Original Article

Knowledge, attitude, and practice regarding diabetic dermopathy among physicians in Riyadh, Saudi Arabia

Rania Naguib[1,2], Abeer S Al Shahrani[1], Muneera R AlSaleh[3], Manar M Alhawsawi[1], Hala N Elmorshedy[1]

[1]Department of Clinical Sciences, College of Medicine, Princess Nourah Bint Abdulrahman University, Saudi Arabia, [2]Internal Medicine Department, Alexandria Faculty of Medicine, Alexandria University, Egypt, [3]Dermatology Department, College of Medicine, King Saud University, Saudi Arabia

Abstract

Context: Type 2 diabetes mellitus (T2DM) is expanding at an epidemic rate. Diabetes and the prediabetes are associated with a number of skin manifestations which are seen in a minimum of 30% of diabetics as first sign or during the course of their illness. To the best of our knowledge, this is the first study in Saudi Arabia that assess physicians' knowledge, attitude and practice regarding this common problem. **Aims:** To assess the level of knowledge, attitude, and practice (KAP) about diabetic dermopathy among a representative sample of physicians in Saudi Arabia; and to identify determinants of good KAP. **Settings and Design:** A cross-sectional study was conducted among physicians at university and governmental hospitals in Riyadh, KSA
Materials and Methods: 112 physicians from different specialties and experiences were interviewed using an English self-administered questionnaire. **Statistical analysis used:** Data was analyzed using IBM SPSS Statistics for Windows, version 20, with appropriate statistical test. P value < 0.05 was considered significant. **Results:** It included 112 physicians in which 43.8%, Family medicine, 31.3% endocrinologist/Internal Medicine, and 25.0% GPs/Interns. Physicians above 35 year-old, master/PhD holders, consultants, endocrinologist/Internal Medicine, and those in practice for more than 10 years scored the highest in the overall knowledge. However, only 47% were confident to diagnose diabetic dermopathy. Moreover, majority of physicians regardless of the specialty, had educated their patients, examined them for other lesions, and followed conservative protocols. As much as 74.3% of endocrinologists seek for dermatologists' consultation. **Conclusions:** Physicians' knowledge regarding diabetic dermopathy is suboptimal, this may impact quality of diabetes care.

Keywords: Attitude, dermopathy, diabetes mellitus, knowledge, practice, physicians

Introduction

Diabetes Mellitus (DM) is becoming a major health problem worldwide. Epidemiological studies strongly suggest that type 2 diabetes mellitus (T2DM) is expanding at an epidemic rate. Globally, it has been estimated that the number of diabetics might reach up to 250–300 million by the year 2025.[1] DM and the prediabetes state are associated with a number of skin manifestations. It has been shown that cutaneous manifestations are seen in a minimum of 30% of diabetics during the course of their illness, and in some patients, it may be the first sign of the disease. While in others, it may even appear before the diagnosis of diabetes mellitus (DM) is confirmed.[2-5] Skin disorders also may be clues to the presence of associated microvascular complications of DM.[6] One study has demonstrated that skin disorders may reach as high as 79.2% among patients with DM and that the most common skin manifestations are cutaneous infections, xerosis, and inflammatory skin diseases.[7] Other

Address for correspondence: Dr. Abeer S Al Shahrani, College of Medicine, Princess Nourah Bint Abdulrahman University, Saudi Arabia.
E-mail: drabeer_fm@yahoo.com

Received: 23-03-2020 **Revised:** 25-04-2020
Accepted: 02-05-2020 **Published:** 30-07-2020

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_447_20

How to cite this article: Naguib R, Al Shahrani AS, Al Saleh MR, Alhawsawi MM, Elmorshedy HN. Knowledge, attitude, and practice regarding diabetic dermopathy among physicians in Riyadh, Saudi Arabia. J Family Med Prim Care 2020;9:3518-24.

