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Worldwide distribution of *Trichophyton rubrum* and other dermatophytes in the different health conditions of global population: A Systematic Review

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Abstract

This review aims to provide an overview of the worldwide prevalence of *Trichophyton rubrum* and other dermatophytes and the infections caused according to population groups. The systematic review was performed following PRISMA guidelines. The search terms were: (trichophyton) OR (trichophyton AND rubrum) AND (prevalence), adapted to five databases accessed (PubMed, Lilacs, Scielo, Web of Knowledge and Scopus). In this review, the database of 98 articles from 41 countries was created. The articles were subdivided according to population groups (underlying disease, risk group, age group). A map was constructed containing the worldwide distribution of *T. rubrum* according to the population groups. It is also discussed the implications of dermatophytosis in patients with comorbidities, along with the second most prevalent dermatophyte worldwide. The main causative agents of dermatophytosis worldwide are the cosmopolitan species, and while the global mean for this disease are 20 - 25%, for the subsets of the population with immunosuppressive diseases or other predisposing factors the mean are 10% above. Besides that, this subset of population is the most susceptible to chronic dermatophytosis. Other dermatophytes most prevalent in the world than as *T. rubrum* were *Trichophyton mentagrophytes*, followed by *Microsporum canis*, *Trichophyton interdigitale* and *Epidermophyton floccosum*.

Keywords: *Trichophyton*; Prevalence; *Trichophyton rubrum*; Dermatophytosis.

Distribuição mundial de *Trichophyton rubrum* e outros dermatófitos nas diferentes condições de saúde da população global: uma revisão sistemática. Esta revisão tem como objetivo fornecer uma visão geral da prevalência mundial de *Trichophyton rubrum* e outros dermatófitos e as infecções causadas de acordo com os grupos populacionais. A revisão sistemática foi realizada seguindo as diretrizes do PRISMA. Os termos de busca foram: (trichophyton) OR (trichophyton AND rubrum) AND (prevalência), adaptado para cinco bases de dados acessadas (PubMed, Lilacs, Scielo, Web of Knowledge e Scopus). Nesta revisão, foi criada a base de dados de 98 artigos de 41 países. Os artigos foram subdivididos de acordo com grupos populacionais (doença de base, grupo de risco, faixa etária). Um mapa foi construído contendo a distribuição mundial de *T. rubrum* de acordo com os grupos populacionais. Também são discutidas as implicações da dermatofitose em pacientes com comorbidades, juntamente com o segundo dermatófito mais prevalente no mundo. Os principais agentes causadores de dermatofitose em todo o mundo são as espécies cosmopolitas, e embora a média global para esta doença seja de 20 a 25%, para

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os subconjuntos da população com doenças imunossupressoras ou outros fatores predisponentes a média é 10% acima. Além disso, esse subgrupo da população é o mais suscetível à dermatofitose crônica. Outros dermatófitos mais prevalentes no mundo além do *T. rubrum* foram *Trichophyton mentagrophytes*, seguido por *Microsporum canis*, *Trichophyton interdigitale* e *Epidermophyton floccosum*.

Palavras-Chave: *Trichophyton*; Prevalência; *Trichophyton rubrum*; Dermatofitose

1. Introduction

In superficial and cutaneous mycoses, dermatophytes (Onygenales: Arthrodermataceae) are frequently found to be the causative etiological agents. It is estimated that about 20-25% of the world's population carries a dermatophyte infection (Hayette and Sacheli 2015).

Trichophyton is the genus with the most anthropophilic pathogenic species. *Trichophyton rubrum* is the most prevalent cause of dermatophytosis in the world, and in some cases can cause chronic, non-, or mild inflammatory infections (Vishnu et al. 2015; P. Zhan et al. 2018; Ping Zhan and Liu 2017).

Despite its prevalence, there is a gap in the knowledge about *Trichophyton* infections in the world due to a lack of studies with a common approach. Because of the diversity of the methodologies used, it is not possible pool the studies to determine *Trichophyton* prevalence. Therefore, this review aims to provide an overview of the worldwide prevalence of *T. rubrum* and other dermatophytes and the infections caused according to population groups.

2. Methods of Systematic Literature Review

2.1.Eligibility criteria

The systematic literature review was conducted following PRISMA (Moher et al. 2015) guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which steps are presented in Figure 1.

An electronic literature search was performed using the following search question: *What is the prevalence of dermatophytosis caused by Trichophyton rubrum?* The search terms were: (trichophyton) OR (trichophyton AND rubrum) AND (prevalence), adapted to each database accessed (Table 1).

Table 1. Search terminology used in literature review, according to database

Database	Search terms for'*Trichophyton*'or '*Trichophyton rubrum*'	AND	Search terms for 'Prevalence'
PubMed	trichophyton [MeSH Terms] OR "Trichophyton rubrum" [All Fields]		Prevalence [Mesh]
Lilacs	mh:(trichophyton)) OR (tw:(Trichophyton rubrum))		mh:(Prevalence)
Scielo	(trichophyton) OR (Trichophyton rubrum)		Prevalence
Web of Knowledge	Topic:(trichophyton rubrum)		Topic:(Prevalence)
Scopus	TITLE-ABS-KEY (trichophyton) OR ALL (trichophyton AND rubrum)		TITLE-ABS-KEY (prevalence)

