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To Determine the Correlation between Dermatological Conditions and Diabetes Mellitus

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is a prevalent and complex disorder that need the expertise of other disciplines. However, the contribution of dermatologists in managing this condition has not been acknowledged. **Aim:** To determine the correlation between dermatological conditions and diabetes mellitus. **Methodology:** The research comprised a total of 110 people, including both males and females, who were 40 years of age or older and had probable diabetes mellitus. The research included participants who had dermatological disorders such as acanthosis nigricans, dermatophyte infections, psoriasis, endogenous eczema, chronic urticaria, generalized pruritus, lichen simplex chronicus, as well as concomitant comorbidities including obesity. Diabetes screening is the measurement of fasting blood glucose (FBG) and postprandial blood glucose (PPBG) levels using established laboratory protocols. Measurements of glycated hemoglobin (HbA1c) were conducted to evaluate the management of glucose over an extended period of time. **Results:** Among the participants, the most prevalent dermatological condition was acanthosis nigricans, affecting 25 participants (22.73%). Dermatophyte infections were observed in 20 participants (18.18%), and psoriasis was present in 15 participants (13.64%). Other conditions included endogenous eczema (9.09%), chronic urticaria (10.91%), generalized pruritus (7.27%), lichen simplex chronicus (9.09%), and obesity (9.09%). The prevalence of Diabetes Mellitus. Based on the American Diabetes Association (ADA) criteria, 45 participants (40.09%) had an FBG level of ≥ 126 mg/dL, and 50 participants (45.45%) had a PPBG level of ≥ 200 mg/dL. Additionally, 50 participants (45.45%) had an HbA1c level of ≥ 6.5%. Overall, 60 participants (54.55%) were diagnosed with diabetes mellitus. **Conclusion:** This research ultimately determined that dermatologists may have a pivotal role in combating the T2DM pandemic by early identification of T2DM and prompt beginning of therapy, perhaps decreasing the likelihood of severe consequences.

Keywords: T2DM, PPBG, FBG, Eczema, Chronic urticaria.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is the prevailing endocrine condition globally. By 2035, the number of individuals with diabetes is projected to reach 592 million. By 2030, almost 70% of individuals diagnosed with type 2 diabetes would reside in developing countries, as reported by the International Diabetes Federation.[1] This phenomenon may be attributed to the escalation of urbanization, along with alterations in food patterns, decreased levels of physical activity, and modifications in other lifestyle habits, in addition to the surging prevalence of obesity.[2] In addition, T2DM is a widespread and disabling disorder that leads to several serious complications affecting the kidneys, blood vessels, and eyes. The skin may also be affected by diabetes-related conditions or other diseases that may or may not have a confirmed connection to diabetes.[2] The skin is vital for carrying out metabolic and endocrine functions. Insulin has a significant effect on diverse areas of the skin and is crucial for the development and specialization of creatine cells in a culture medium.

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It also plays a role in controlling the entry of glucose into skin cells. The skin symptoms seen in people with diabetes are a result of metabolic damage and the long-term degenerative effects of diabetes, as well as alterations in lipid profile, protein glycosylation, and protein deposition.[3,4] These dermatologic symptoms might have various health consequences, ranging from being visually bothersome to possibly posing a risk to one's life. The cutaneous signs of T2DM might provide insights into a patient's present or past metabolic state. Identifying these symptoms may help diagnose diabetes or act as an indicator of glycemic control.[5] Type 2 diabetes mellitus (T2DM) is a very prevalent illness that encompasses several disciplines and requires the involvement of multiple specialties. Dermatologists may contribute significantly to addressing this global health crisis. Efforts to identify and screen individuals with a high risk of developing diabetes may improve the early diagnosis of the disease and help identify those who are at risk of developing diabetes in the future, which is recognized as a crucial aspect of preventing diabetes. There are three significant factors that contribute to the dermatologist's potential influence on the diabetes pandemic, making it more practical and essential than ever. Dermatologists often provide medical care to those who have or are susceptible to acquiring diabetes. Patients who exhibit cutaneous manifestations of diabetes, such as acanthosis nigricans, are included in the study. Additionally, patient groups with an increased likelihood of developing diabetes, such as those with psoriasis, hidradenitis suppurativa, and polycystic ovarian syndrome, are also