reported skin disorders associated with DM include diabetic dermopathy (DD), acanthosis nigricans (AN), necrobiosis lipoidica (NL), rubeosis faciei (RF), pruritus (PR), skin tags (ST), granuloma annulare (GA), Scleroderma diabeticorum (SD), and bullosis diabeticorum (BD). These conditions are possibly related to underlying diabetogenic mechanisms.[8] Glycemic control does appear to play a role in the rate of cutaneous involvement. Patients with hemoglobin A1c (HbA1C) values >8 mmol/mL had more diabetic skin complications compared to those with hemoglobin A1c values <8 mmol/mL.[7]

Increasing the knowledge about cutaneous manifestations of DM can be associated with overall prognosis improvement of disease through the early diagnosis and treatment. 30%–82% of DM patients experience different types of cutaneous disorder during the chronic course of their disease.[9]

Besides being markers of DM, skin manifestations could possibly play an important role in reducing the complications associated with diabetes as they may improve the motivation of patients and physicians toward disease management. This will help improves health care outcomes, reduces expenditure, and prevents the complication of unnecessary interventions.[10-12] Given the increasing incidence and prevalence of DM worldwide, physicians are expected to be aware of all diabetes-associated cutaneous manifestations and they should make dermatologic assessments an integral part of the general physical examination for optimal diabetic care. Another fundamental aspect of care is tailoring the management plan for individual patient and discussing the management goals with their patients. In addition, timely referral to dermatologist when needed is among physician's comprehensive management plans.

The prevalence of diabetes in Saudi Arabia is now one of the highest in the world with a substantially high prevalence of type 2 DM reaching as high as 34.1% in males and 27.6% in females which represents one of the major health problems encountered by physicians.[13] Skin disorders among Saudi patients with DM are alarmingly high and patients commonly suffer from a wide variety of cutaneous disorders.[14] One study demonstrated that out of the 320 patients who were included in the study, 292 (91.2%) had skin manifestations. Cutaneous lesions were seen in 12 patients (34.3%) with type 1 DM and in 280 patients (98.2%) with type 2 diabetes.[15] Another study demonstrated that the common skin disorders were: xerosis (74.7%), pruritus (38.2%), diabetic dermopathy (30.1%), finger pebbles (25.6%), and thickened skin (22.2%).[15]

Since diabetic patients can be managed by different specialties like family physicians, internists, and endocrinologists, it is therefore important to assess the degree of physicians' knowledge regarding diabetes and its complications like dermopathy. Most of the conducted studies in KSA were focusing mainly on the physicians' adherence to the diabetes guidelines and were limited to type 2 diabetes only, but there is a shortage in literatures that explore physicians' knowledge, attitude, and practice (KAP) with regard to diabetic dermopathy and how they perceive the magnitude of the problem in the community. Therefore, in this study, we aim to assess the level of knowledge about diabetic dermopathy among a representative sample of physicians who provide care for prediabetes and diabetic patients in multiple medical centers in Saudi Arabia, to investigate the perception of physicians to the degree and magnitude of the problem of diabetic dermopathy in the community, and to identify determinants of good knowledge, attitude, and practice. This information is crucial for providing adequate intervention plans and providing a rationale for planners responsible for CME to strengthen the program according to real needs.

Subjects and Methods

A cross-sectional study was conducted among physicians in university and governmental hospitals in Riyadh, KSA. Hospitals which are serving the largest number of the population in Riyadh and which are willing to participate were enrolled in the study. Verbal approval of the study was obtained from the hospital director.

The study included male and female physicians, any age, physicians included: interns, general practitioners (GPs), family medicine, internal medicine, and endocrinologists. A convenient sampling technique was used. Sample size was calculated using STATA 14 software. Based on our experience and literature review, we assumed that 35%–50% of physicians might have good knowledge and considering a power of 0.8, at 95% confidence interval (CI) and alpha level value of 0.05, the calculated sample size was 85. We targeted 100 physicians to compensate for incomplete data.

