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A Study of Association of Psoriasis and Type 2 Diabetes Mellitus: A Comprehensive Systematic Review

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ABSTRACT

Keyword:
Diabetes Mellitu; Psoriasis; Metabolic; Association

Diabetes mellitus is a significant risk factor in psoriasis, a chronic inflammatory disease with a high genetic predisposition. The association between psoriasis and diabetes mellitus is inconsistent, with some studies finding a higher risk of metabolic disorders in psoriasis patients. However, meta-analytical studies confirm a significant association between adult psoriasis and obesity, hypertension, diabetes, dyslipidemia, and metabolic syndrome. Understanding this association can help develop treatments and plans to alleviate the burden of these conditions. This systematic review focused on full-text English literature published between 2014 and 2024, adhering to PRISMA 2020 principles. Without a DOI, editorials and review papers that were published in the same journal as the submission were not accepted. ScienceDirect, PubMed, and SagePub were among the many web resources used to compile the literature. Using reliable resources, including Science Direct, SagePub, and PubMed, the study examined over 7,000 publications. Following the determination that eight publications warranted further inquiry, a more thorough examination of the full corpus was conducted. Diabetes mellitus risk in psoriasis patients is significantly increased due to insulin resistance, a common pathogenic mechanism in both psoriasis and metabolic syndrome. Treatment can reduce this risk by reducing proinflammatory cytokines and increasing anti-inflammatory cytokine.

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Introduction

Psoriasis is a chronic inflammatory disease that has a high genetic predisposition. The incidence of this disease varies according to location, with Scandinavian regions having the highest prevalence (11%) and some African and Asian countries having the lowest (Rendon & Schäkel, 2019). There are different clinical subtypes of psoriasis, the most common of which is plaque psoriasis (psoriasis vulgaris). Other variants include guttate psoriasis, inverse psoriasis, pustular psoriasis, erythrodermic psoriasis, nail psoriasis, and scalp psoriasis (Mirghani et al., 2023). Psoriasis affects multiple body parts, including the skin, joints, oral cavity, scalp, and nails. It is also associated with other conditions such as psychiatric diseases, cardiometabolic issues, and streptococcal infections, as well as factors such as smoking, alcohol consumption, and obesity (Griffiths et al., 2021). Psoriasis is considered an immune-mediated systemic disease and is associated with various comorbidities, which significantly impact patients, communities, and healthcare systems (Korman, 2020). Chronic inflammation and keratinocyte hyperproliferation are initiated by genetic predisposition and environmental triggers, leading to a chronic proinflammatory process that releases interleukins, tumor necrosis factor, and interferons. Targeting the inflammatory pathways and cytokines contributing to the disease pathogenesis can revolutionize psoriasis treatment (Baliwag et al., 2015; Mirghani et al., 2023). It is important to note that psoriasis shares its pathogenesis with various comorbidities, including metabolic-associated fatty liver disease, dyslipidemia, hypertension, diabetes, and myocardial infarction (Wu et al., 2022).

Research has appeared that psoriasis isn't fair restricted to skin clutters. Psoriatic patients are at an expanded hazard of other maladies, such as Crohn's infection, cardiovascular illness, hypertension, diabetes mellitus, and metabolic disorder (Davidovici et al., 2010). Numerous observational considers have been conducted to examine the predominance and rate of metabolic disarranges in patients with psoriasis. Be that as it may, the comes about are conflicting and changed. Whereas a few studies have found a better chance of metabolic clutters in psoriasis patients compared to the common populace, others have detailed no noteworthy distinction or indeed a lower chance. These incongruities can be ascribed to contrasts in ponder plan, populace characteristics, symptomatic criteria, perplexing variables, and result degree (Alajroush et al., 2024).

