors		105	55.3
Using a vacuum cleaner for indoor cleaning	Always	66	34.7
	Sometimes	18	9.5
	Never	106	55.8
Exposing mattresses and sheets to sunlight directly when cleaning	Always	166	87.4
	Sometimes	2	1.1
	Rarely or Never	22	11.6

affected age group, whereas ≥ 60 is the least [20]. Age's median and IQR were 30 and 18-42.25.

The study sample doesn't show domination for one gender upon the other, 94 (49.5%) and 96 (50.5%) males and females respectively show to be infested with *Tinea corporis*, and those findings agree with Hillah's study [21].

The greater frequency of the study participant falls in overweight and obese BMI 60%, and the BMI's median and IQR were 25.7 and 21.9-29.9 respectively, compared to a study in Korea in which the results show trends toward increased incidence of dermatophytosis with increased body weight and vice versa [15]. This difference might be due to difference in the environment, climate, and personal factors or there is no correlation between BMI and dermatophytosis and *Tinea corporis*. Another reason is the current study's BMI results that may reflect the general population BMI.

The 166 (87.4%) *Tinea corporis* patients were urban in comparison to rural residents 24 (12.6%). This somewhat agrees with a previous study in Al-Najaf City by Al-Hmadani et al., 2014 that mentioned 76.43% of dermatophytosis patients were from an urban area and 23.57% were from a rural area. Still, it disagrees with a study conducted in Al-Anbar governorate [23] which may be due to urban residents are the vast majority of Al-Najaf City [24] and the urban area may be overcrowded in home, work, and school compared to a rural area.

The education levels of the study participants were 27.4% and 26.8% for primary and intermediate school levels of education respectively, both making the highest frequencies and this may be due to the early socialization and exposure to the environment while with low knowledge ages [25]. The

lowest frequency education level for infection with *Tinea corporis* was those with college and higher education levels was 12.1%. This may be due to increased awareness regarding health in general and personal hygiene in particular. The limited data on this parameter makes it impossible to compare these findings.

Housewife had the highest frequency of high-risk occupation for infection with *Tinea corporis* with a frequency of 31.1% agreeing with studies in Hilla City [21] and Al-Diwaniya City [26] whose findings reveal that housewife is the highest affected occupation with dermatophytosis.

The SES of the participants was 63% with low SES, 34% with moderate SES, and 3% with high SES. This might be due to the general demographic characteristics of the city which is consistent with a study in Hillah City of dermatophytosis [21].

In the current study, 31.1% of participants were suspected of human-related possible source, followed by 12.1% who were suspected of animal-related possible source and this results sequence was somehow consistent with the results showed by [4] in Tehran, Iran were the anthropophilic species were the predominant source of infection while zoophilic species came after.

This study shows that 86.4% of *Tinea corporis* participants with human-related possible source are of household and the rest of non-household-related possible source. This result agrees with a study declaring that having a family member with tinea is a definitive risk factor due to the contagious nature of the disease [27]. This result is novel in our study and may reveal that the probability of getting dermatophytosis and especially *Tinea corporis* from family or household for specific is more than its

probability from other people such as work colleagues due to sharing clothes, footwear, combs, or many other things, which is considered a significant factor in the household transmission of dermatophytosis [28].

In the personal habits, the study viewed that 23.1% of *Tinea corporis* cases were owning animals (16.8% own pets and 6.3% own farm animals), and animal rearing is considered a risk factor for getting dermatophytosis [5]. Sharing clothes or towels (45.3% of the study sample) also facilitated the transmission of infection, especially when 31.1% of the study participants had a human-related possible source. This may indicate that such bad habit may have played an important role in getting this percentage of cases infected with *Tinea corporis* [28]. In the housekeeping habits section, the study participant responses tend toward a good impression of these habits [29,30]. This is interesting because it goes against what is supposed to be a prevention measure for its human-to-human transmission that maybe it has a weak effect against human-to-human transmission. It requires more studies for the establishment of such a conclusion and our study was the first study that screened such parameters.

CONCLUSION

Tinea corporis infects both genders equally arises at post-puberty ages and depression in the elder-

ly. Many of the *Tinea corporis* patients in the study were from a low socioeconomic status population. The most common possible source is human-related possible source that is mostly from family or household source of infection, then animal-related possible source from pets. Bad personal habits like animal husbandry and sharing clothes or towels exist at noticeable rates. Study participants have good housekeeping habits rates even though they are infected with dermatophytes.