Data were collected using a self-administered questionnaire. The questionnaire was created by the authors based on reviewing available literature, similar articles, and scientific books since this study is relatively new. A pilot study was conducted on 20 subjects to test the face validity and estimate the time required for data collection.

The survey consists of four sections: the first section was about the sociodemographic characteristics of respondents and included questions inquiring about age, sex, highest qualification, specialty, years of experience, and whether education about diabetic dermopathy was received over the preceding year. The second section included the assessment of knowledge through answering 6 open-ended questions requesting the participant to enumerate at least six cutaneous manifestations in Type 1 and Type 2 diabetes, enumerate the pre-diabetic skin manifestations, mention the mechanisms responsible for diabetic dermopathy, and state the indications for biopsy and indications for referral to dermatologist. The third section of the survey included multiple choice questions in addition to, Yes/No questions assessing the practice, for example, the plan of management of patients who are at risk of developing diabetic dermopathy,

the frequency of screening diabetic patients for dermopathy, if the participant came across a diabetic patient with dermopathy over the last month, next step when diagnosing patient with diabetic dermopathy. The fourth section included assessment of perception and attitude regarding diabetic dermopathy through six questions inquiring about the magnitude of the diabetic dermopathy frequency, the possibility of diagnosing diabetic dermopathy by physical examination, the likelihood of examining diabetic patients for cutaneous manifestations, the likelihood of referring diabetic patients with cutaneous problems to dermatologist, the degree of confidence to diagnose diabetic dermopathy, and the need for workshop training regarding diabetic dermopathy. The answers ranged from strongly agree to strongly disagree and were scored on a scale from 1 to 5. All answers were evaluated by a subject expert and were given marks for scoring. Total knowledge and attitude scores were calculated and standardized to 100. Physicians who scored 60 or more were considered as having acceptable score.

Ethical consideration

The study protocol was approved by the Institutional Review Board at Princess Nourah bint Abdelrahman University, Riyadh, Kingdom of Saudi Arabia (KSA) (IRB-PNU: 17-0135). Informed consent was taken from all study participants. All data used in the study is available for interested researchers upon approval from Institutional Review Board at PNU. Contact: irb@pnu.edu.sa.

Statistical analyses

Data were analyzed using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). Descriptive statistics in terms of frequency and percentages was used to describe qualitative variables. The total knowledge and attitude scores were computed and standardized to 100. As the distribution of knowledge and attitude scores was not symmetric, it was presented as median with inter-quartile-range (IQR). Group comparison in median score was performed using the nonparametric Mann–Whitney test for two groups and the Kruskal–Wallis test for more than two groups. Association between qualitative variables was tested by Chi-square. *P* value less than 0.05 was considered as statistically significant.

Results

This survey included 112 physicians working in secondary and tertiary hospitals in Riyadh City, the capital of Saudi Arabia. Table 1 displays the survey characteristics of participants. The majority were below 36 years (64.0%), and female participants exceed males (57.5% versus 42.5%). The percentage of board-certified physicians is comparable to diploma holders, while holders of master and doctorate degrees accounted for 12.5% only. Family medicine, endocrinologist/internal medicine, and GPs/interns were represented in the following order: 43.8%, 31.3%, and 25.0%, respectively. About one-fifth of the sample had 5–9 years of experience, 51.8% were in practice for less than 5 years, and 28.6% were in practice for more than 10 years. Over the year preceding this survey, most of the participants (75.0%) did not enroll in any workshop about diabetic dermopathy.