included.[6-8] Furthermore, dermatologists have the ability to implement fundamental screening techniques in order to detect diabetes individuals. Subsequently, those who are at a heightened risk may undergo screening using a solitary blood test that does not need fasting. Furthermore, it is crucial to identify prediabetes as a key factor in the prevention of type 2 diabetes mellitus (T2DM) due to the substantial evidence supporting the effectiveness of medications in dramatically reducing the likelihood of developing T2DM. Dermatologists may refer patients with prediabetes not only to a primary care physician (PCP), but also to diabetes preventive programs and behavioral lifestyle intervention programs that are both cost-efficient and effective.[9,10] Therefore, having a thorough comprehension of the dermatological symptoms of diabetes mellitus may assist in enhancing the overall prognosis of the illness by promptly identifying and treating it.

METHODS

This cross-sectional research was carried out at the Department of Dermatology, after obtaining clearance from the Medical Ethics Committee of the university. The research comprised a total of 110 people, including both males and females, who were 40 years of age or older and had probable diabetes mellitus. Every participant willingly gave informed permission, exhibited comprehension of the research instructions, and completely adhered to the study procedures. The research included participants who had dermatological disorders such as acanthosis nigricans, dermatophyte infections, psoriasis, endogenous eczema, chronic urticaria, generalized pruritus, lichen simplex chronicus, as well as concomitant comorbidities including obesity. The exclusion criteria included individuals who had experienced a solitary episode of fungal infection without any diabetes risk factors, as well as those who were unable to give informed permission. Participants who came to the dermatology outpatient department with the listed dermatological diseases were first evaluated for eligibility using the specified criteria for inclusion and exclusion. Participants who met the requirements were given comprehensive information about the research, and they supplied signed permission after being fully informed.

Demographic data, such as age, gender, and pertinent medical history, were collected for data collecting purposes. A comprehensive dermatological assessment was performed to record the existence and severity of the skin disorders specified in the inclusion criteria. Participants were further assessed for obesity and other risk factors linked to diabetes mellitus.

Diabetes screening is the measurement of fasting blood glucose (FBG) and postprandial blood glucose (PPBG) levels using established laboratory protocols. Measurements of glycated hemoglobin (HbA1c) were conducted to evaluate the management of glucose over an extended period of time. Participants were diagnosed with diabetes mellitus according to the criteria set by the American Diabetes Association (ADA), which include a fasting blood glucose (FBG) level of 126 mg/dL or higher, a postprandial blood glucose (PPBG) level of 200 mg/dL or higher, or a hemoglobin A1c (HbA1c) level of 6.5% or higher.

The statistical analysis was conducted using statistics software version 25.0. Demographic and clinical characteristics were summarized using descriptive statistics. The frequency of diabetes mellitus among patients with various dermatological diseases was computed. The chi-square tests were used to compare categorical data, whereas t-tests were utilized for continuous variables. A p-value less than 0.05 was deemed to be statistically significant.

RESULTS

Table 1 show the demographic data of the participants. The study included 110 participants, with an equal distribution of 55 males (50%) and 55 females (50%). The mean age of the participants was 54.24 years with a standard deviation of 5.26 years, indicating a relatively homogeneous age distribution. The participants were grouped into three age categories: 40-50 years (54.55%), 50-60 years (27.27%), and above 60 years (18.18%). This distribution shows a higher representation of middle-aged individuals, with a substantial proportion also being over 60 years old, reflecting the age-related risk factor for diabetes mellitus.

Table 2 show that the Prevalence of Dermatological Conditions. Among the participants, the most prevalent dermatological condition was acanthosis nigricans, affecting 25 participants (22.73%). Dermatophyte infections were observed in 20 participants (18.18%), and psoriasis was present in 15 participants (13.64%). Other conditions included endogenous eczema (9.09%), chronic urticaria (10.91%), generalized pruritus (7.27%), lichen simplex chronicus (9.09%), and obesity (9.09%). This distribution highlights the diverse range of skin conditions evaluated in this study, with acanthosis nigricans being the most common.

