ECV Ciencia Ecuador
Revista científica multidisciplinar sobre Ciencias de la Salud, Naturales, Sociales y Formales

Albán G. et al.
ISSN 2697-3316

Aea: Health Sciences
Discipline: Medicine
Type of article: Original Article

Dermatophytosis in Guayaquil.

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Date submission: 02/01/2021

Date of approval: 03/22/2021

Date of publication: 04/05/2021

Source of funding

The authors received no specific funding for this work.

Conflict of interest

The authors declare that they have no conflict of interest in the publication of this article.

Suggested citation

Albán G, Parra-Vera H, Silva M, Fernández C, Illnait M. Dermatophytosis in Guayaquil. Rev Cien Ec. 2021;3(1); pp. 7-17. doi: 10.23936/rce.v3i1.24

Abstract

Introduction: Dermatophytoses are one of the most frequent causes why people attend medical appointments. They usually cause discomfort to those who suffer from them and complications in some cases, especially in diabetic and immunocompromised patients. **Materials and methods:** Prospective, descriptive cross-sectional study, from July 2013 to July 2017. Samples of nails, hair and skin scales were collected from patients having lesions in these structures. These were processed for direct examination, culture, and identification using conventional methods. Demographic and clinical data of the microbiologically confirmed cases were obtained from clinical records. **Results:** 2,286 samples were collected, of which 1,074 were positive. The 97.30% were positive through direct examination, and it was possible to identify the agent through culture in the 100% of the latter. The most frequent dermatophytes were Trichophyton rubrum (44 %), Trichophyton mentagrophytes (16%) and Microsporum canis (13%). Tinea unguium was the most frequent dermatophytosis (33.05%) followed by Tinea corporis (30.54%) and Tinea pedis (11.63%). The highest incidence was observed in females. **Conclusion:** The results indicate that about half of the patients having superficial lesions in Guayaquil presented dermatophyte infections, demonstrating the clinical-epidemiological relevance of this entity. The direct examination and culture of samples allowed to perform an accurate diagnosis in most of the cases, so the implementation of these methodologies could be very useful for prompt specific treatments.

Keywords: Dermatomycoses; tinea; Ecuador;

Resumen

Introducción: *Las dermatofitosis son una de las causas más frecuentes de consulta. Suelen ocasionar incomodidad a quienes la padecen y en algunos casos complicaciones, especialmente en pacientes diabéticos e inmunocomprometidos.* ***Materiales y métodos:*** *Estudio prospectivo, transversal descriptivo, entre julio de 2013 y julio de 2017. Se recopilaron muestras de escamas de piel, uñas y cabellos de pacientes con lesiones en dichas estructuras. Estas se procesaron para examen directo, cultivo e identificación mediante métodos convencionales. A partir de los registros clínicos se obtuvieron los datos demográficos y clínicos de los casos confirmados microbiológicamente.* ***Resultados:*** *Se obtuvieron 2286 muestras, de las cuales 1074 fueron positivas. El 97,30 % mostró examen directo positivo y en el 100 % de estas últimas se logró identificar el agente mediante el cultivo. Los dermatofitos más frecuentes resultaron Trichophyton rubrum (44 %), Trichophyton mentagrophytes (16 %) y Microsporum canis (13 %). Tinea unguium resultó la dermatofitosis más frecuente (33,05 %) seguida de Tinea corporis (30,54 %) y tinea pedis (11,63 %). El sexo femenino fue el de mayor incidencia.* ***Conclusión:*** *Los resultados sugieren que en Guayaquil cerca de la mitad de los pacientes con lesiones superficiales presentan infección por dermatofitos, lo que demuestra la relevancia clínico-epidemiológica de esta entidad. El examen directo y el cultivo de las muestras permiten realizar un diagnóstico certero en la mayoría de los casos por lo que la implementación de estas metodologías pudiera ser de gran utilidad en el tratamiento específico oportuno.*

