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THE STUDY OF ASSOCIATION OF TYPE 2 DIABETES MELLITUS AND TINEA PEDIS : A SYSTEMATIC REVIEW

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ABSTRACT

Background: *A common fungal infection that is more common in those with weakened immune systems is tinea pedis. people with diabetes continue to be more prone to tinea pedis than other people because of their compromised vascular and immune systems.*

Aims : *This systematic review is to review the association of type 2 diabetes mellitus and cases of tinea pedis.*

Methods: *This study demonstrated compliance with all requirements by means of a comparison with the standards established by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020. Thus, the specialists were able to guarantee that the research was as current as feasible. Publications released between 2014 and 2024 were considered for this search strategy. This was accomplished by utilizing a number of distinct online reference sites, including Pubmed, ScienceDirect, and SagePub. It was determined that reviews, previously published works, and partially completed works would not be included.*

Result: *In the PubMed database, the results of our search brought up 68 articles, whereas the results of our search on SCIENCE DIRECT brought up 885articles, our search on SAGEPUB brought up 65 articles. The results of the search conducted for the last year of 2014 yielded a total 24 articles for PubMed, 316 articles for SCIENCE DIRECT and 18 articles for SAGEPUB. In the end, we compiled a total of 8 papers, 6 of which came from PubMed, 1 of which came from SCIENCE DIRECT and 1 of which came from SAGEPUB. We included eight research that met the criteria.*

Conclusion: *In summary, there are association between the cases of tinea pedis in patients with diabetes mellitus.*

Keyword: *Diabetes mellitus, tinea pedis*

INTRODUCTION

One of the major metabolic and chronic illnesses that is steadily increasing in prevalence is diabetes mellitus. Fungal skin infections account for a significant component of the various skin lesions experienced by around thirty percent of people with diabetes. Patients with chronic hyperglycemia may have disturbances in phagocytic activity, cellular immunity, and polymorphonuclear leukocytes. In addition to various bacterial infections, cutaneous fungal infections are common in patients with this disease.[1–4]

Fungi that is easily spread and affects 15% to 25% of people worldwide is tinea pedis. Even while tinea pedis's side effects might leave a person restless and unconnected cosmetically, it is improper to relate the condition to any serious side effects, especially in people who are totally immune. Diabetes patients are more likely to get tinea pedis because of things like weakened immune systems, poor circulation, and nerve damage. Tinea pedis raises the risk of bacterial infections, which can lead to cellulitis, ulcers, gangrene, osteomyelitis, and in extreme situations, the possibility of amputating a lower leg. Treatment options for diabetic people with tinea pedis may include topical lotions or ointments, antifungal medicines, and good foot cleanliness. Nevertheless, there aren't many studies on treatment outcomes, particularly in diabetics with tinea pedis; as a result, further research is required to improve treatment strategies.[5–10]

Patients with diabetes are mostly at risk for developing tinea pedis because of their underlying medical issues. To minimize difficulties and maintain foot health, diabetes people should take a proactive approach to treating and preventing tinea pedis.[11,12]

METHODS

Protocol

The author of this study ensured that it complied with the standards by adhering to Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines. This is done to guarantee the accuracy of the results that are derived from the investigation. Thus, the specialists were able to guarantee that the research was as current as feasible. Publications released between 2014 and 2024 were considered for this search strategy. This was accomplished by utilizing a number of distinct online reference sites, including Pubmed, ScienceDirect, and SagePub. It was determined that reviews, previously published works, and partially completed works would not be included.

CRITERIA FOR ELIGIBILITY

In order to completse this literature evaluation, we looked at published research that discusses the association of type 2 diabetes mellitus in patients with tinea pedis. This is done to enhance the patient's therapy management and to offer an explanation. This paper's primary goal is to demonstrate the applicability of the issues that have been noted overall.

To be eligible to participate in the study, researchers had to meet the following requirements: 1) English must be used to write the paper. The manuscript must fulfill both of these conditions in order to be considered for publication. 2) A few of the examined studies were released after 2013 but prior to the time frame considered relevant by this systematic review. Editorials, submissions without a DOI, already published review articles, and entries that are nearly exact replicas of journal papers that have already been published are a few examples of research that are prohibited.

SEARCH STRATEGY

We used "diabetes mellitus" and "tinea pedis" out using the PubMed and SAGEPUB databases by inputting the words: ((("diabetes mellitus"[MeSH Terms] OR ("diabetes"[All Fields] AND "mellitus"[All Fields]) OR "diabetes mellitus"[All Fields]) AND ("tinea pedis"[MeSH Terms] OR ("tinea"[All Fields] AND "pedis"[All Fields]) OR "tinea pedis"[All Fields])) AND (2014:2024[pdat]) used in searching the literature.