Table1: Personal, educational, and occupational profiles of the study sample (Total *n*=112)

Variable	*n* (%)
*Gender	
Males	45 (42.5)
Females	61(57.5)
**Age category	
25-35	71 (64.0)
>35	40 (36.0)
Qualification	
Bachelor/Diploma	48 (42.9)
Master/PhD	14 (12.5)
Board Membership	50 (44.6)
***Job title	
Residents/intern	51 (46.8)
Registrar/senior registrar	25 (22.9)
Consultant	33 (30.3)
Specialty	
GP and Intern	28 (25.0)
Family Medicine	49 (43.7)
Endocrinology and Internal Medicine	35 (31.3)
Years of experience	
<5	58 (51.8)
5-9	22 (19.6)
10+	32 (28.6)
Place of Work	
**Public Hospital	91 (82.0)
Private/both	20 (18.0)
Attended workshop about diabetic dermopathy over the last year	
Yes	26 (23.2)
No	86 (76.8)

*Data were missing for 6 participants **Age was missed for one participant. ***Data were missing for 3 participants

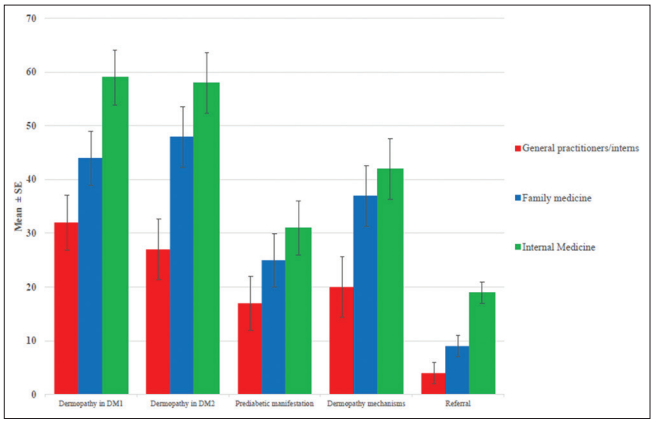

Figure 1: Mean knowledge score of diabetic dermopathy according to specialty

Table 2 demonstrates the standardized knowledge score according to personal factors, experience, and credentials. Overall, the median score was evidently low 28.3, IQR 13.3–50, yet attending workshop significantly increased the median score:

44.2 for attendees versus 21.7 for nonattendees. Physicians above 35 years old, master/PhD holders, consultants, endocrinologist/internal medicine, and those in practice for more than 10 years scored the highest in the overall knowledge; nevertheless, the median score is suboptimal, as it was about 50.0. Of note, the difference in knowledge score according to gender was not significant. Figure 1 depicts the mean knowledge score according to specialty. For all topics, endocrinologist/internal medicine scored the highest followed by family medicine and lastly the GPs and interns. The scores of dermopathy manifestations of diabetes exceed those of prediabetic dermopathy manifestations and the mechanism of diabetic dermopathy, while the lowest score was for conditions which call for referral to dermatologists.

Table 2: Median knowledge score according to personal factors and credentials in a sample of physicians in Saudi Arabia, Riyadh city, (*n*=112)

Variable	Median, [75th percentile], (IQR)	*P
*Gender		
Males	30.0, [50.8], (33.3)	
Females	25.0, [48], (40.0)	0.63
**Age category		
25-35	21.6, [35], (41.7)	
>35	50.0, [63.8], (42.1)	<0.001
Qualification		
Bachelor/Diploma	17.5, [36.7], (30.0)	
Master/PhD	51.7, [58.8], (23.8)	<0.001
Board Membership	36.7, [54.2], (34.2)	
***Job title		
Residents/intern	18.3, [36.7], (30.0)	
Registrar/senior registrar	36.7, [52.5], (35.8)	
Consultant	46.7, [68.3], (47.5)	<0.001
Specialty		
GP and Intern	13.3, [33.8], (29.6)	
Family Medicine	25.0, [47.5], (28.3)	
Endocrinology and Internal Medicine	48.3, [58.3], (45.0)	0.003
Years of experience		
<5	20.8, [38.8], (32.1)	
5-9	20.8, [48.8, (37.1)	
10+	52.5, [70.8], (49.2)	<0.001
Attended workshop about diabetic dermopathy over the last year		
Yes	44.2, [52.9], (32.9)	0.03
No	(21.7), [48.3], (38.3)	
Total: Median, [75th percentile], (IQR)	28.3 [50.0], (36.7)	