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Conceptualization: ARR, AMK DMA. Methodology: ARR. Software: ARR. Validation: AMK, DMA. Formal analysis, ARR. Investigation: ARR. Data curation: ARR. Writing—original draft preparation: ARR. Writing—review and editing: AMK, DMA. Visualization: ARR. Supervision: AMK, DMA. Project administration: ARR.

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REFERENCES

- Łagowski D, Gnat S, Nowakiewicz A, Osińska M, Trościańczyk A, Zięba P. In search of the source of dermatophytosis: Epidemiological analysis of Trichophyton verrucosum infection in llamas and the breeder. *Zoonoses Public Health*. 2019;66(8):982-9. <https://doi.org/10.1111/zph.12648>
- Gnat S, Łagowski D, Nowakiewicz A, Dyląg M. Tinea corporis caused by Trichophyton equinum transmitted from asymptomatic dogs to two siblings. *Braz J Microbiol*. 2020;51(3):1433-38. <https://doi.org/10.1007/s42770-019-00204-0>
- Baumgardner DJ. Fungal Infections From Human and Animal Contact. *J Patient Cent Res Rev*. 2017;4(2):78-89. <https://doi.org/10.17294/2330-0698.1418>
- Hassanzadeh Rad B, Hashemi SJ, Farasatinasab M, Atighi J. Epidemiological Survey of Human Dermatophytosis due to Zoophilic Species in Tehran, Iran. *Iran J Public Health*. 2018;47(12):1930-6. <http://ijph.tums.ac.ir>
- Segal E, Frenkel M. Dermatophyte infections in environmental contexts. *Res Microbiol*. 2015;166(7):564-9. <https://doi.org/10.1016/j.resmic.2014.12.007>
- Al-Khikani F. Dermatophytosis a worldwide contiguous fungal infection: Growing challenge and few solutions. *Biomedical and Biotechnology Res J*. 2020;4(2): 117–122. https://doi.org/10.4103/bbrj.bbrj_1_20
- Sacheli R, Cuyppers L, Seidel L, Darfouf R, Adjetej C, Lagrou K, et al. Epidemiology of Dermatophytes in Belgium: A 5 Years' Survey. *Mycopathologia*. 2021;186(3):399-409. <https://doi.org/10.1007/s11046-021-00542-4>
- Saadoon NB, Ali LH, Kadum SA. Knowledge and Practices of HealthCare Workers Regarding of Medical Waste Management in Hospitals of Al Najaf Governorate. *J Tech*. 2022;4(special issue):64-72. <https://doi.org/10.51173/jt.v4i33.633>
- Salih AM, Ah A, Al-Sarray M. Practices Regarding Human Papillomavirus and Cervical Cancer in A Sample of Paramedical Staff in Al-Najaf Governorate, Iraq. *J Tech*. 2022;4(special issue):45-51. <https://doi.org/10.51173/jt.v4i33.613>
- Majeed N, Ubaid A, Savore A, Al-Gburi J, Al-Haidarey M. The physical properties of Najaf province soils, Iraq. *Ecology, Environment and Conservation*. 2021;27(November Suppl. Issue):109-13.
- Keys A, Fidanza F, Karvonen MJ, Kimura N, Taylor HL. Indices of relative weight and obesity. *J Chron Dis*. 1972;25:329-43. [https://doi.org/10.1016/0021-9681\(72\)90027-6](https://doi.org/10.1016/0021-9681(72)90027-6)
- Leung AKC, Lam JM, Leong KF, Hon KL. Tinea corporis: An updated review. *Drugs Context*. 2020. <https://doi.org/10.7573/dic.2020-5-6>
- Omer W, Al-Hadithi T. Developing a socioeconomic index for health research in Iraq. *East Mediterr Health J*. 2017;23(10):670-7. <https://doi.org/10.26719/2017.23.10.670>
- Mattei AS, Beber MA, Madrid IM. Dermatophytosis in Small Animals. *SOJ Microbiol Inf Dis*. 2014;2(3). <https://doi.org/10.15226/sojmid/2/3/00124>
- Son JH, Doh JY, Han K, Kim YH, Han JH, Bang CH, et al. Risk factors of dermatophytosis among Korean adults. *Sci Rep*. 2022;12(1). <https://doi.org/10.1038/s41598-022-17744-5>
- Starace M, Carpanese MA, Alessandrini A, Piraccini BM, Patrizi A, Neri I. Tinea corporis incognito due to Microsporum Gypseum: Report of eight cases in children. *Pediatr Dermatol*. 2021;38(3):652-4. <https://doi.org/10.1111/pde.14573>
- Rahman A, Muktadir G. SPSS: An Imperative Quantitative Data Analysis Tool for Social Science Research. *IJRISS*. 2021;5(10):300-2.
- Abdulkareem HA, Khalaf HY, Mohammed BL. Epidimological Study of Dermatophytes Infection in Kirkuk City. *Ann Rom Soc Cell Biol*. 2022;26(1):343-52.