Psoriasis and metabolic clutter may come together due to shared immunopathogenesis counting ceaseless low-level aggravation intervening by pro-inflammatory cytokines such as IFN-gamma, IL-17, IL-23, and TNF-alpha (Esser et al., 2014). **I**n addition, a number of consider have associated insulin-like improvement calculate 1 (IGF-1) as a shared authority inside the keratinocyte increase in psoriasis and the progression of diabetes and hyperlipidemia (Azfar & Gelfand, 2008). Diabetes mellitus could be a gather of metabolic disorders characterized by high blood sugar levels and a lack of the generation or activity of insulin (Mamizadeh et al., 2019). Although several researchers have studied the association between psoriasis and diabetes, their

findings are inconsistent. Therefore, a combined analysis of various studies was conducted to establish a single result (Mamizadeh et al., 2019). I In pediatric bunches with psoriasis, a few considers have watched the next hazard of metabolic co-morbidities than in control bunches (Cho et al., 2021). Thus, it is suggested to screen for metabolic comorbidities in pediatric patients with psoriasis. Be that as it may, the level of prove is low (Osier et al., 2017). Meta-analytical ponders have affirmed a critical affiliation between grown-up psoriasis and corpulence, hypertension, diabetes, dyslipidemia, and metabolic disorder (Cho et al., 2021). Understanding the affiliation between psoriasis and diabetes mellitus given to certain individuals can be valuable in making plans and medications to understanding easing this maladies. The reason of this efficient writing audit was to distinguish the relationship between psoriasis and diabetes mellitus found in considers conducted over the past ten a long.

Research Methods

Protocol

The author of this work meticulously adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure that the study complied with all regulations. The chosen methodology was thoughtfully crafted to ensure precise and coherent research outcomes.

Criteria for Eligibility

This consider gives a comprehensive investigation of investigate conducted over the past decade on the relationship between psoriasis and diabetes mellitus. Through intensive information investigation, this venture points to illustrate and improve persistent care methods. The essential objective of this proposition is the importance of key themes that can be found in a assortment of scholarly works.

To ensure the accuracy of the data utilized in this study, strict inclusion and exclusion criteria were implemented. A piece must have been published in English between 2014 and 2024 to be considered for inclusion. Exclusion criteria include published reviews, editorials, submissions lacking a DOI, and duplicate journal entries.

Search Strategy

The study's keywords include "diabetes mellitus, psoriasis, association, relationship, connection, outcomes, incidence, risk factor". For this research, the following Boolean MeSH keywords were entered into the databases: (((“Diabetes Mellitus”[MeSH Terms] OR “Diabetes Mellitus “[All Fields] AND “Psoriasis”[All Fields]) OR (“Diabetes Mellitus”[MeSH Terms] OR “Association”[All Fields] AND “psoriasis”[All Fields]) AND (“Association”[MeSH Terms] OR “relationship”[All Fields] OR “connection”[All Fields] OR “outcomes”[MeSH Subheading] OR “incidence”[All Fields] OR “risk factor”[All Fields]))).

Data retrieval

Before embarking on this comprehensive examination, the writers meticulously reviewed the title and abstract of each article to determine its relevance. Only studies that

met the inclusion criteria and aligned with the article's objectives were given greater consideration. Through a series of searches, a clear and recurring pattern emerged. English was the sole language accepted for full-text entries. The most rigorous screening process resulted in content that satisfied all predetermined inclusion criteria and was directly applicable to the study's subject matter. Research that did not conform to these parameters was generally disregarded, and their findings were not accorded significant weight. The assessment encompassed a wide range of information, including factors, titles, authors, publication dates, locations, and study methodologies.

Quality Assessment and Data Synthesis

Each article's titles and abstracts were scrutinized by the writers themselves to determine which ones necessitated further investigation. The next step involved thoroughly reviewing each document that was initially qualified for inclusion in the review. The assessment results were used as a basis for choosing the review papers. By expediting the process of selecting publications for further scrutiny, this criterion facilitated a more thorough evaluation of previous research and the circumstances that warranted its review.