DATA RETRIEVAL

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

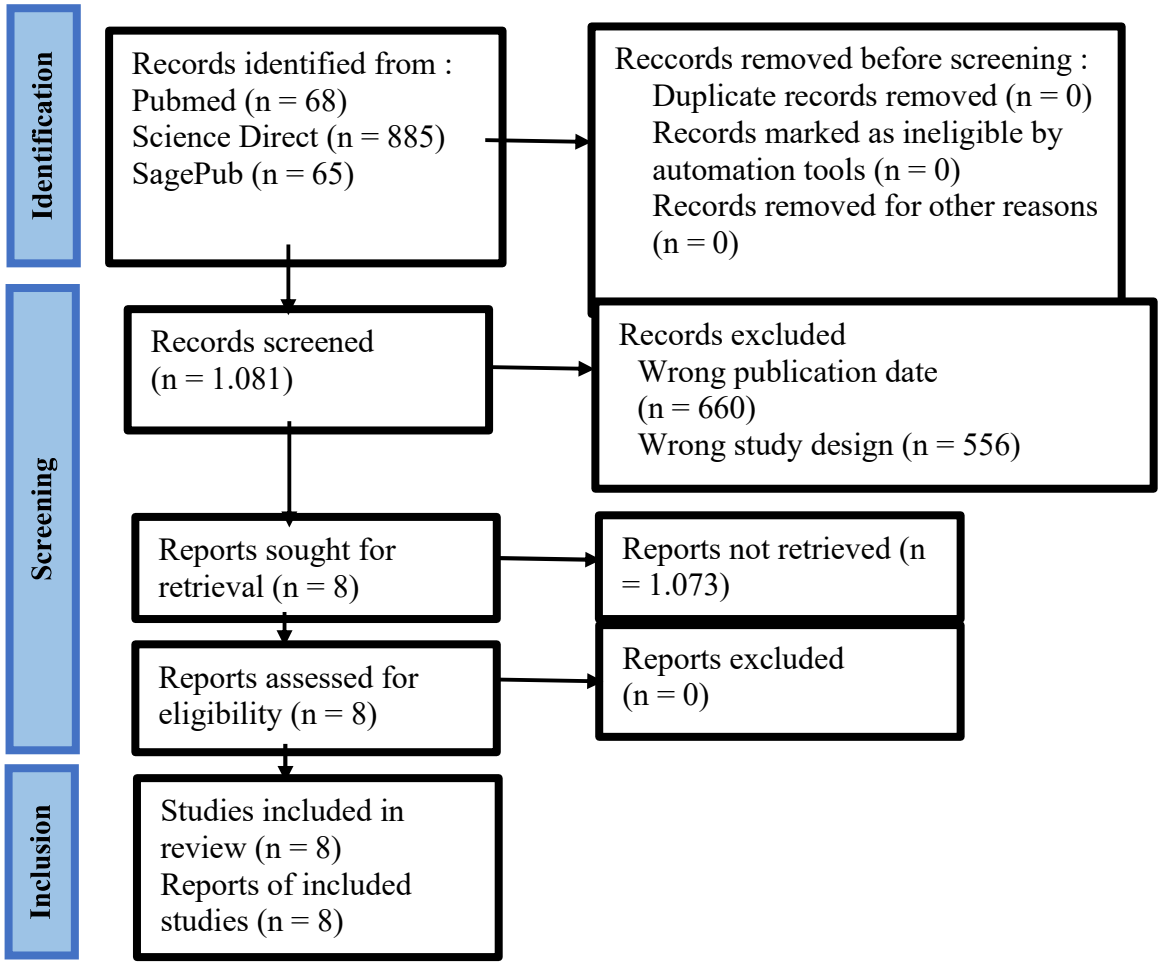

Figure 1. Prisma Flow Diagram

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

QUALITY ASSESSMENT AND DATA SYNTHESIS

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 68 articles, whereas the results of our search on SCIENCE DIRECT brought up 885articles, our search on SAGEPUB brought up 65 articles. The results of the search conducted for the last year of 2014 yielded a total 24 articles for PubMed, 316 articles for SCIENCE DIRECT and 18 articles for SAGEPUB. In the end, we compiled a total of 8 papers, 6 of which came from PubMed, 1 of which came from SCIENCE DIRECT and 1 of which came from SAGEPUB. We included eight research that met the criteria.

Aragon-Sanchez, et al[13] (2023) showed that in diabetic individuals with onychomycosis who had a clinical suspicion of the disease, the prevalence of onychomycosis and tinea pedis was 40.6% and 10.9%, respectively. Furthermore, tinea pedis was not necessarily linked to onychomycosis. These findings demonstrate that clinical diagnosis in individuals with diabetes mellitus is not very accurate and that clinical nail features alone should not be the basis for diagnosis.