Knowledge score was standardized to 100, *P< 0.05 is significant using non-parametric statistical tests. **Data were missing for 6 participants, ***Age was missed for one participant, ****Data were missing for 3 participants

In contrast to knowledge scores, the attitude scores were acceptable, as the median of the total score was 62.5, IQR 54.1–70.8. Majority of participants agreed that dermopathy can be diagnosed by physical examination (93%); however, only 47% were confident to diagnose diabetic dermopathy. Accordingly, as much as 86% stated that they need workshops about diabetic dermopathy. About one-fifth of the sample expressed that they were likely to refer cases to dermatologists [Table 3].

Table 4 describes the practice of participants. During a period of 1 month, 52.9% of endocrinologist/internal medicine encountered cases of diabetic dermopathy compared to 39.6% and 39.3% for family medicine physicians and GPs/interns, respectively. Although more than 90% of all physicians reported screening for diabetic dermopathy for the population at risk, yet about 50% performed the screening for diabetic dermopathy approximately every 6 months. As for the management of cases with diabetic dermopathy, majority of physicians regardless of the specialty had educated their patients, examined them for other lesions, and followed conservative protocols. Of note, 88.6% of endocrinologist practiced patient's education versus 100% of family physicians and 96.4% of GPs/interns, with a statistical difference. Referral to dermatologists was statistically different according to specialty as endocrinologist practiced more referral (74.3%) compared to 61.2% for family medicine and 42.9% for GPs/interns.

Discussion

This survey was conducted to assess the knowledge, attitude, and practices among physicians regarding diabetic dermopathy. An insight into the awareness of physicians regarding diabetic dermopathy would be a guide to the health education programs. In the Saudi community, diabetic patients represent a large cohort of patients attending hospitals or centers.

Results of this study revealed a remarkable deficit in physicians' knowledge about skin disorders in DM; the overall standardized

Table 3: Attitude and perception about diabetic dermopathy in a sample of physicians in Saudi Arabia, Riyadh city, (*n*=112)

Variable	Agree *n* (%)	Undecided *n* (%)	Disagree *n* (%)
*Frequency of diabetic dermopathy is high	62 (58.5)	27 (25.5)	17 (16.0)
Dermopathy can be diagnosed by physical exam	93 (83.0)	11 (9.8)	8 (7.1)
I'm likely to examine for diabetic dermopathy	73 (65.2)	24 (21.4)	15 (13.4)
I'm likely to refer diabetic dermopathy to a dermatologist	21 (18.8)	27 (24.1)	64 (57.1)
I'm confident to diagnose diabetic dermopathy	47 (42.0)	43 (38.4)	22(19.6)
I feel I need more workshops focusing on diabetic dermopathy	86 (76.8)	12 (10.7)	14 (12.5)
**Standardized Total Attitude score: Median [75th percentile], IQR		62.5, [70.8], (16.7)	

* Data were missed for 6 participants. ** Total score was standardized to 100

Table 4: Practice regarding diabetic dermopathy in a sample of physicians in Saudi Arabia, Riyadh city

Practice	Specialty (% of acceptable response)				
	GP/intern *n*=28	Family Medicine *n*=49	Internal Medicine /Endocrinology *n*=35	Total	**P*
Dealing with population at risk					
Screening and management of risk factors	(100.0)	(95.9)	(94.3)	(96.4)	0.463
#Watchful waiting	(85.2)	(87.0)	(80.6)	(84.6)	0.750
Frequency of screening not more than 6 months	(71.4)	(53.0)	(48.5)	(56.3)	0.345
Management of a case of diabetic dermopathy					
Patient education**	(96.4)	(100.0)	(88.6)	(95.5)	0.042
Examine for other skin manifestations	(100.0)	(85.7)	(88.6)	(90.2)	0.119
Conservative management	(78.6)	(72.9)	(60.0)	(70.3)	0.240
Referral to a dermatologist	(42.9)	(61.2)	(74.3)	(60.7)	0.040
Examining a case of diabetic dermopathy over the previous month	(39.3)	(39.6)	(52.9)	(43.6)	0.420

#Reverse coded *The difference is statistically significant if $P<0.05$ using the Chi-square test

median score was only 28. Surprisingly, although consultants and specialists scored the highest score, we considered the computed scores are fairly low. In contrast to knowledge, the attitude score was acceptable. Similarly, practice was considered acceptable with minor variations according to physician's tile or experience.