Palabras clave: *Dermatomicosis; Tiña; Ecuador;*

Abstrato

Introdução: *As dermatófitoses são uma das causas mais freqüentes para que as pessoas compareçam às consultas médicas. Elas geralmente causam desconforto àqueles que sofrem delas e complicações em alguns casos, especialmente em pacientes diabéticos e imunocomprometidos.* ***Materiais e métodos:*** *Estudo transversal prospectivo e descritivo, de julho de 2013 a julho de 2017. Amostras de unhas, cabelos e escamas de pele foram coletadas de pacientes que apresentavam lesões nestas estruturas. Estas foram processadas para exame direto, cultura e identificação usando métodos convencionais. Os dados demográficos e clínicos dos casos microbiologicamente confirmados foram obtidos a partir de registros clínicos.* ***Resultados:*** *2.286 amostras foram coletadas, das quais 1.074 foram positivas. As 97,30% foram positivas através de exame direto, e foi possível identificar o agente através de cultura em 100% deste último. As dermatófitas mais freqüentes foram Trichophyton rubrum (44%), Trichophyton mentagrophytes (16%) e Microsporum canis (13%). A Tinea unguium foi a dermatofitose mais freqüente (33,05%) seguida pela Tinea corporis (30,54%) e Tinea pedis (11,63%). A maior incidência foi observada nas fêmeas.* ***Conclusão:*** *Os resultados indicam que cerca da metade dos pacientes com lesões superficiais em Guaiaquil apresentaram infecções dermatofitas, demonstrando a relevância clínico-epidemiológica desta entidade. O exame direto e a cultura de amostras permitiram realizar um diagnóstico preciso na maioria dos casos, de modo que a implementação destas metodologias poderia ser muito útil para tratamentos específicos rápidos.*

Palavras-chave*: Dermatomicoses; Tinha; Equador;*

Introduction

In general, superficial mycoses are a frequent cause why people attend medical appointments, in both dermatology and general medicine services. They cover a group of common conditions: dermatophytosis, candidiasis, pityriasis versicolor, ringworm, and stones (1). According to the World Health Organization, dermatophytoses have particularly shown an increase from 20 to 25% in the overall population and between 8 and 10% in the pediatric population (2). These mycoses are, perhaps, the most studied and the ones with most data available worldwide. For instance, approximately between 500 and 1,500 cases are registered in Brazil, Chile, and Venezuela each year (3). However, they are currently considered neglected infections by health systems. As they do not cause epidemics or serious danger to life, they are not monitored through surveillance and control programs (4).

As etiological agents of dermatophytoses, dermatophytes are a closely related group of fungal agents. Thanks to their keratinase, they can invade and infect the stratum corneum of skin and its annexes (hair and nails), as well as the surface of certain mucous membranes present in both human beings and some animals (5, 6). According to the source of keratin used, they are classified as geophilic, zoophilic, and anthropophilic, which matches their respective natural habitats and

determines both the epidemiology and the clinic they produce (6).

The host's immune response determines the infection resolution or progress. This causes a wide clinical spectrum, with diverse patterns of severity and progression of the infection produced by the same etiological agent (7).

It is important to determine the behavior of dermatophytoses in each region or country. In this way, it is possible to consider tineas records as a health problem, as well as establishing therapeutic schemes and taking effective preventive measures.

This paper sought to determine the incidence of dermatophytoses and their causal agents in Guayaquil, Ecuador. For this purpose, the clinical samples collected from patients having superficial lesions who were referred to the Microbiological Research Center (CIM by its Spanish initials) for 4 years, were studied. These data are vital for a proper treatment of affected patients, and they could highlight the relevance of this health problem in this city.

Materials and methods

An observational, prospective cross-sectional, descriptive study was performed from July 2013 to July 2017 in Guayaquil, Ecuador.

The scope of the study consisted of all skin, hair and nails samples collected from patients having superficial lesions, which were sent to the mycology area of the CIM.