Khalifa, et al[14] (2023) showed that patients with diabetes mellitus showed little variations in their knowledge of Tinea pedis and Tinea unguium infection, despite the fact that only 10.20% of research participants had type 2 diabetes.

Akkus, et al[15] (2016) showed that according to the research, fungal infections were more commonly seen in diabetes patients with peripheral vascular disease and poor glycemic control. Fungal infections may also be the cause of the formation of foot ulcers.

Oz, et al[16] (2017) showed that ageing, male gender, and type 2 diabetes were all strongly associated with the development of onychomycosis, also known as tinea pedis. The isolate Trichophyton rubrum was the most prevalent. Since non-dermatophyte fungi can cause tinea pedis and onychomycosis in diabetic patients, the identification and isolation of the fungus is crucial to the efficient therapy of these illnesses.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Aragon-Sanchez	Spain	Cross sectional study	58 patients	Only 41 individuals (40.6%) had confirmed cases of onychomycosis. Trichophyton rubrum, which was identified in 10 patients (36%), was the most common aetiological agent. Candida parapsilosis was found in 7 patients (25%). Only 11 individuals (10.9%) had positive test results on the fourth toe cleft samples; in all of these cases, onychomycosis was also detected. In the univariate study, the only significant variable linked to onychomycosis (P <.01) was neuroischemic foot. In 11 individuals (10.9%), a positive result for mycosis in the fourth toe cleft was discovered. In the multivariate model, this result was linked to a history of neuroischemic foot (P<.01; OR: 13.7, CI: 12.6-71.6) and myocardial infarction (P<.01; odds ratio [OR]: 84.2, confidence interval [CI]: 6.8-1036.4).
Khalifa et al, 2023	Saudi Arabia	Cross sectional study	155 patients	Gender awareness scores differed significantly across individuals (p<0.05=0.041), with females rating higher (71%) than men (28%). Age-related variations in participant awareness were also significant (p<0.01=0.041), with the greatest mean ranking going to those in the 18–30 age group (70.59%) and the lowest mean ranking going to those over 50 (1.57%). Participants' knowledge of their social position varied significantly as well (p<0.05=0.02), with singles scoring highest (71.37%) and divorced people having the lowest mean rank (1.57%).

Akkus et al, 2016	Turkey	Cross sectional study	227 patients	Gender awareness scores differed significantly across individuals ($p<0.05=0.041$), with females rating higher (71%) than men (28%). Age-related variations in participant awareness were also significant ($p<0.01=0.041$), with the greatest mean ranking going to those in the 18–30 age group (70.59%) and the lowest mean ranking going to those over 50 (1.57%). Participants' knowledge of their social position varied significantly as well ($p<0.05=0.02$), with singles scoring highest (71.37%) and divorced people having the lowest mean rank (1.57%).
Oz et al, 2017	Turkey	Cross sectional study	600 patients	Gender awareness scores differed significantly across individuals ($p<0.05=0.041$), with females rating higher (71%) than men (28%). Age-related variations in participant awareness were also significant ($p<0.01=0.041$), with the greatest mean ranking going to those in the 18–30 age group (70.59%) and the lowest mean ranking going to those over 50 (1.57%). Participants' knowledge of their social position varied significantly as well ($p<0.05=0.02$), with singles scoring highest (71.37%) and divorced people having the lowest mean rank (1.57%)
Alhammadi et al, 2023	Saudi Arabia	Cross sectional study	295 patients	The study included 295 individuals with diabetes cases in total. Out of them, 149 (50.5%) were men, ranging in age from 16 to over 60, with an average age of 49.5 ± 12.9 years. Of the study participants, 194 (65.8%) had type II diabetes. Of the 134, 45.4% had a diabetes diagnosis that lasted longer than ten years. 152 (52%) of the study's diabetes individuals had a tinea pedis diagnosis. The only factor that significantly correlated with the presence of tinea pedis was the patient's BMI; 47 overweight diabetes and 47 obese patients, as well as five underweight patients, were diagnosed with the condition ($p=0.049$).