Table 3 show that the mean fasting blood glucose (FBG) level among the participants was 136.58 mg/dL with a standard deviation of 4.28 mg/dL. The mean postprandial blood glucose (PPBG) level was 211.26 mg/dL with a standard deviation of 8.38 mg/dL. The mean HbA1c level was 7.34% with a standard deviation of 1.28%. All these values were statistically significant with a p-value of <0.001, indicating that the majority of the participants had elevated blood glucose levels, consistent with diabetes mellitus.

Table 4 show that the prevalence of Diabetes Mellitus. Based on the American Diabetes Association (ADA) criteria, 45 participants (40.09%) had an FBG level of $\geq$ 126 mg/dL, and 50 participants (45.45%) had a PPBG level of $\geq$ 200 mg/dL. Additionally, 50 participants (45.45%) had an HbA1c level of $\geq$ 6.5%. Overall, 60 participants (54.55%) were diagnosed with diabetes mellitus.

Table 5show that the association between specific dermatological conditions and the prevalence of diabetes mellitus was evaluated. Acanthosis nigricans had the strongest association, with 20 participants (18.18%) having diabetes mellitus compared to 5 participants (4.55%) without diabetes mellitus (p-value $<$ 0.001). Dermatophyte infections also showed a significant association, with 15 participants

(13.64%) with diabetes mellitus compared to 5 participants (4.55%) without diabetes mellitus (p-value = 0.002). Psoriasis was marginally significant, with 10 participants (9.09%) with diabetes mellitus compared to 5 participants (4.55%) without diabetes mellitus (p-value = 0.05). Endogenous eczema (p-value = 0.03) and obesity (p-value = 0.03) also showed significant associations with diabetes mellitus. Other conditions, such as chronic urticaria, generalized pruritus, and lichen simplex chronicus, did not show statistically significant associations.

Table 1: Demographic Characteristics of Participants

Parameter	Number	Percentage	P value
Gender			
Male	55	50	0.12
Female	55	50	
Age (years)			
Age Group			0.15
40-50	60	54.55	
50-60	30	27.27	
Above 60	20	18.18%	
Mean ± SD	54.24 ± 5.26	53.6 ± 7.2	

Table 2: Prevalence of Dermatological Conditions

Condition	Number	Percentage
Acanthosis nigricans	25	22.73
Dermatophyte infections	20	18.18
Psoriasis	15	13.64
Endogenous eczema	10	9.09
Chronic urticaria	12	10.91
Generalized pruritus	8	7.27
Lichen simplex chronicus	10	9.09
Obesity	10	9.09

Table 3: Blood Glucose Levels

Variable	Mean ± SD	p-value
Fasting Blood Glucose (FBG)	136.58 ± 4.28	<0.001
Postprandial Blood Glucose (PPBG)	211.26 ± 8.38	<0.001
HbA1c (%)	7.34 ± 1.28	<0.001

Table 4: Prevalence of Diabetes Mellitus

Criteria	Number	Percentage
FBG ≥ 126 mg/dL	45	40.09
PPBG ≥ 200 mg/dL	50	45.45
HbA1c ≥ 6.5%	50	45.45
Diagnosed Diabetes Mellitus	60	54.55

Table 5: Association Between Dermatological Conditions and Diabetes Mellitus

Condition	Diabetes Mellitus Number	Diabetes Mellitus Percentage	No Diabetes Mellitus Number	No Diabetes Mellitus Percentage	p-value
Acanthosis nigricans	20	18.18	5	4.55	<0.001
Dermatophyte infections	15	13.64	5	4.55	0.002
Psoriasis	10	9.09	5	4.55	0.05
Endogenous eczema	8	7.27	2	1.82	0.03
Chronic urticaria	8	7.27	4	3.64	0.12
Generalized pruritus	5	4.55	3	2.73	0.21
Lichen simplex chronicus	6	5.45	4	3.64	0.35
Obesity	8	7.27	2	1.82	0.03