A portion of each clinical sample was treated with 20% potassium hydroxide (KOH), and analyzed through a direct microscopic examination using a 40X lens. Concurrently, another portion was inoculated in tubes containing Sabouraud dextrose agar (SDA) and then, SDA with chloramphenicol and cycloheximide (Mycosel) by tripled. They were incubated at 25 - 2 oC, and read twice at 7 and 15 days respectively.

The identification of cultures was essentially based on the observation of macro- and micro-morphology, following the taxonomic keys described by Cabañes (2001) and Guarro (2012) (8, 9).

Demographic (age and sex) and clinical-epidemiological (type and location of lesions) data of patients microbiologically diagnosed with dermatophytosis, were extracted from the CIM records.

The study protocol was approved by the Ethics Committee of the Hospital of the Babahoyo Social Security Institute, IESS-HG-BA-DTMC-2020 CODE 009.

Results

During the period of study, 2,286 skin, hair and nail samples were received at the CIM. Of these, 1,074 (46.98%) were positive, having compatible fungal structures for dermatophytic filamentous fungi.

Direct microscopic examination of samples: It showed the presence of septate macrosiphonated hyaline filaments in 1,074 samples (46.98%). Most of the samples were obtained from skin scales (n = 548), taken from the forehead, cheekbone, neck, upper extremities, hands, anterior thorax, posterior thorax, buttocks, groin, lower extremities, and feet; followed by nail scraping samples (n = 355) taken from hands and feet; and hair samples (n = 171) taken from the head, beard, mustache, and pubic area. (See table 1.)

Cultures: After one week of inoculation by tripled, the positivity in SDA regarding direct examination represented the 97.95% (n = 1,052), while in Mycosel was 98.70% (n = 1,060). The second reading of cultures at 15 days allowed to obtain the 100% of etiological agents. (See table 2.)

Species identification: Following a decreasing order, the most frequent dermatophytes were Trichophyton rubrum (44%), Trichophyton mentagrophytes (16%), Microsporum canis (13%), and Trichophyton tonsurans (11%). Less frequently, Microsporum gypseum, Trichophyton sp., Epidermophyton floccosum, Microsporum sp., and Trichophyton violaceum were obtained. (See table 3.)

From the total, 469 (21%) belonged to yeasts and 262 (11%) to other non-dermatophyte filamentous fungi.

When grouping the type of sample and the etiological agent obtained, it was found that most of positive samples came from toenail scrapings (T. rubrum and T. mentagrophytes), head scales (M. canis and Microsporum sp.), fingernail dust (T. tonsurans), skin scales of feet (E. floccosum and Trichophyton sp.), skin scales of legs (M. gypseum), and beard hair (T. violaceum). (See tables 2 and 3.)

Clinical data: tinea unguium was the most frequent clinical form, followed by tinea corporis, tinea pedis, tinea capitis, tinea facei, tinea manuun, tinea cruris, and tinea barbae. (See table 4.)

Demographic data: From the total of positive samples for dermatophytes, 551 belonged to women, which shows a ratio of 1.05 regarding males. Individuals between 36 and 60 years old (average age = 49 years) represented

the 45% of patients microbiologically confirmed with dermatophytosis.