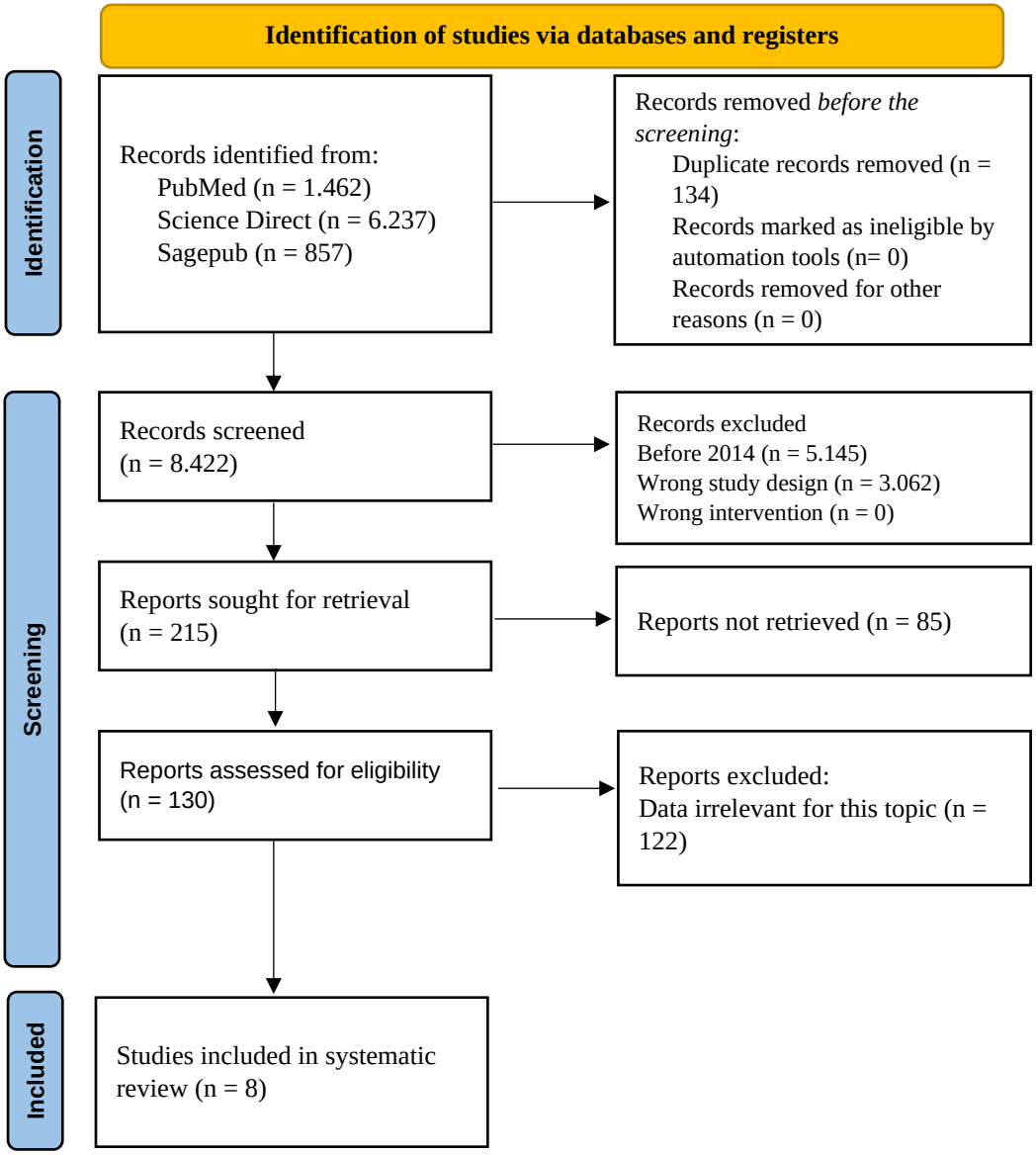

Figure 1 Article search flow chart

Result and Discussion

In the beginning stages of our research, our team diligently compiled a vast collection of publications from highly regarded databases, including Science Direct, PubMed, and SagePub. After a meticulous three-tier screening process, we pinpointed eight papers that were deemed highly pertinent to our ongoing systematic investigation. From there, we honed in on specific areas for further examination and conducted a comprehensive review of each manuscript. To help streamline our analysis, we've included a succinct summary of the evaluated content in Table 1 for your convenience.