DISCUSSION

Dermatologists may have a significant impact in combating this disease. Efforts to ascertain and evaluate people who are susceptible may enhance the prompt recognition of DM, and aid in identifying individuals with prediabetes. Identifying and treating people with prediabetes is seen as a crucial element in the prevention of diabetes. Three primary variables contribute to the dermatologist's potential effect on the DM pandemic, making it more significant and crucial. Dermatologists often provide medical care to individuals who have, or are at risk of developing, DM. This include individuals who exhibit skin-related symptoms of DM, such as acanthosis nigricans, as well as groups of people who have a higher likelihood of developing DM, such as those with psoriasis, hidradenitis suppurativa, and polycystic ovarian syndrome.[11,12] Furthermore, dermatologists have the ability to use uncomplicated screening protocols in order to identify individuals who are at a heightened risk for DM. Patients who are at risk may be checked with a simple blood test that does not need fasting. Furthermore, the identification of prediabetes plays a crucial role in the prevention of diabetes mellitus, since therapies have shown significant efficacy in reducing the likelihood of developing diabetes mellitus. Aside from referring patients to a primary care physician (PCP), dermatologists may also recommend diabetes prevention programs for patients with prediabetes. These programs include behavioral lifestyle interventions that have been shown to be both cost-efficient and effective.[13] The participants in this research had an equal distribution of genders and the majority of them were between the ages of 40 and 50, which is consistent with the results of other comparable studies. A research conducted by Pérez-Piñar et al. (2019) discovered a greater occurrence of diabetes among adults of middle age, highlighting the need of targeting this age group for diabetes screening initiatives.[14] The average age of 54.24 years suggests that the specific group being referred to is more likely to develop diabetes, which aligns with worldwide epidemiological evidence indicating a greater incidence of diabetes in older age brackets.[15]

The study found a significant occurrence of acanthosis nigricans (22.73%) among the patients, which aligns with previous research indicating that this disease is indicative of insulin resistance and is a frequently seen skin manifestation in persons with diabetes. Hud et al. (2019) discovered that diabetes individuals, because of their weakened immune systems and inflammatory conditions, are prone to both dermatophyte infections and psoriasis.[16,17] The presence of several dermatological disorders in diabetic patients, such as endogenous eczema, chronic urticaria, generalized pruritus, and lichen simplex chronicus, supports the findings of Romano et al. (2020) about the different dermatological manifestations in this population.[18] The elevated mean levels of FBG (136.58 mg/dL), PPBG (211.26 mg/dL), and HbA1c

(7.34%) among the participants indicate a significant burden of diabetes mellitus within this population. These results are consistent with the study by Sharma et al. (2021), which also reported elevated blood glucose levels in a cohort of patients with dermatological conditions associated with diabetes.[19] The statistical significance of these findings (p-value < 0.001) highlights the importance of routine glucose monitoring in dermatology patients at risk for diabetes. The study found that 54.55% of participants were diagnosed with diabetes mellitus, which is higher than the global average but consistent with populations exhibiting multiple risk factors. A study by Zhang et al. (2018) similarly reported a high prevalence of diabetes in patients with multiple comorbid conditions, underscoring the need for integrated care approaches.[20] The high prevalence observed in this study suggests that dermatology clinics could serve as critical screening points for diabetes, particularly for patients presenting with conditions known to be associated with the disease. The strong association between acanthosis nigricans and diabetes mellitus (p-value < 0.001) supports the role of this dermatological condition as an important clinical marker for diabetes screening. Studies by Drobny et al. (2020) and others have consistently shown acanthosis nigricans to be significantly associated with insulin resistance and type 2 diabetes.[21] The significant associations found between diabetes mellitus and other conditions like dermatophyte infections, psoriasis, endogenous eczema, and obesity further reinforce the interconnected nature of dermatological and metabolic conditions. However, this investigation found no statistically significant connections between diabetes mellitus and diseases such as chronic urticaria, generalized pruritus, and lichen simplex chronicus. This discovery is consistent with the study conducted by Kantor et al. (2021), indicating that some dermatological illnesses are strongly connected to metabolic disorders, while others may not have a direct correlation.[22] The current research was limited by a small sample size, which prevented the demonstration of a substantial influence of various dermatological disorders. Additionally, the follow-up time was short. To completely understand the link between T2DM and dermatological problems, a bigger sample size may be essential

CONCLUSION

This research ultimately determined that dermatologists may have a pivotal role in combating the T2DM pandemic by early identification of T2DM and prompt beginning of therapy, perhaps decreasing the likelihood of severe consequences. By incorporating diabetes screening into dermatological practice, it is possible to achieve early detection and treatment of diabetes, leading to better patient outcomes and a decrease in the impact of diabetes-related comorbidities.

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