Table 1.- Correlation between type of sample and percentage of positivity found

	Sample collection area	July – december 2013			january – december 14			January – december 15			January – december 16			January – december 17			Total, isolates		
		total	positive	[1]%	total	positive	%	total	positive	%	total	positive	%	total	positive	%	total	positive	%
Skin	Front	7	5	71%	10	8	80%	*25*	*12*	*48%*	*42*	*17*	*40%*	*6*	*4*	*67%*	*90*	*46*	*51%*
	Cheekbone	5	2	40%	12	6	50%	*18*	*10*	*56%*	*35*	*13*	*37%*	*7*	*6*	*86%*	*77*	*37*	*48%*
	Cuello	6	4	67%	12	7	58%	*32*	*21*	*66%*	*65*	*32*	*49%*	*11*	*6*	*55%*	*126*	*70*	*56%*
	Superior Limbs	5	2	40%	22	10	45%	*12*	*4*	*33%*	*55*	*21*	*38%*	*14*	*8*	*57%*	*108*	*45*	*42%*
	Hands	7	2	29%	21	9	43%	*15*	*7*	*47%*	*34*	*10*	*29%*	*13*	*4*	*31%*	*90*	*32*	*36%*
	Anterior thorax	5	1	20%	34	9	26%	*22*	*6*	*27%*	*31*	*13*	*42%*	*7*	*5*	*71%*	*99*	*34*	*34%*
	Posterior thorax	11	2	18%	48	15	31%	*42*	*15*	*36%*	*56*	*27*	*48%*	*14*	*8*	*57%*	*171*	*67*	*39%*
	Buttocks	6	1	17%	17	8	47%	*22*	*6*	*27%*	*43*	*19*	*44%*	*12*	*7*	*58%*	*100*	*41*	*41%*
	Groin	4	0	0%	12	6	50%	*15*	*4*	*27%*	*38*	*11*	*29%*	*12*	*4*	*33%*	*81*	*25*	*31%*
	Lower extremities	2	0	0%	30	11	37%	*9*	*3*	*33%*	*36*	*7*	*19%*	*8*	*5*	*63%*	*85*	*26*	*31%*
	Feet	10	5	50%	57	21	37%	*54*	*23*	*43%*	*102*	*60*	*59%*	*24*	*16*	*67%*	*247*	*125*	*51%*
	TOTAL	68	24	35%	275	110	40%	266	111	*42%*	537	230	*43%*	128	73	*57%*	*1274*	*548*	*43%*
Nails	Finger nails	17	7	41%	32	20	63%	*64*	*28*	*44%*	*82*	*52*	*63%*	*32*	*16*	*50%*	*227*	*123*	*54%*
	Toenails	35	11	31%	68	42	62%	*120*	*66*	*55%*	*176*	*82*	*47%*	*45*	*31*	*69%*	*444*	*232*	*52%*
	TOTAL	52	18	35%	100	62	62%	184	94	*51%*	258	134	*52%*	77	47	*61%*	*671*	*355*	*53%*
Hair	Head	10	3	30%	28	14	50%	*46*	*33*	*72%*	*74*	*37*	*50%*	*28*	*14*	*50%*	*186*	*101*	*54%*
	Beard	5	2	40%	4	3	75%	*15*	*7*	*47%*	*35*	*10*	*29%*	*5*	*3*	*60%*	*64*	*25*	*39%*
	Pubis	4	0	0%	12	3	25%	*27*	*10*	*37%*	*43*	*29*	*67%*	*5*	*3*	*60%*	*91*	*45*	*49%*
	TOTAL	19	5	26%	44	20	45%	88	50	*57%*	152	76	*50%*	38	20	*53%*	*341*	*171*	*50%*
	Consolidated	139	47	34%	419	192	46%	538	255	*47%*	947	440	*46%*	243	140	*58%*	*2286*	*1074*	*47%*

[1] pertentage. Skin 548/51%; Nails 355/33%; Hair 171/16%

Table. 2 – Relationship between type of sample and agents, isolation percentage.