Table 1 The Literature Included in This Study

Author	Origin	Method	Sample	Result
Rodriguez-Zuniga et al.[14] (2017)	Multicenter	Systematic Review	14 studies	We discovered that 31.4% of psoriasis patients had metabolic syndrome (MS). Studies conducted in Europe (in Germany, Italy, the United Kingdom, Norway, and Denmark) found a lower risk of multiple sclerosis than studies conducted in the Middle East (in Israel, Turkey, and Lebanon).
Singh et al.[15] (2017)	USA	Meta Analysis	35 studies	We specifically examined the data from 35 observational studies involving 1,450,188 participants from 20 countries, 46,714 of whom had psoriasis. Random effects analysis yielded a pooled odds ratio of 2.14. A graphic visualization using a funnel plot and an Egger test both revealed publication bias. This thorough meta-analysis indicates that, in comparison to the general population, psoriasis patients have increased odds of having metabolic syndrome.
Mamizadeh et al.[11] (2019)	Iran	Systematic Review	38 studies	The estimated OR was found to be 1.69 (95% CI [Confidence Interval]: 1.51-1.89; P<0.001) based on an analysis of 38 eligible studies with 922870 cases and 12808071 controls. Based on the study design and the nation of study, subgroup analysis was carried out, and the results were significant (test for subgroup differences: P=0.025 and P<0.001, respectively).
Cho et al.[12] (2021)	Korea	Meta Analysis	16 studies	There were sixteen distinct studies that met the inclusion criteria in the meta-analysis. In children with psoriasis, the pooled odds ratios for obesity (13 studies), hypertension (8 studies), diabetes mellitus (8 studies), dyslipidemia (7

				studies), and metabolic syndrome (4 studies) were 2.40, 2.73, 2.01, and 7.49, respectively.
Cintoni et al.[16] (2023)	Italy	Review	-	Our analysis demonstrates that leading a healthy lifestyle can have a positive impact on how the illness progresses. The severity of psoriasis is thought to improve when a healthy weight is maintained along with physical activity and wise dietary decisions. Yes, a Mediterranean diet high in fiber, vitamins, and polyphenols may help manage the symptoms of psoriasis. This diet works well not only because it reduces inflammation but also because it can help regulate gut microbiota and prevent dysbiosis, which is linked to a number of autoimmune disorders.
Mirghani et al.[2] (2023)	Saudi Arabia	Meta Analysis	7 studies	Diabetes and hypertension were found to be associated with psoriasis at odds ratios of 1.38, 95% CI 1.17-1.64; P-value 0.0002, chi-square 224.93, and 1.60, 95% CI 1.41-1.81, P-value 0.00001, chi-square 226.59, respectively. Significant variation was noted (heterogeneity I2 = 97%, P < 0.001).
Sodagar et al.[17] (2023)	Iran	Meta Analysis	37 studies	Individuals with psoriasis, hidradenitis suppurative, vitiligo, androgenetic alopecia, and lichen planus are more likely than the general population to develop metabolic syndrome or diabetes. Insulin resistance, hypertension, and elevated blood lipids are more common in people with seborrheic dermatitis and rosacea. Particularly in Spain and Thailand, a strong correlation between metabolic syndrome and skin conditions has been discovered.

Alajroush et al.[8] (2024)	Saudi Arabia	Meta Analysis	16 studies	Psoriasis showed a strong correlation with hypertension (HTN, 35%), hyperlipidemia (19%), diabetes mellitus (DM, 18% increased incidence), and obesity (25%). Meta-analyses revealed significant heterogeneity, especially with regard to DM.

precise survey of 45 ponders by Rodriguez-Zuniga et al. found a noteworthy affiliation between psoriasis and MS, with a pooled chances proportion (OR) of 1.42 and moo heterogeneity. The ponder too found that planned ponders had a gently higher hazard for MS. Systemic treatment decreased the hazard for MS. Geographic area and quality did not altogether influence the association between psoriasis and MS (Rodríguez-Zúñiga & García-Perdomo, 2017).

According to think about by Singh et al. (2017) soriasis patients had an altogether higher predominance of metabolic disorder than non-psoriasis controls. It was found that the recurrence of metabolic disorder was dose-dependent on the seriousness of psoriasis, with higher chances proportions for serious cases.

Patients with psoriasis are more likely to develop diabetes mellitus, according to a current study by Maamizadeh et al. that combined the data of 38 studies, supporting the conclusions of a prior meta-analysis. Psoriasis and diabetes mellitus had a 1.69 (95% CI: 1.51-1.89; P<0.001) overall odds ratio (Mamizadeh et al., 2019).