Henry et al, 2020	Pakistan	Cross sectional study	251 patients	A cross-sectional observational research was conducted on 251 patients who visited the dermatology outpatient department, 159 of whom were male and 92 of whom were female. A thorough dermatological examination was performed, and the results were noted. In non-infectious conditions, the most prevalent conditions were skin tags and acanthosis nigricans. Fungal infections were the most common infections linked to diabetes
Alqahtani et al, 2021	Saudi Arabia	Cross sectional study	61 patients	This research comprised 61 people with diabetes in total. Eleven percent of those with type 2 diabetes have tinea pedis. 31.3% of the sample as a whole were 60 years of age or older; 89.2% of the patients routinely used nail clippers; 89.8% of the patients cleansed their feet more than three times a day; and 71.5% of the patients checked their toes and feet. Additionally, 48.5% of patients had their feet checked by a physician in the past, and 82.3% of patients had never experienced tinea pedis. Male gender, age (p-value = 0.008), education level (p-value = 0.036), wearing socks, a history of tinea pedis, seeing a doctor, having higher HbA1c levels, and having diabetes for a longer period of time were all significant risk factors for tinea pedis.
Nijenhuis-Rosien et al, 2019	Netherlands	Cross sectional study	64 patients	From March 2015 to July 2016, 64 patients were randomized; 63 could be analysed. Trichophyton rubrum was the most detected pathogen. There was no difference in the primary outcome between laser and sham treatment. With the exception of a subungual haematoma in the fifth toenail occurring 2 weeks after laser treatment, the results suggested that treatment with Nd-YAG 1064 nm laser is safe

Alhammadi, et al[17] (2023) showed that despite reports of excellent diabetic foot care, over 50% of individuals with diabetes were obese, had previously been diagnosed with tinea pedis, and had poor glycemic control.

Henry, et al[18] (2020) showed that diabetes is most frequently linked to acanthosis nigricans, fungal infections, and skin tags.

Alqahtani, et al[19] (2021) showed that diabetes patients in Riyadh City were found to have tinea pedis frequently—roughly one in ten of them. In Saudi Arabia, similar research is needed in other fields.

Nijenhuis-Rosien, et al[20] (2019) showed that for individuals with diabetes who are more likely to develop foot ulcers, there is no proof that laser therapy for onychomycosis has any effect—at least not for a full year following treatment.

DISCUSSION

Type 2 diabetes, which affects 90% of individuals, is thought to be the most prevalent kind of the disease. Patients with diabetes, particularly those who are uncontrolled, experience problems in several physiological systems. Diabetes-related vasculopathy and immune system compromise are the main causes of these consequences. It has been estimated that 30% of diabetes people get dermatological problems. Fungal infections are the most frequent cause of these lesions. The majority of people affected by this kind of illness have uncontrolled glucose levels. Patients with tinea pedis may have cosmetic pain, but the main issue is that it raises the possibility of developing a secondary bacterial infection.[21–25]

A dermatophyte fungus causes tinea pedis, often known as foot ringworm, an infection of the feet that affects the nails, soles, and interdigital clefts of the toes. Another name for it is athlete's foot. Tinea unguium is a dermatophyte that causes onychomycosis of the nail. One kind of dystrophic nail is an aberrant nail that is not brought on by a fungal infection. Both fingernails and toenails can have onychomycosis, although toenail infections are far more common.[18]

Aragon-Sanchez et al in their study with 41 patients confirmed with onycohomycosis and tinea pedis with diabetes mellitus, showed that tinea pedis has low accuracy in people with diabetes mellitus.[13] There was no discernible correlation between participants' knowledge and their nationality, location of residence, educational attainment, or living situation ($p>0.05$). Furthermore, despite the fact that only 10.20% of research participants had type 1 diabetes and 4.32% had type 2 diabetes, there were negligible variations in the knowledge of Tinea pedis and Tinea unguium infections among diabetes patients ($p>0.05$). Therefore, there has to be a greater effort made to educate people about mycosis through social media, hospitals, and health facilities, with an emphasis on patients who are at high risk of infection, given the low level of awareness about foot and nail mycosis in the Ha'il region.[14]

According to a research by Akkus et al., tinea pedis is the second most common fungal infection in diabetes people, after onychomycosis. Research has demonstrated that onychomycosis and tinea pedis are facilitated by the age of diabetes patients as well as consequences including peripheral circulatory failure and diabetic foot ulcers.[15]

Research has indicated that there might be a notable incidence of tinea pedis in individuals with diabetes. According to one study, diabetic individuals had a 40.6% incidence of onychomycosis (a fungal infection of the nails) and a 10.9% prevalence of tinea pedis. Another study discovered that almost one-third of diabetes individuals with foot ulcers also had onychomycosis and tinea pedis. A non-controlled study found that diabetes individuals had a 22% incidence of onychomycosis.[15,16]

Oz, et al did study in 600 patients with diabetes, with 85 patients spotted to have tinea pedis. With the increased age and male gender, the tinea pedis significatly related with diabetes mellitus. The isolation and identification of the fungus is important to the effective management of tinea pedis and onychomycosis in diabetes patients because non-dermatophyte fungi can cause these infections.[16]

CONCLUSION

In summary, there are association between the cases of tinea pedis in patients with diabetes mellitus. The evidences are still just a few of the researches. More studies needed to improve the proof of tinea pedis cases in patients with diabetes mellitus.

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