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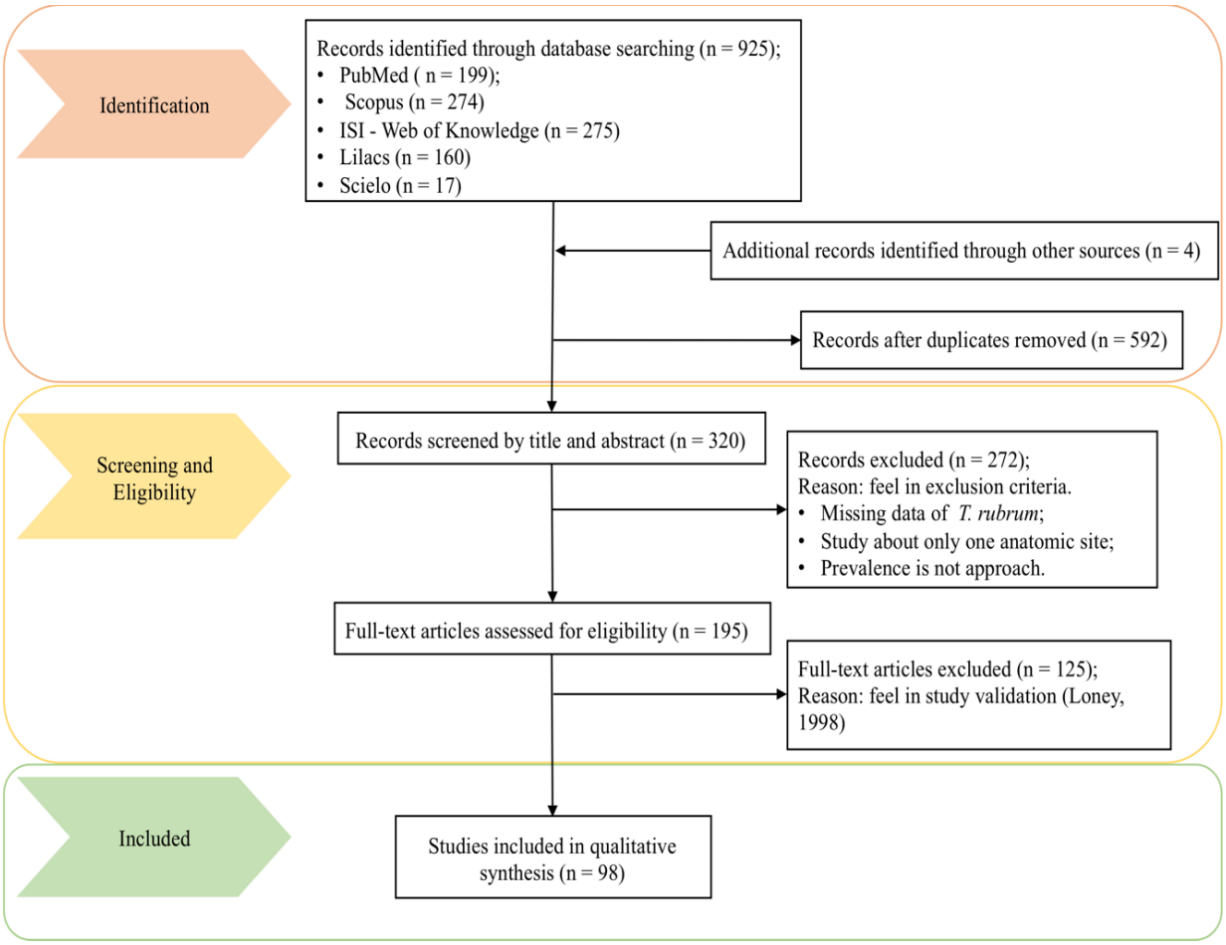

Figure 1. Flowchart of steps in Systematic Literature Review.

2.2. Data extraction

The data were gathered on May 24th, 2018, into a five-bibliography database. The results from the databases were merged and duplicates were removed. Two independent researchers proceeded with article selection, and discrepancies were included. Editorials, reviews, commentaries, brief communications, and opinion pieces were excluded, and all data about *Trichophyton rubrum* and the prevalence of dermatophytes were included with no language-based limitations. Additional articles of interest were identified from the references of included articles. Publications were limited to human dermatophytosis.

The literature search resulted in 925 publications, and after removal of duplicates, 592 publications underwent the steps of systematic review. Two authors reviewed titles and abstracts and identified 195 records to include for full-text reading. As inclusion criteria, the publications were submitted to a validation instrument, and those with a score of five or higher than five were included (Loney et al. 1998).

Data extracted from the full texts was inputted into a Microsoft Excel spreadsheet, guided by an instrument of data extraction created for this review (the product of this work is in a Table S1 - Supplementary data A).

2.3. Scope of the study

The scope of this review was the worldwide prevalence of human dermatophytosis, caused primarily by *T. rubrum*, and the infections caused according to population groups. Since the prevalence itself is

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difficult to find in literature, distribution was analogous to prevalence.

2.4. Data analysis

From the created database, containing all the publication included in this review, the frequency of dermatophytosis was calculated, considering *Trichophyton rubrum* infection and other dermatophytes species (such as *T. erinacei*, *T. tonsurans*, *T. interdigitale*, *T. violaceum*, *T. mentagrophytes*, *T. schoenleinii*, *T. verrucosum*, *T. simii*, *T. soudanense*, *T. equinum*, *T. concentricum*, *Microsporum canis*, *Microsporum gypseum*, *Microsporum audouinii*, and *Epidermophyton floccosum*).

A map of the frequency distribution of *T. rubrum* was created by SimpleMappr (Shorthouse 2010), an online tool for publications, using point data with decimal degrees coordinates for each city studied. The frequency distribution for other species was plotted in Excel version 16.23, using its graph tool.

A table with study descriptions is presented (Table S2 - supplementary data B) containing the following data: author and year; country; type of study; size of population; prevalence of dermatophytosis; and *T. rubrum* infection prevalence.

As comorbidities are relevant for the explanation of *Trichophyton* infections, a table was built to show the most frequent comorbidities reported in the studies.

The frequency distributions of dermatophytosis for each country from the studies included in this review were plotted in Excel using the dynamic graph tool.

3. Results and Discussion

This review included 98 out of the 195 publications selected for full-text reading, of which a descriptive overview is presented in Table S2 (supplementary data B). A map shows the distribution of *Trichophyton rubrum* prevalence for each city studied (Figure 2). The infections were grouped by similarities, such as size of the *T. rubrum* isolates (over 10,000; 3,000 to 9,999; 300 to 2,999; under 299) along with the following conditions: children; HIV-status; comorbidities; children with skin disorders; chronic dermatophytosis; and renal transplant.

There were few prevalence studies on dermatophytosis caused by *T. rubrum* in North America. Most of the studies only examined dermatophytosis occurring on specific anatomic site (Auger et al. 2009; Gupta, Fleckman, and Baran 2000; Gupta et al. 2000; Jimenez-Gonzalez et al. 2013; Manzano-Gayosso et al. 2008), and were therefore excluded from this review.

The earliest study found in this review on the prevalence of dermatophytosis caused by *T. rubrum* in North America was in Canada (Dion and Kapica 1975) and consisted of a retrospective study from 1963 to 1973. In this study, double infections were reported at the same anatomical site caused by *T. rubrum* and *E. floccosum*, *T. rubrum* and *T. mentagrophytes,* or *T. rubrum* and *M. canis*.

In 2006, a retrospective study was done in Mexico (Welsh et al. 2006), where *T. rubrum* was frequently isolated in dermatophytosis, with tinea pedis being the most commonly found lesion type.

In the USA, a retrospective study was conducted in which *T. rubrum* was the second-most isolated etiological agent in dermatophytosis, the first being *T. tonsurans*. However, that study highlighted a high and increasing incidence of dermatophytosis caused by *T. violaceum* and *T. soudanense* (Magill et al. 2007).

In most of the studies included in this review, *T. rubrum* was frequently isolated from dermatophytosis in Europe and the Middle East (Figure 2). In Asia, the most numerous cases of dermatophytosis occurred in India and South Korea. The data in this review are in accordance with (Hayette and Sacheli 2015), regarding the scattering capacity of this species, mainly in the European continent.