Children with psoriasis have considerably higher chances of hypertension, diabetes mellitus, dyslipidemia, and metabolic syndrome, according to a study by Cho et al. A pooled odds ratio of 2.73 indicated that children with psoriasis had a significantly higher prevalence of these conditions. There is a strong correlation between psoriasis and these health problems, as the studies also showed that children with psoriasis have higher odds of dyslipidemia and metabolic syndrome (Cho et al., 2021).

Research conducted by Cintoni et al. has demonstrated a strong correlation between metabolic disorders such as diabetes, obesity, celiac disease, and vitamin deficiencies, and psoriasis. Chronic non-communicable diseases like Crohn's disease, depression, metabolic syndrome, cardiovascular disease, and cancer are linked to psoriasis. According to recent research, metabolic disorders linked to gut-microbiota dysbiosis may be triggers or causes of psoriasis (Sodagar et al., 2023).

Compared to control subjects, patients with psoriasis had a higher odds ratio (1.38), 95% confidence interval (1.17), P-value (0.0002), chi-square (224.93), and standard deviation (6.0) of diabetes, according to the current meta-analysis by Mirghani et al. (2023).

Sodagar et al. investigated the connection between psoriasis and metabolic syndrome (MetS) in 21 studies involving participants ranging in age from 35 to 53 on average. MetS has been shown in nineteen studies to have a significant impact on psoriasis patients. Nonetheless, two studies conducted in Tunisia and Macedonia revealed no correlation between MetS and psoriasis, suggesting a possible association (Sodagar et al., 2023).

Alajroush et al. discovered a significant correlation between psoriasis and diabetes mellitus (DM) in psoriatic patients. In comparison to non-psoriatic patients, the pooled RR of

DM2 in psoriatic patients was 1.18 (95% CI 1.16, 1.20), signifying an 18% rise in DM2 incidence (Alajroush et al., 2024).

Discussion

Psoriasis is linked to several metabolic comorbidities, including obesity, hypertension, diabetes, dyslipidemia, and metabolic syndrome. These conditions can worsen the severity of psoriasis and increase the risk of developing it (Alajroush et al., 2024; Lønnberg et al., 2016; Sodagar et al., 2023). Psoriasis is an immune-mediated disease that causes inflammation and oxidative stress, leading to insulin resistance and dyslipidemia (Brembilla & Boehncke, 2023). It shares many cardiovascular risk factors with metabolic syndrome, such as abdominal obesity, hypertension, dyslipidemia, and insulin resistance (Singh et al., 2017). People with psoriasis are 40% more likely to develop metabolic syndrome than those without it. The psoriatic march concept explains the connection between psoriasis and metabolic syndrome, which is increased systemic inflammation (Rodríguez-Zúñiga & García-Perdomo, 2017). Both psoriasis and metabolic syndrome cause chronic inflammation, which contributes to insulin resistance and endothelial cell dysfunction. This can lead to adverse cardiovascular events, such as atherosclerosis (Gelfand & Yeung, 2012). The overproduction of pro-inflammatory cytokines in psoriasis lesions can cause systemic resistance, endothelial dysfunction, and oxidative stress (Gisondi et al., 2018). This inflammation can ultimately lead to metabolic comorbidities. Insulin resistance, endothelial cell dysfunction, and cardiovascular disease are all linked to psoriasis and metabolic syndrome (Coimbra et al., 2016). Recent meta-analyses have indicated an 80% increased risk of developing metabolic syndrome in people with psoriasis (Rodríguez-Zúñiga & García-Perdomo, 2017).