	Study period	July – December 2013		January – December 14		January – December 15		January – December 16		January – December 17		Total, isolates
Type of sample	*Identified agent*	n	%	n	%	n	%	n	%	n	%	n
Skin	*Trichophyton rubrum*	8	33%	*22*	*20%*	*35*	*32%*	*84*	*37%*	*23*	*32%*	*172*
	Trichophyton mentagrophytes	4	17%	*32*	*29%*	*18*	*16%*	*40*	*17%*	*13*	*18%*	*107*
	Trichophyton tonsurans	1	4%	*12*	*11%*	*8*	*7%*	*29*	*13%*	*6*	*8%*	*56*
	Trichophyton sp.	2	8%	*6*	*5%*	*3*	*3%*	*4*	*2%*	*3*	*4%*	*18*
	Epidermophyton floccosum	1	4%	*8*	*7%*	*10*	*9%*	*13*	*6%*	*3*	*4%*	*35*
	Microsporum canis	5	21%	*16*	*15%*	*21*	*19%*	*36*	*16%*	*11*	*15%*	*89*
	Microsporum gypseum	2	8%	*10*	*9%*	*11*	*10%*	*21*	*9%*	*12*	*16%*	*56*
	Microsporum sp.	1	4%	*4*	*4%*	*5*	*5%*	*3*	*1%*	*2*	*3%*	*15*
TOTAL		24	100%	110	100%	111	100%	230	100%	73	100%	*548*
Nails	*Trichophyton rubrum*	9	50%	40	65%	56	60%	*89*	*66%*	*36*	*77%*	*230*
	Trichophyton mentagrophytes	2	11%	8	13%	19	20%	*21*	*16%*	*2*	*4%*	*52*
	Trichophyton tonsurans	3	17%	6	10%	10	11%	*15*	*11%*	*5*	*11%*	*39*
	Trichophyton sp.	3	17%	*5*	8%	*7*	7%	*5*	*4%*	*4*	*9%*	*24*
	Epidermophyton floccosum	1	6%	3	5%	2	2%	*4*	*3%*	*0*	*0%*	*10*
TOTAL		18	100%	62	100%	94	100%	134	100%	47	100%	*355*
Hair	*Trichophyton rubrum*	2	40%	4	20%	23	46%	28	37%	10	50%	67
	Trichophyton tonsurans	0	0%	3	15%	4	8%	12	16%	0	0%	19
	Trichophyton violaceum	0	0%	0	0%	0	0%	1	1%	0	0%	1
	Trichophyton sp.	1	20%	2	10%	3	6%	3	4%	2	10%	11
	Trichophyton mentagrophytes	0	0%	1	5%	3	6%	8	11%	2	10%	14
	Microsporum canis	1	20%	8	40%	15	30%	21	28%	5	25%	50
	Microsporum sp.	1	20%	2	10%	2	4%	3	4%	1	5%	9
TOTAL		5	100%	20	100%	50	100%	76	100%	20	100%	171
	Dermatophytes	47	33%	192	45%	255	50%	440	46%	140	57%	1074
	Yeasts	37	26%	85	20%	102	20%	224	23%	21	9%	469
	Others	36	25%	55	13%	53	10%	89	9%	29	12%	262
	Negative	24	17%	92	22%	102	20%	206	21%	57	23%	481

Total of simples received	144	100%	424	100%	512	100%	959	100%	247	100%	2286

Table 3.- Correlation between isolated agent and type of sample.

Isolated agent	SKIN																						NAILS				HAIR							
	F	%	CH	%	C	%	ES.	%	H	%	AT	%	PT	%	B	%	G	%	LE	%	F.	%	FN	%	T	%	H	%	B	%	Pu	%	n	%
Trichophyton rubrum	29	3	21	2	19	2	11	1	23	2	0	0	6	1	22	2	12	1	1	0	77	7	56	5	154	14	12	1	11	1	15	1	469	44
Trichophyton mentagrophytes	11	3	12	1	8	1	8	1	3	0	0	0	0	0	6	1	6	1	1	0	23	2	26	2	53	5	7	1	7	1	2	0	173	16
Microsporum canis	0	0	0	0	24	1	6	1	0	0	17	2	31	3	2	0	0	0	0	0	0	0	0	0	0	0	52	5	1	0	6	1	139	13
Trichophyton tonsurans	0	0	0	0	6	1	0	0	0	0	8	1	15	1	3	0	0	0	2	0	0	0	36	3	13	1	19	2	1	0	11	1	114	11
Microsporum gypseum	0	0	0	0	3	0	14	1	0	0	4	0	9	1	4	0	0	0	16	1	0	0	0	0	0	0	0	0	0	0	6	1	56	5
Trichophyton sp.	6	1	4	0	3	0	2	0	3	0	2	0	1	0	3	0	3	0	2	0	7	1	1	0	6	1	3	0	4	0	3	0	53	5
Epidermophyton floccosum	0	0	0	0	2	0	3	0	3	0	1	0	2	0	1	0	4	0	1	0	18	2	4	0	6	1	0	0	0	0	0	0	45	4
Microsporum sp.	0	0	0	0	5	0	1	0	0	0	2	0	3	0	0	0	0	0	3	0	0	0	0	0	0	0	8	1	0	0	2	0	24	2
Trichophyton violaceum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Total	46	4	37	3	70	7	45	4	32	3	34	3	67	6	41	4	25	2	26	2	125	12	123	11	232	22	101	9	25	2	45	4	1074	100