19. Ebrahimi M, Zarrinfar H, Naseri A, Najafzadeh MJ, Fata A, Parian M, et al. Epidemiology of dermatophytosis in northeastern Iran; A subtropical region. *Curr Med Mycol.* 2019;5(2):16-21. <https://doi.org/10.18502/cmm.5.2.1156>
20. Araya S, Tesfaye B, Fente D. Epidemiology of dermatophyte and non-dermatophyte fungi infection in Ethiopia. *Clin Cosmet Investig Dermatol.* 2020;13:291-7. <https://doi.org/10.2147/CCID.S246183>
21. Abed Ali FAH, Al-Janabi JKA, Alhattab MK. Prevalence of dermatophyte fungal infection in Hillah, Iraq. *Int J Chemtech Res.* 2017;10(6):827-37.
22. Al-Hamadani A, Al-Dhalimi M, Alrufae M. Epidemiologic study of Dermatophytosis in Al-Najaf government. *Magazin of Al-Kufa University for Biology.* 2014;6(1).
23. Turkey NM, Al-janabi AOF, Hassan AS. MRSA association with *Tinea corporis* in Al-Anbar governorate/ west of Iraq. *HIV Nursing.* 2023;23(1): 1000-4. <https://doi.org/doi.org/1031838/hiv23.01.169>.
24. Central Statistical Organization Iraq. https://cosit.gov.iq/ar/?option=com_content&view=article&layout=edit&id=1219 [Accessed 18th November 2023].
25. Shope TR. Infectious Diseases in Early Education and Child Care Programs. *Pediatr Rev.* 2014;35(5):182-93. <https://doi.org/10.1542/pir.35-5-182>
26. Al-Garawyi A, Al-Hamadani A, Waheed Al-Bederi A. Prevalence and Incidence of Dermatophytosis in Al-Diwaniya City, Iraq. *Indian J Forensic Med Toxicol.* 2021;15(2):1813-7. <https://doi.org/https://doi.org/10.37506/ijfmt.v15i2.14602>
27. Bhattacharya T, Datta J, Sen I, Patra AC, Roy S, Sarkar AP, et al. Perception Among the Sufferers of Recalcitrant Dermatophytosis Regarding its Causation, Prevention, Care-Seeking Behaviour and their Personal Hygiene: A Qualitative Research. *Indian Dermatol Online J.* 2022;13(1):52-9. https://doi.org/10.4103/idoj.idoj_211_21
28. Dalei S, Nayak D, Bhue P, Das N, Behera B. Current Status of Dermatophytosis: A Hospital-Based Study in Northern Odisha, India. *Cureus.* 2023;15(11):1-8. <https://doi.org/10.7759/cureus.48664>
29. Braga GUL, Rangel DEN, Fernandes ÉKK, Flint SD, Roberts DW. Molecular and physiological effects of environmental UV radiation on fungal conidia. *Curr Genet.* 2015;61(3):405-25. <https://doi.org/10.1007/s00294-015-0483-0>
30. Tang W, Kuehn TH, Simcik MF. Effects of Temperature, Humidity and Air Flow on Fungal Growth Rate on Loaded Ventilation Filters. *J Occup Environ Hyg.* 2015;12(8):525-37. <https://doi.org/10.1080/15459624.2015.1019076>