According to Rodriguez (2017), while the connection between psoriasis and metabolic syndrome is significant, the association's strength is reduced due to low heterogeneity and confidence intervals. Psoriasis, a skin condition, has a considerable impact on metabolic syndrome risk. The use of systemic treatment can reduce this risk by decreasing proinflammatory cytokines' release and increasing anti-inflammatory cytokines. Treatment-naive psoriasis patients show increased proinflammatory cytokines and decreased anti-inflammatory cytokines, which normalize after treatment (Dowlatshahi et al., 2013). Psoriasis treatment can also help improve metabolic risk and psoriasis after MS treatment. Research has found that psoriasis patients have low levels of the anti-inflammatory cytokine IL-10, suggesting that psoriasis treatment may help reduce cardiovascular risk (Rodríguez-Zúñiga & García-Perdomo, 2017). Psoriasis patients face more than twice the odds of metabolic syndrome than the general population. A meta-analysis of 35 studies has shown a dose-dependent relationship between the severity of psoriasis and metabolic syndrome prevalence. As psoriasis is a systemic disease with significant morbidity and mortality, healthcare providers must screen psoriasis patients for cardiometabolic diseases and provide structured management. Further research is necessary to determine the exact pathologic mechanisms shared by these two diseases and the relationship directionality (Singh et al., 2017).

Diabetes and psoriasis share common pathogenic mechanisms, such as inflammation, insulin resistance, and hyperglycemia. Inflammation is a characteristic feature of psoriasis, which can trigger insulin resistance, commonly observed in psoriasis patients (Abramczyk et al., 2020). A meta-analysis of 22 studies indicates that psoriatic patients are at higher risk of diabetes (Cheng et al., 2012). Psoriasis patients with severe symptoms have a higher likelihood of developing cardiovascular disease (CVD). Inflammation can stimulate the proliferation of keratinocytes and fibroblasts, which are risk factors for psoriatic lesions (Cintoni et al., 2023). In psoriasis, inflammatory cytokines can raise IGF levels, which is reduced in both diabetes and psoriasis (Hu et al., 2019). Hyperglycemia is closely associated with psoriatic inflammation, and a link between serum glycated hemoglobin (HbA1c) and psoriasis PASI score has been observed. Anti-inflammatory and anti-diabetic drugs, such as GLP-1 receptor agonists, can improve psoriasis in patients with type 2 diabetes (Cintoni et al., 2023). Genetic analysis supports that susceptibility genes for type 1 diabetes, type 2 diabetes, and psoriasis overlap.[24] Inflammation plays a crucial role in the relationship between these two conditions (Lowes et al., 2007). More research is required to identify the shared pathophysiological mechanism and the precise relationship between these two systemic disorders (Mamizadeh et al., 2019). Proper management and treatment of metabolic comorbidities are crucial to prevent cardiovascular events and reduce the psoriasis treatment response (Takeshita et al., 2017). However, studies targeting children and adolescents are limited, and the association between metabolic comorbidities and pediatric psoriasis is clear. Psoriasis is associated with a poor prognosis and increased cardiovascular risks in pediatric patients. To reduce these risks, active detection and management of high-risk groups are crucial. Treatment with biologics has been shown to lower cardiovascular disease risk in adults. Further evidence-based guidelines are necessary for adequate metabolic comorbidities screening and management (Cho et al., 2021).

There is a strong correlation between psoriasis and diabetes, with significant implications for cardiovascular health. A comprehensive meta-analysis found that individuals with psoriasis had a notably higher prevalence of hypertension, even when factors such as age and other cardiovascular risks were taken into account (Mirghani et al., 2023). This risk was particularly elevated in patients with severe psoriasis, underscoring the need for careful cardiovascular risk assessment among this population (Duan et al., 2020). Given the known bidirectional relationship between diabetes and hypertension, it is important to screen for hypertension among psoriasis patients to prevent serious complications such as stroke and myocardial infarction (Parati & Piepoli, 2022). Additionally, the association between psoriasis and diabetes mellitus has important implications for therapeutic choices, including the use of lipid-lowering drugs with a low risk of diabetes (Mirghani et al., 2023).

Conclusion

Psoriasis patients are at a higher risk of developing diabetes due to the increased inflammation and insulin resistance caused by the psoriatic march concept. This inflammation contributes to endothelial cell dysfunction, leading to adverse cardiovascular events. Treatment for psoriasis can reduce the risk of metabolic syndrome by decreasing proinflammatory cytokines and increasing anti-inflammatory cytokines. Psoriatic patients face a higher prevalence of hypertension, especially in severe cases, underscoring the need for careful cardiovascular risk assessment. Anti-inflammatory and anti-diabetic drugs, such as GLP-1 receptor agonists, can improve psoriasis in type 2 diabetes patients.

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