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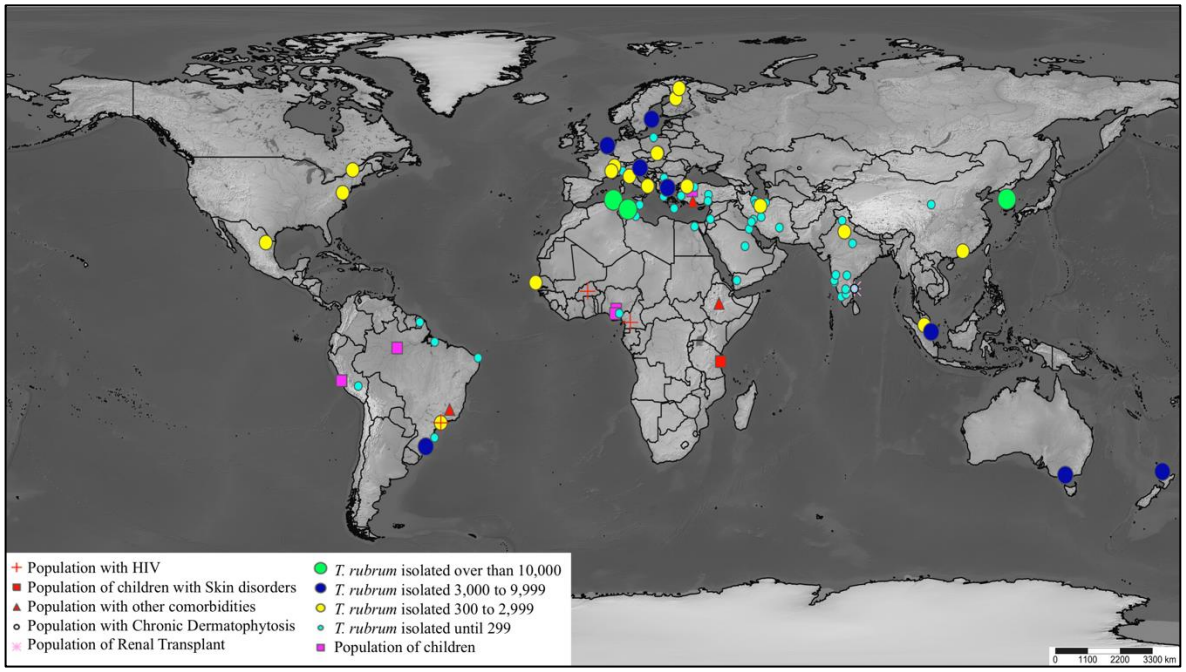

Figure 2. *Trichophyton rubrum* distribution in the world based on published data from 1960 to 2018. The distribution is split into subgroups according to population type – the codes are in the legend embedded.

The analysis of how comorbidities affect prevalence is important because other diseases can alter the course of dermatophytosis. Table 2 lists such cases. This table shows an increased prevalence of dermatophytosis (35%) in the population with HIV. The population with HIV has already been cited (Gupta, Fleckman, and Baran 2000; Jimenez-Gonzalez et al. 2013; Ruíz-López et al. 2015; Surjushe et al. 2007) as a population that is more susceptible to dermatophytosis, and tinea unguium are the most frequent anatomic site of infection. However, with this review it was possible to describe the situation of people with HIV from different countries for a period of 46 years.

In India, a paper about dermatophytosis in renal transplant individuals demonstrated a correlation, where in people with renal transplants tended to develop chronic dermatophytosis (Sentamil Selvi et al. 1999). Chronic dermatophytosis is a persistent form of the disease with episodes of remission and exacerbation, identified by duration and recurrences of infection (Sentamilselvi et al. 1998). A underlayer disease makes a patient most susceptible to chronic dermatophytosis. It is necessary to call attention to the importance of dermatophytosis in individuals with chronic conditions, since, generally, their vulnerability is not considered in the healthcare system for individuals with this fungal infection.

The total number of dermatophytes per country, based on the studies included in this review, demonstrate in American continent the most prevalent country with dermatophytosis was Brazil (19,561 cases of dermatophytosis in total of 5 studies) and the second most in the world. South Korea highlight among all the studies in the world by a single retrospective study of dermatophytosis presenting the largest number of individuals and isolates obtained (131,122 subjects and 115,846 T. rubrum).

An interesting article was a retrospective study in Brazil (Mezzari 1998) from 1960 to 1995, in which they compared the distribution of the frequency of the etiological agents of dermatophytosis between urban and rural populations in the

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south of the country. They showed that there was a difference, not in the species that cause dermatophytosis, but in the quantity of cases, with the rural population being 4.5 times more affected by *T. rubrum*, *T. mentagrophytes*, *M. canis*, and *E. floccosum* than the urban population.

A screening of trends and prospects in data from the 98 studies in this review has shown that large studies on the prevalence of dermatophytosis are no longer being done with high frequency or coverage, which will ultimately hinder the acquisition of data on the prevalence of this neglected disease.

Table 2. Studies on populations with concomitant disease.

Author	Country of study	Concomitant Disease	Year of publication	Population of study	Dermatophytes (%)	*Trichophyton rubrum*
(Zida et al. 2016)	Burkina Faso	HIV	2016	382	10,73	**15**
(da Silva et al. 2014)	Brazil	HIV	2014	84	47,6	**30**
(Komba and Mgonda 2010)	Tanzania	Skin Disorders	2010	420	10	**8**
(Woldeamanuel et al. 2006)	Ethiopia	Skin Disorders	2006	539	67,5	**2**
(Lohoue Petmy et al. 2004)	Cameroon	HIV	2004	148	22,2	**27**
(Celik, Ilkit, and Tanir 2003)	Turkey	Predisposition risk	2003	431	13	**32**
(Ergin, Ergin, and Arikan 2002)	Turkey	Mal de Meleda	2002	29	37,9	**4**
(Sentamil Selvi et al. 1999)	India	Renal Transplant	1999	100	26	**21**
(Sentamilselvi et al. 1998)	India	Various	1997	300	57,3	**129**

Figure 3 shows all the clinical presentation of dermatophytosis, been the frequency of sum by country of study. Tinea unguium was show been a trend at the most clinical presentation of this disease, following by Tinea pedis, Tinea cruris, Tinea corporis and Tinea capitis. That manifestations of this disease were principally caused by *T. rubrum*, *T. mentagrophytes*, *Microsporum canis* and *Epidermophyton floccosum* (Drakensjö and Chryssanthou 2010; Neji et al. 2009). Tinea unguium was most frequent in Australia, Sweden, Brazil, and Tunisia, respectively. Tinea pedis are most common in Iran, Tunisia, Brazil, and Netherlands.

The second most prevalent dermatophyte in the world is *Trichophyton mentagrophytes* (Figure 4), followed by *Microsporum canis*, *Trichophyton interdigitale*, and *Epidermophyton floccosum*. These dermatophytes have previously been described as the most isolated etiological agents in dermatophytosis, after *T. rubrum*, in European countries and in North and South America (Hayette and Sacheli 2015). The identification of dermatophytes *T. mentagrophytes* and *M. canis* as the second and third most frequent etiologic agents of dermatophytosis demonstrates the spreading capability of zoophilic species in humans; this increase in frequency is due to changes in recurrent migrations and the close relationship between humans and other animals. The species *E. floccosum* is an anthropophilic dermatophyte that causes dermatophytosis mainly in the skin, and this species has also demonstrated a worldwide spreading capability.