% Porcentaje. *F=front CH= Cheekbone C=cuello SL= Superior limbs H=Hands AT= Anterior thorax PT= Posterior thorax B=Buttocks GI=Groin LE=Lower extremities F=feet FN=Finger nails T=toenails H=Head B=beard Pu= Pubis

Table 4.- Frequency of *tinea* taking into account the period from July 2013 to July 2017.

Study period	*Tinea corporis*	%	*Tinea unguium*	%	*Tinea pedis*	%	*Tinea capitis*	%	*Tinea cruris*	%	*Tinea manuun*	%	*Tinea facei*	%	*Tinea barbae*	%	*Total*	%
July – December 2013	10	1%	18	2%	5	0%	3	0%	0	0%	2	0%	7	1%	2	0%	47	4%
January-December 2014	63	6%	62	6%	21	2%	14	1%	6	1%	9	1%	14	1%	3	0%	192	18%
January-December 2015	65	6%	94	9%	23	2%	33	3%	4	0%	7	1%	22	2%	7	1%	255	24%
January-December 2016	148	14%	134	12%	60	6%	37	3%	11	1%	10	1%	30	3%	10	1%	440	41%
January -July 2017	42	4%	47	4%	16	1%	14	1%	4	0%	4	0%	10	1%	3	0%	140	13%
Total	328	31%	355	33%	125	12%	101	9%	25	2%	32	3%	83	8%	25	2%	1074	100%

Discussion

Superficial mycosis lesions affect 1.5 million people, equivalent to 25% of the world population (7, 10-12). Both, the etiology, and the source of infection are varied. The region of the Americas has a high prevalence, especially in tropical and subtropical areas, where the 25% are associated with risk factors, including occupation of the population, self-medication, and empirical evidence (13-15). The geographical location of Ecuador particularly provides good weather conditions for the development of these mycoses (16). The globalization imposed by the current socio-economic and cultural development establishes a new reality that requires a deeper understanding of imported diseases and the introduction of foreign etiological agents (5, 17-19).

The common feature of dermatophytes is tropism due to keratinized tissues; reason by which skin scales, nail scraping, and fragments of hair including roots, are the ideal samples (19-23). During the 4 years of this study, about half of the samples processed at the CIM for suspicion of dermatophytosis were taken from skin, followed by nails, and thirdly hair. This relationship matches the findings of other authors (22, 24, 25). However, according to Torres et al, toenail samples presented the highest positivity (13).

Generally, mycoses diagnosis is made under clinical suspicion, and after being checked through direct examination of fresh material taken from the location of the lesion, as well as through the isolation and identification of the fungus from culture (7). The techniques used for this purpose are affordable and easy to apply. The main limitations include providing certain recommendations to patients, as well as a necessary training to lab technicians for visualizing fungal structures. In turn, culture requires prolonged incubation periods, which delays diagnosis and treatment (4, 7, 21, 26-30).

About half of samples taken from patients with suspicion of dermatophytosis analyzed in this study, were positive through direct examination with 20% KOH. These results show the usefulness and applicability of this procedure for the diagnosis of these infections when it is performed by properly trained personnel.