4. Limitations of the study

No population-based studies were found, which limited our ability to calculate a pooled prevalence. The studies instead included recruited cases from specific settings such as reference laboratories, multicentric laboratories, medical centers, and hospitals. Consequently, the studies represented only a part of the general population, highlighting the dermatophytosis problem. However, this study also underscored that cosmopolitan species of dermatophytes are often the cause of dermatophytosis.

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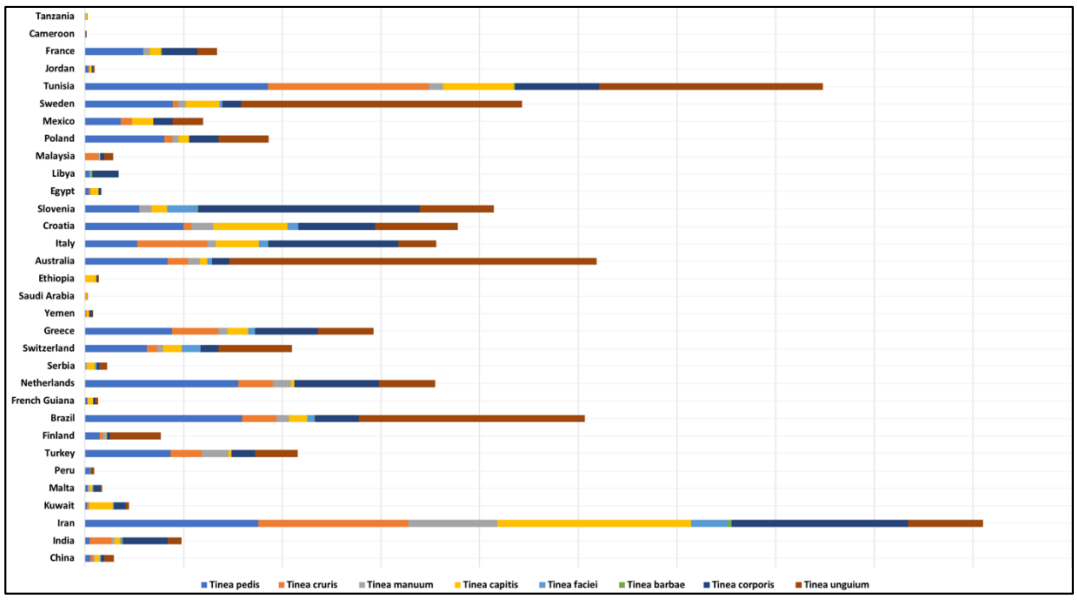

Figure 3. Frequency of Tineas by country from 1960 to 2018. Note: this number considers the sum of cases found in each study.

In Figure 4, the frequency distributions for *T. mentagrophytes*, *M. canis*, *T. interdigitale*, *Epidermophyton floccosum*, *T. verrucosum*, *T. violaceum*, *T. tonsurans*, *T. soudanense*, *T. schoenleinii*, *M. gypseum*, *M. audouinii,* and *T. erinaceii* were plotted in Excel version 16.13, according to total isolates in each country.

5. Conclusions

Trichophyton rubrum is widely distributed and is the most prevalent dermatophyte in the world. Some other dermatophytes are also notable because of their high frequency, such as *Trichophyton mentagrophytes*, *Microsporum canis*, *Trichophyton interdigitale*, and *Epidermophyton floccosum*.

Cosmopolitan species of dermatophytes are the major causative agents of this disease throughout the world, and the subsets of the population with immunosuppressive diseases or other predisposing factors are the most susceptible to chronic dermatophytosis. It is also identified other comorbidities that affect people with dermatophytosis, which calls attention to this important yet neglected infection.

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Divulgação

Este artigo é inédito e não está sendo considerado para qualquer outra publicação. Os autores e revisores não relataram qualquer conflito de interesse durante a sua avaliação. Logo, a revista *Scientia Amazonia* detém os direitos autorais, tem a aprovação e a permissão dos autores para divulgação, deste artigo, por meio eletrônico.

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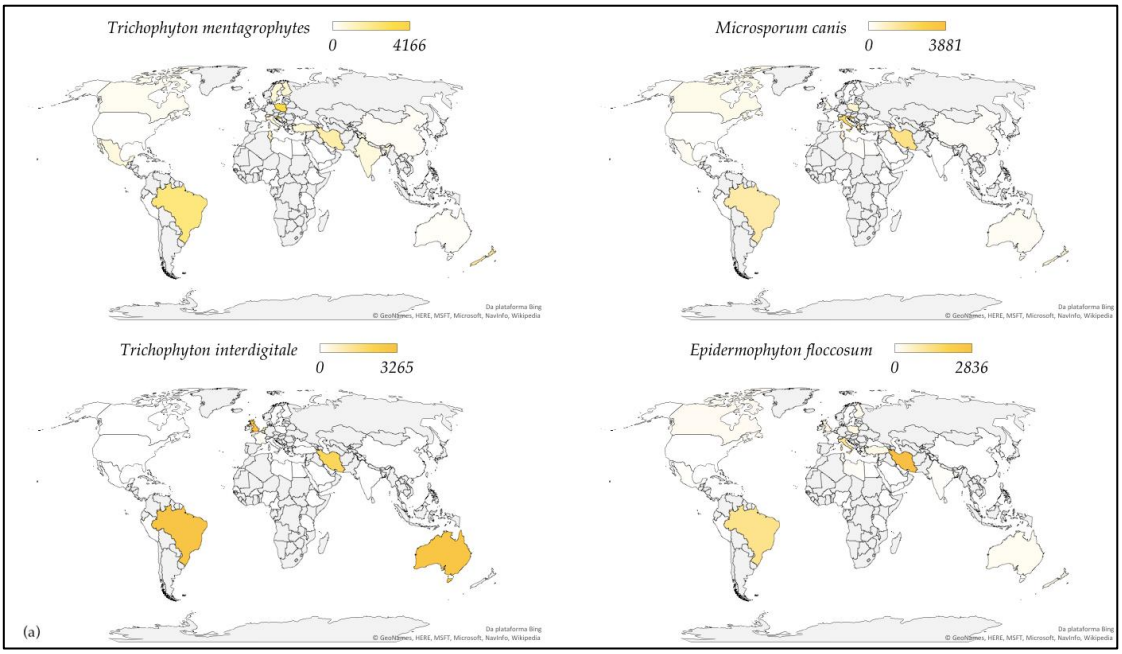

Figure 4. The frequency distribution of *T. mentagrophytes, M. canis*, *T. interdigitale*, and *Epidermophyton floccosum*, dermatophytes species in each country, from 1960 until 2018. Light grey coloring indicates that there is no data about dermatophytosis prevalence in this review, meaning there was a lack of studies from that country. Note: Other dermatophytes species are in FigureS1 and FigureS2 (supplementary data).

References

Auger, P., G. Marquis, Jeannine Joly, and A. Attye. 2009. "Epidemiology of Tinea Pedis in Marathon Runners: Prevalence of Occult Athlete's Foot." *Mycoses* 36 (1–2): 35–41. https://doi.org/10.1111/j.1439-0507.1993.tb00685.x.

Celik, E., M. Ilkit, and F. Tanir. 2003. "Prevalence and Causative Agents of Superficial Mycoses in a Textile Factory in Adana, Turkey." *Mycoses* 46 (8): 311–15. https://doi.org/10.1046/j.1439-0507.2003.00900.x.

Dion, W M, and L Kapica. 1975. "Isolation of Dermatophytes, Candida Species and Systemic Fungi from Dermatologic Specimens in Montréal, 1963 to 1973." *Canadian Medical Association Journal* 112 (6): 712–16. http://www.ncbi.nlm.nih.gov/pubmed/1091342.

Drakensjö, Iara Trocoli, and Erja Chryssanthou. 2010. "Epidemiology of Dermatophyte Infections in Stockholm, Sweden: A Retrospective Study from 2005–2009." *Medical Mycology*, December, 1–5. https://doi.org/10.3109/13693786.2010.540045.

Ergin, Çagri, Şeniz Ergin, and Sevtap Arikan. 2002. "Prevalence of Dermatomycoses in Mal de Meleda Patients: A Field Study." *Scandinavian Journal of Infectious Diseases* 34 (10): 753–55. https://doi.org/10.1080/00365540210147868.

Gupta, Aditya K., Philip Fleckman, and Robert Baran. 2000. "Ciclopirox Nail Lacquer Topical Solution 8% in the Treatment of Toenail Onychomycosis." *Journal of the American Academy of Dermatology* 43 (4): S70–80. https://doi.org/10.1067/mjd.2000.109071.

Gupta, Aditya K., Paulo Taborda, Valeria Taborda, Janet Gilmour, Anita Rachlis, Irv Salit, Madhulika A. Gupta, Paul MacDonald, Elizabeth A. Cooper, and Richard C. Summerbell. 2000. "Epidemiology and Prevalence of Onychomycosis in HIV-Positive Individuals." *International Journal of Dermatology* 39 (10): 746–53. https://doi.org/10.1046/j.1365-4362.2000.00012.x.

Hayette, Marie-Pierre, and Rosalie Sacheli. 2015. "Dermatophytosis, Trends in Epidemiology and Diagnostic Approach." *Current Fungal Infection Reports* 9 (3): 164–79. https://doi.org/10.1007/s12281-015-0231-4.

Jimenez-Gonzalez, Carmen, José Antonio Mata-Marin, Carla Ileana Arroyo-Anduiza, Iván de Jesús Ascencio-Montiel, José Luis Fuentes-Allen, and Jesús Gaytan-Martinez. 2013. "Prevalence and Etiology of Onychomycosis in the HIV-Infected Mexican Population." *European Journal of Dermatology* 23 (3): 378–81. https://doi.org/10.1684/ejd.2013.2015.

Scientia Amazonia, v. 10, n.3, CS41-CS56, 2021
Revista on-line http://www.scientia-amazonia.org
ISSN:2238.1910

Komba, Ewaldo V, and Yassin M Mgonda. 2010. "The Spectrum of Dermatological Disorders among Primary School Children in Dar Es Salaam." *BMC Public Health* 10 (1): 765. https://doi.org/10.1186/1471-2458-10-765.

Lohoue Petmy, J, AJ Lando, L Kaptue, V Tchinda, and M Folefack. 2004. "Superficial Mycoses and HIV Infection in Yaounde." *Journal of the European Academy of Dermatology and Venereology* 18 (3): 301–4. https://doi.org/10.1111/j.1468-3083.2004.00924.x.

Loney, P L, L W Chambers, K J Bennett, J G Roberts, and P W Stratford. 1998. "Critical Appraisal of the Health Research Literature: Prevalence or Incidence of a Health Problem." *Chronic Diseases in Canada* 19 (4): 170–76. http://www.ncbi.nlm.nih.gov/pubmed/10029513.

Magill, Shelley S., Liliana Manfredi, Andrew Swiderski, Bernard Cohen, and William G. Merz. 2007. "Isolation of Trichophyton Violaceum and Trichophyton Soudanense in Baltimore, Maryland." *Journal of Clinical Microbiology* 45 (2): 461–65. https://doi.org/10.1128/JCM.02033-06.

Manzano-Gayosso, Patricia, Francisca Hernández-Hernández, Luis Javier Méndez-Tovar, Yanni Palacios-Morales, Erika Córdova-Martínez, Elva Bazán-Mora, and Rubén López-Martinez. 2008. "Onychomycosis Incidence in Type 2 Diabetes Mellitus Patients." *Mycopathologia* 166 (1): 41–45. https://doi.org/10.1007/s11046-008-9112-5.

Mezzari, Adelina. 1998. "Frequency of Dermatophytes in the Metropolitan Area of Porto Alegre, RS, Brazil." *Revista Do Instituto de Medicina Tropical de São Paulo* 40 (2): 71–76. https://doi.org/10.1590/S0036-46651998000200002.

Moher, David, Larissa Shamseer, Mike Clarke, Davina Ghersi, Alessandro Liberati, Mark Petticrew, Paul Shekelle, and Lesley A Stewart. 2015. "Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 Statement." *Systematic Reviews* 4 (1): 1. https://doi.org/10.1186/2046-4053-4-1.

Neji, Sourour, Fattouma Makni, Fatma Cheikhrouhou, Amira Sellami, Hayet Sellami, Slaheddine Marreckchi, Hamida Turki, and Ali Ayadi. 2009. "Epidemiology of Dermatophytoses in Sfax, Tunisia." *Mycoses* 52 (6): 534–38. https://doi.org/10.1111/j.1439-0507.2008.01651.x.

Ruíz-López, Patricia, Gabriela Moreno-Coutiño, Ramón Fernández-Martínez, Jessica Espinoza-Hernández, Patricia Rodríguez-Zulueta, and Gustavo Reyes-Terán. 2015. "Evaluation of Improvement of Onychomycosis in HIV-Infected Patients after Initiation of Combined Antiretroviral Therapy without Antifungal Treatment." *Mycoses* 58 (9): 516–21. https://doi.org/10.1111/myc.12350.

Sentamil Selvi, G., A. Kamalam, K. Ajithados, C. Janaki, and A. S. Thambiah. 1999. "Clinical and Mycological Features of Dermatophytosis in Renal Transplant Recipients." *Mycoses* 42 (1-2): 75–78. https://doi.org/10.1046/j.1439-0507.1999.00405.x.