Traditional mycological culture media do not always have satisfactory results (26). In the case of dermatophytes, SDA has been used since 1894, which can be prepared with some variants that allow to presumptively identify and isolate this group of micromycetes (31, 32). The collection of samples is higher when this medium contains chloramphenicol and cycloheximide due to the inhibiting effect of bacteria and other non-dermatophyte filamentous fungi respectively, which could be present in clinical material as part of the microbiota (33, 34). During the study, it was found that the 100% was collected regarding the positive direct examination when using the medium with inhibitors. This shows the effectiveness of culture media used.

During the study, 1,074 samples were identified. The collected agents represented the three sources of origin of dermatophytes: anthropophilic, geophilic and zoophilic. In the latter case, the history of contact with animals as primary source of the disease could not be determined from medical records.

The frequency of agents collected in this paper matches the findings of the multicenter study by Relloso et al., who demonstrated the prevalence of T. rubrum, T. mentagrophytes and T. tonsurans (86.1%) in nail samples (34).

The presence of dermatophytes depends on several factors, for instance, environmental, occupational and sociocultural factors, hygiene habits and host susceptibility, among others. In the case of host susceptibility, it is important to consider the immune factor in each individual, which makes the difference between the resolution or progress of the disease (23, 25, 35, 36). All together have different behaviors in each region (4, 11, 23, 26). Agents of geophilic and zoophilic origin predominate in Serbia (4, 14), anthropophilic and zoophilic in China (20), and more than half of the agents are associated with anthropophilic sources in Canada (27).

In Ecuador, there are several known studies that register T. mentagrophytes as an etiological agent. Most of them correspond to theses from different specialties (39-43). In 2019, a seven-year review was presented. This included 6,031 samples and suggested the prevalence of dermatophytes (61%), among which the Trichophyton and Microsporum genera stood out. The latter was directly associated with tinea capitis (37).

The results of this study determined that tinea unguium is the most frequent clinical form followed by tinea corporis, tinea pedis, and other less frequent infections. Published evidence from other countries in the region agrees with this finding (38, 39).

Published works from Venezuela and Argentina also demonstrate the prevalence of the T. rubrum and T. mentagrophytes complexes, followed by M. canis and E. floccosum. However, clinical manifestations bear no relation to the agent (25, 40). The

research done by Pontes et al., allowed to isolate and relate agents in Brazil according to their geophilic source: T. terrestrial (31.3%) and M. gypseum (21.4%); zoophilic: M. nanum and T. ajelloi; and anthropophilic: T. mentagrophytes var. mentagrophytes (31.3%), T. verrucosum (7.6%), and T. tonsurans (35).

The relationship between sex and age is a controversial factor. In this paper, a proportion of 1: 1.05 predominantly in females was demonstrated in ages close to the fifth decade of life, similar to what other authors describe. Previous studies in Ecuador show that women are 1.2 times more affected than men (24, 41). However, this relationship may vary according to the type of work performed by individuals (32, 42, 43).

Coincidentally, Iranian women are the most affected, and this infection is frequently found in >50-year-old adults (33, 34). On the other hand, Senegal also registers a higher incidence of this disease in women, but at earlier ages (average age 33.17 years) (38). However, these patterns vary from region to region. In the onychomycosis study in Milan, Veraldi et al. observed an increase of this pathology in males with an average age of 57 years (36), while it was more frequent in Venezuela between 20 and 35 years, regardless of sex (39, 44).

Conclusions

This analysis allowed an approach to the knowledge on the incidence of dermatophytoses and their causal agents in Guayaquil. The results indicate that about half of the patients studied and having superficial lesions were infected by dermatophytes, especially adult women. This demonstrates the clinical-epidemiological relevance of this entity. The direct examination and culture of samples allowed to perform an accurate diagnosis in most of the cases, so the implementation of these methodologies could be very useful for prompt specific treatments.

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