Sentamilselvi, G, A Kamalam, K Ajithadas, C Janaki, and A S Thambiah. 1998. "Scenario of Chronic Dermatophytosis: An Indian Study." *Mycopathologia* 140 (3): 129–35. https://doi.org/10.1023/a:1006843418759.

Shorthouse DP. SimpleMappr, an online tool to produce publication-quality point maps. http://www.simplemappr.net; 2010. [Accessed February 20, 2019]

Silva, Bosco Christiano Maciel da, Claudete Rodrigues Paula, Marcos Ereno Auler, Luciana da Silva Ruiz, Jairo Ivo dos Santos, Márcia Cristina Naomi Yoshioka, Alexandre Fabris, Luiz Guilherme Martins Castro, Alberto José da Silva Duarte, and Walderez Gambale. 2014. "Dermatophytosis and Immunovirological Status of HIV-Infected and AIDS Patients from Sao Paulo City, Brazil." *Mycoses*, January, n/a-n/a. https://doi.org/10.1111/myc.12169.

Surjushe, Amar, Ratnakar Kamath, Chetan Oberai, Dattatray Saple, Minal Thakre, Sujata Dharmshale, and Aruna Gohil. 2007. "A Clinical and Mycological Study of Onychomycosis in HIV Infection." *Indian Journal of Dermatology, Venereology and Leprology* 73 (6): 397. https://doi.org/10.4103/0378-6323.37057.

Vishnu, Sharma, Kumar Kumawat Tarun, Sharma Anima, Seth Ruchi, and Chandra Subhash. 2015. "Dermatophytes: Diagnosis of Dermatophytosis and Its Treatment." *African Journal of Microbiology Research* 9 (19): 1286–93. https://doi.org/10.5897/AJMR2015.7374.

Welsh, Oliverio, Esperanza Welsh, Jorge Ocampo-Candiani, Minerva Gomez, and Lucio Vera-Cabrera. 2006. "Dermatophytoses in Monterrey, Mexico." *Mycoses* 49 (2): 119–23. https://doi.org/10.1111/j.1439-0507.2006.01199.x.

Woldeamanuel, Y., R. Leekassa, E. Chryssanthou,

Y. Mengistu, and B. Petrini. 2006. "Clinico-Mycological Profile of Dermatophytosis in a Reference Centre for Leprosy and Dermatological Diseases in Addis Ababa." *Mycopathologia* 161 (3): 167–72. https://doi.org/10.1007/s11046-004-3141-5.

Zhan, P., K. Dukik, D. Li, J. Sun, J.B. Stielow, B. Gerrits van den Ende, B. Brankovics, et al. 2018. "Phylogeny of Dermatophytes with Genomic Character Evaluation of Clinically Distinct Trichophyton Rubrum and T. Violaceum." *Studies in Mycology* 89 (March): 153–75. https://doi.org/10.1016/j.simyco.2018.02.004.

Zhan, Ping, and Weida Liu. 2017. "The Changing Face of Dermatophytic Infections Worldwide." *Mycopathologia* 182 (1–2): 77–86. https://doi.org/10.1007/s11046-016-0082-8.

Zida, A., P.M. Sawadogo, I. Diallo, H. Tapsoba, Z. Bazie, Y.J. Drabo, and T.R. Guiguemde. 2016. "Aspects Épidémiologiques Des Mycoses Cutanéo-Phanériennes Chez Les Patients Infectés Par Le VIH Au Centre National de Référence Du Burkina Faso, Afrique de l'Ouest." *Journal de Mycologie Médicale* 26 (2): 133–37. https://doi.org/10.1016/j.mycmed.2016.01.004.

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Table S1 - Supplementary data A - Data Collection Instrument by the authors.

A. Identification	
1.Title: 2.Magazine: 3.Authors: 4.Idiom: 5.Country of Study: 6.Year of publication:	City:
B.Institution headquarters of the Study	
1.Type of Institution:	( ) Tertiary Hospital name: ( ) Reference laboratory name: ( ) Medical Center Medical Center ( ) Others:
C. Methodological Aspects	
1.Purpose of the study:	
2. About the Study	2.1. Kind of study: 2.2. Duration of the study:
3. Sample Identification:	( ) Direct Examination ( ) Culture ( ) Morphology ( ) Biochemical test ( ) Molecular tool ( ) Others:
4. About Population of study:	4.1. Size: 4.2. Type of lesions studied 4.3. Concomitant disease
D. Results of the Study	
1. About Sample	1.1. Population affected by dermatophytosis 1.1.a Total of dermatophytes 1.1.b Distribution by population groups 1.1.c Distribution by species 1.1.d Distribution by injury
E. Methodological scoring system used to rate studies reviewed (Loney 1998)	
	( ) 1. Random sample or whole population ( ) 2. Unbiased sampling frame (i.e. census data) ( ) 3. Adequate sample size (>300 subjects) ( ) 4. Measures were the standard ( ) 5. Outcomes measured by unbiased assessors ( ) 6. Adequate response rate (70%), refusers described ( ) 7. Confidence intervals, subgroup analysis ( ) 8. Study subjects described Total

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Table S2 - Supplementary data B – Data from 98 studies.

Author - year	Country	Kind of study	Size of population	Prevalence	
				Dermatophytes	Trichophyton rubrum
Coloe, S., & Baird, R. (2010)	Australia	Retrospective	10616	10616	7126
Cortez, A. C. A., et al. (2012)	Brazil	Cross-sectional	590	210	15
Silva-Rocha, W. P., et al. (2017)	Brazil	Cross-sectional	205	59	21
Costa-Orlandi, et al. (2012)	Brazil	Cross-sectional	189	14	9
Chimelli, P. A. V., et al. (2003)	Brazil	Cross-sectional	15300	655	319
da Silva, B. C., et al. (2014)	Brazil	Cross-sectional	84	40	30
Silveira-Gomes, F., et al. (2013)	Brazil	Cross-sectional	494	20	6
Heidrich, D., et al. (2015)	Brazil	Retrospective	36446	9048	5396
MEZZARI, A. (1998)	Brazil	Retrospective	9438	9438	4964
SANTOS, J. I., et al. (1997)	Brazil	Cross-sectional	946	287	179
Zida, A., et al. (2016)	Burkina Faso	Cross-sectional	382	41	15
Lohoué Petmy, J., et al. (2004)	Cameroon	Cross-sectional	148	33	27
Dion, W. M., & Kapica, L. (1975)	Canada	Cross-sectional	10057	1660	825
Tao-Xiang, N., et al. (2005)	China	Cross-sectional	1443	190	97
Cai, W., et al. (2016)	China	Retrospective	3367	588	392
Kastelan, M., et al. (2014)	Croatia	Cross-sectional	52578	5668	4
Brajac, I., et al. (2003)	Croatia	Cross-sectional	20463	1888	3
Zaki, S. M., et al. (2009)	Egypt	Cross-sectional	506	403	25
Abd Elmegeed, A. S. M., et al. (2015)	Egypt	Cross-sectional	640	330	39
Woldeamanuel, et al. (2006)	Ethiopia	Cross-sectional	539	364	2
Lehenkari, E., & Silvennoinen-Kassinen, S. (1995)	Finland	Cross-sectional	17822	3185	2101
Faure-Cognet, O., et al. (2016)	France	Retrospective	5470	1348	1059
Simonnet, C., Berger, F., & Gantier, J.-C. (2011)	French Guiana	Retrospective	726	268	97
Maraki, S., et al. (2007)	Greece	Cross-sectional	3751	520	250
Tsoumani, M., et al. (2011)	Greece	Retrospective	769	769	293
Maraki, S., & Tselentis, Y. (1998)	Greece	Cross-sectional	1361	327	45
Devliotou-Panagiotidou, D., et al. (1992)	Greece	Cross-sectional	17073	6525	4093
Koussidou-Eremondi, T., et al. (2005)	Greece	Cross-sectional	1045	584	34
Maraki, S., & Mavromanolaki, V. E. (2016)	Greece	Cross-sectional	2751	294	98

Sentamil Selvi, et al. (1999)	India	Cross-sectional	100	26	21
Narayanan, M. P., et al. (2016)	India	Retrospective	130	61	35
Kumaran Ganesan, AS Shameem Banu & Riswana Jasmine (2017)	India	Cross-sectional	200	98	22
Maulingkar, S. V, Pinto, M. J. W., & Rodrigues, S. (2014)	India	Cross-sectional	321	191	73
Magdum, R. J., et al. (2016)	India	Cross-sectional	125	63	35
Ebrahimkutty, S. P., Pulikkottil, S. K., & Thampi, D. K. (2018)	India	Cross-sectional	115	50	24
Pavani, A., et al. (2016)	India	Cross-sectional	88	59	9
E. Agrawal, et al. (2015)	India	Cross-sectional	204	204	26
Lakshmanan, A., et al. (2015)	India	Cross-sectional	15950	62	49
Bhatia, V. K., & Sharma, P. C. (2014)	India	Cross-sectional	202	74	26
Das, S., Goyal, R., & Bhattacharya, S. N. (2007)	India	Cross-sectional	1975	641	448
Gowda, T., Manikonda, R., & Hosthota, A. (2018)	India	Cross-sectional	200	108	53
Gopi, A., Harindranath, D., & Kaushik, A. R. (2015)	India	Cross-sectional	609	349	167
Sentamilselvi, G., et al. (1997)	India	Cross-sectional	300	172	129
Abastabar, M., et al. (2013)	Iran	Cross-sectional	603	603	165
Salari, S., et al. (2017)	Iran	Retrospective	1782	181	15
Lari, A. R., et al. (2005)	Iran	Cross-sectional	1254	53	7
Khosravi, A. R., Aghamirian, M. R., & Mahmoudi, M. (1994)	Iran	Cross-sectional	12150	7712	1276
Aghamirian, M. R., & Ghiasian, S. A. (2008)	Iran	Cross-sectional	18756	348	63
Rezaei-Matehkolaei, A., et al. (2016)	Iran	Cross-sectional	1123	1031	15
Zamani, S., et al. (2016)	Iran	Retrospective	13312	1535	402
Falahati, M., et al. (2003)	Iran	Cross-sectional	1254	169	31
Chadeganipour, M., et al. (1997)	Iran	Cross-sectional	16578	1213	37
Nazer, M. R., et al. (2018)	Iran	Retrospective	4414	631	99
Bassiri-Jahromi, S., & Khaksar, A. A. (2010)	Iran	Cross-sectional	1075	607	53
Rassai, S., et al. (2011)	Iran	Cross-sectional	428	375	36
Asticcioli, S., et al. (2008)	Italy	Cross-sectional	95	97	41
Vena, G. A., et al. (2012)	Italy	Retrospective	6133	4998	1737
Sberna, F., et al. (1993)	Italy	Cross-sectional	2085	2085	907

Dal Tio, R., & Lunardi, M. (1991)	Italy	Cross-sectional	199	53	2
Abu-Elteen, K. H., & Malek, M. A. (1999)	Jordan	Cross-sectional	350	199	57
al-Fouzan, A. S., & Nanda, A. (1992)	Kuwait	Cross-sectional	546		28
Yehia, M. A., et al. (2010)	Kuwait	Retrospective	2730	344	47
Ellabib, M. S., Khalifa, Z., & Kavanagh, K. (2002)	Libya	Cross-sectional	2224	682	160
Ng, K. P., et al. (2002)	Malaysia	Cross-sectional	576	576	310
Zahra, L. V, et al. (2003)	Malta	Cross-sectional	1200	353	113
Welsh, O., et al. (2006)	Mexico	Cross-sectional	2397	2397	1081
Korstanje, M. J., & Staats, C. C. G. (1995)	Netherlands	Cross-sectional	9018	7111	4565
Singh, D., et al. (2003)	New Zealand	Cross-sectional	10004	10004	6883
Enemuor, S. C., & Amedu, A. S. (2009)	Nigeria	Cross-sectional	2184	108	27
Oyeka, C. A., & Eze, I. I. (2008)	Nigeria	Cross-sectional	402	61	33
Nweze, E. I., & Okafor, J. I. (2005	Nigeria	Cross-sectional	160	64	3
Flores, J. M., et al. (2009)	Peru	Cross-sectional	106	106	87
Vidotto, V., et al. (1991)	Peru	Cross-sectional	90	42	4
Macura, A. B., et al. (2010)	Poland	Retrospective	23124	4983	3110
Budak, A., et al. (2013)	Poland	Cross-sectional	5333	1598	866
Nowicki, R. (1996)	Poland	Cross-sectional	9240	1544	239
Macura, A. B., Krzyściak, P., & Bochenek, M. (2008)	Poland	Retrospective	8407	1687	1018
Andres, M., et al. (2015)	Poland	Cross-sectional	4608	865	745
Abanmi, A., et al. (2008)	Saudi Arabia	Cross-sectional	119	71	9
Ndiaye, D., et al. (2013)	Senegal	Cross-sectional	2026	1043	323
Otasevic, S., et al. (2011)	Serbia	Retro-spsective	2887	328	22
Tan, H.-H. (2005)	Singapore	Retrospective	12903	7353	3941
Dolenc-Voljc, M. (2005)	Slovenia	Cross-sectional	33974	8286	3044
Lee, W. J., et al. (2015)	South Korea	Retrospective	115846	131122	115846
Drakensjo, I. T., & Chryssanthou, E. (2011)	Sweden	Retrospective	34664	8862	7336
Monod, M., et al. (2002)	Switzerland	Retrospective	34	4	2602
Komba, E. V, & Mgonda, Y. M. (2010)	Tanzania	Cross-sectional	420	42	8
Neji, S., et al. (2009)	Tunisia	Cross-sectional	25432	14957	11149
Koksal, F., et al. (2009)	Turkey	Cross-sectional	8200	4218	2376

Sahin, I., et al. (2004)	Turkey	Cross-sectional	227	43	33
Kayman, T., et al. (2013)	Turkey	Cross-sectional	476	56	55
Metintas, S., et al. (2004)	Turkey	Cross-sectional	2501	86	37
Çelik, E., Ilkit, M., & Tanir, F. (2003)	Turkey	Cross-sectional	431	65	32
Ergin, Ç., Ergin, Ş., & Arikan, S. (2002)	Turkey	Cross-sectional	29	11	4
Ozkutuk, A., Ergon, C., & Yulug, N. (2007)	Turkey	Cross-sectional	926	68	38
Borman, A. M., et al. (2007)	UK	Retrospective	15333	15333	10506
Magill, S. S., et al. (2007).	USA	Retrospective	7,804	2,333	338
Mahmoud, A.-L. E. (2002)	Yemen	Cross-sectional	1100	170	17

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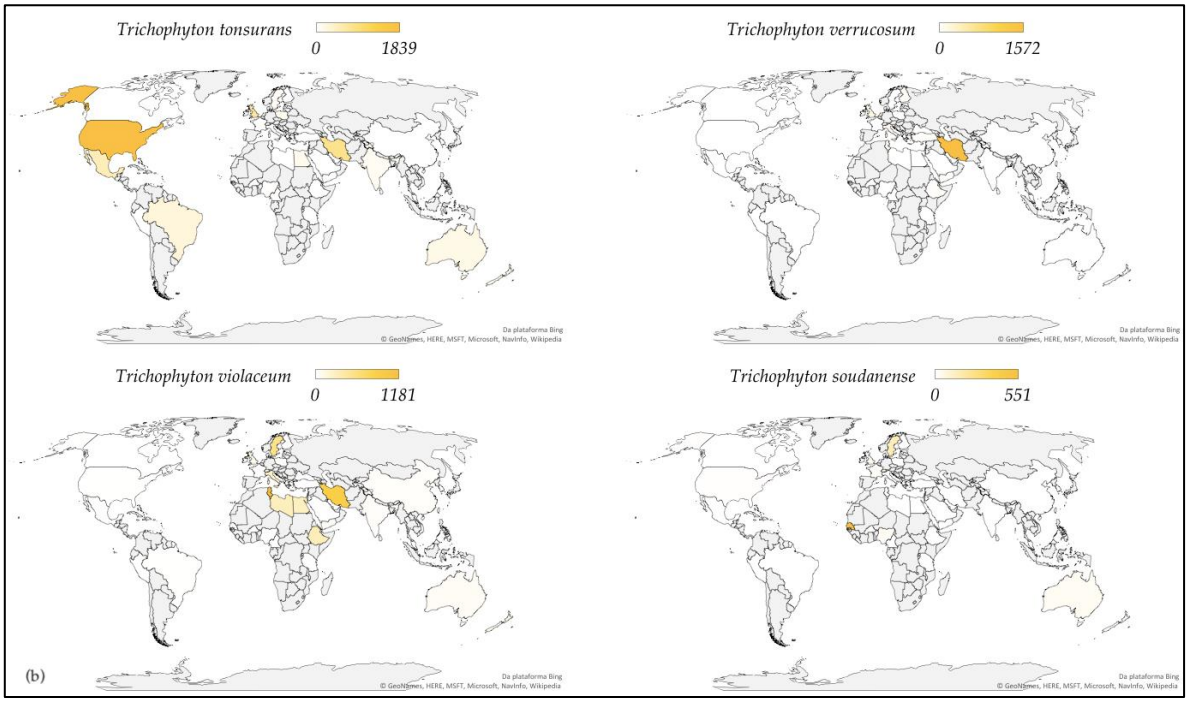

Figure S1 - The frequency distribution of *T. verrucosum*, *T. violaceum, T. tonsurans, and T. soudanense*, dermatophytes species in each country, from 1960 until 2018. Light grey coloring indicates that there is no data about dermatophytosis prevalence in this review, meaning there was a lack of studies from that country.

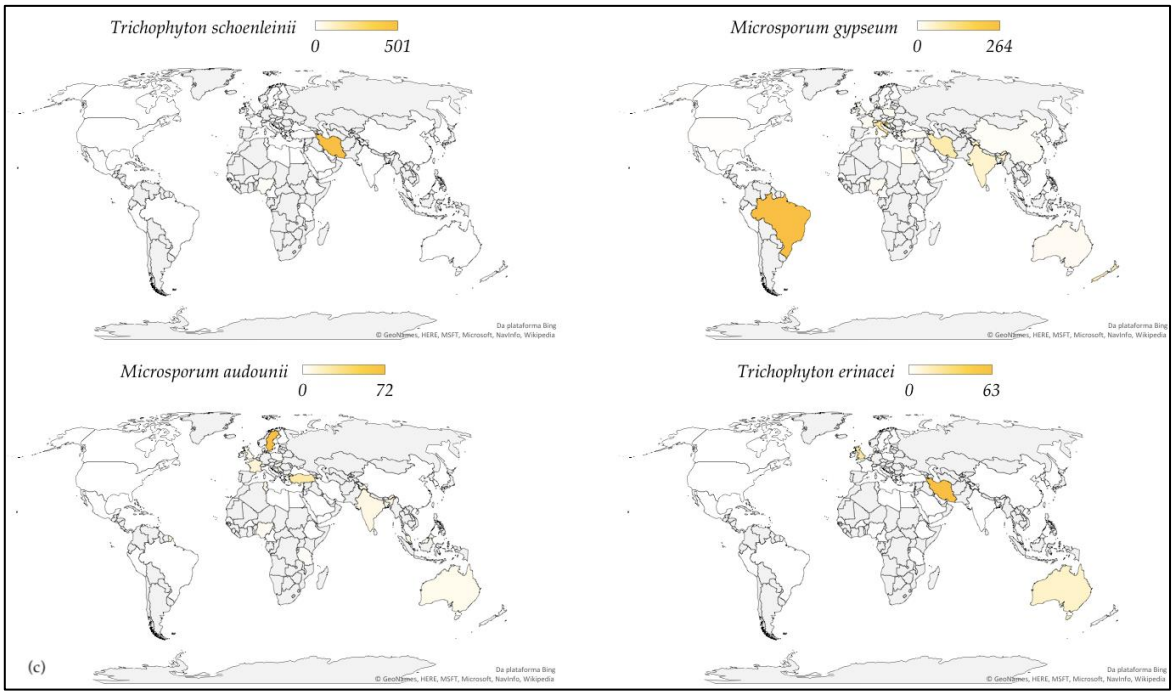

Figure S2 - The frequency distribution of *T. schoenleinii, M. gypseum, M. audouinii*, and *T. erinaceii*, dermatophytes species in each country, from 1960 until 2018. Light grey coloring indicates that there is no data about dermatophytosis prevalence in this review, meaning there was a lack of studies from that country.