Cutaneous manifestations of diabetes usually appear following the development of diabetes. It can be the first manifestations of the disease or even can precede the diagnosis.[16] Diabetic dermopathy functions as an indicator of the diabetic complications resulting from microangiopathy. Physicians need to know the importance of screening diabetic patients for the presence of cutaneous manifestations, as this is a low-cost measure for early detection which is the first line of management. Recognition of cutaneous markers enables earlier diagnosis of diabetes.[8]

Overall, there are notable deficiencies in the knowledge regarding diabetic dermopathy identified from this study. The median knowledge score among physicians was evidently low 28.3. Yet, our study demonstrated how training impacts physician's knowledge regarding diabetic dermopathy. It shows that all physicians who attended and continued medical education programs are more knowledgeable. There was an observed statistically significant difference between knowledge scores after attending workshop with increased median score to 44.2 for attendees versus 21.7 for nonattendees. Furthermore, physicians above 35 years old, master/PhD holders, endocrinologist/internal medicine, and those in practice for more than 10 years scored the highest in the overall knowledge; nevertheless, the median score is still suboptimal, as it was about 50. The low knowledge score among those highly specialized physicians with relatively long experience is a matter of grave concern. Endocrinologist/internal medicine scored the highest followed by family medicine and lastly the GPs and interns.

Our survey showed that a significantly large number of diabetic dermopathy patients are seen initially by GPs and interns with nearly 40% of GPs and interns encountered cases of diabetic dermopathy per month compared to 52.9% of endocrinologist/internal medicine and 39.6% for family medicine physicians. This is of significant importance as GPs and interns are the first line of defense in dealing and managing most of diabetic patients. To the best of our knowledge, this is the first survey to evaluate the knowledge and practices of physicians related to diabetic dermopathy. Understanding the magnitude of the problem is important as the national programs for diabetes prevention and management are evolving rapidly. Inadequate knowledge about diabetes and its related complications will likely lead to under screening of at-risk individuals and low rates of identification of patients with diabetes.

The scores of dermopathy manifestations of diabetes exceed those of prediabetes dermopathy manifestations and the mechanism of diabetic dermopathy, while there was a substantial gap in the knowledge of evidence-based recommendations for referral to dermatologists.

Our results revealed that the attitude scores were acceptable, as the median of the total score was 62.5. However, less than half of the participants were confident to diagnose diabetic dermopathy, and most of them feel that they need more education. One might ask that a person with a good attitude should have good knowledge, but this is not necessarily true, especially what we investigated was an academic level of knowledge which can be gained through education. However, it is more important to have positive attitude rather than to have a good knowledge and a poor attitude, as changing the attitude is more difficult than improving deficits in knowledge. The possible explanation for the greater attitude score regarding diabetic dermopathy compared to the knowledge score could be due to the fact that the most of the continuous medical education programs are usually directed toward improving and updating the management plan rather than on reviewing the basic knowledge which is reflected in our study on the attitude rather than on the knowledge score.

Although more than 90% of all physicians reported screening for diabetic dermopathy for the population at risk, yet about 50% performed the screening for diabetic dermopathy approximately every 6 months. Majority of physicians regardless of their specialty had educated their patients, examined them for other lesions, and followed conservative protocols. Of note, 88.6% of endocrinologist practiced patient's education versus 100% of family physicians and 96.4% of GPs/interns, with a statistical difference. Referral to dermatologists was statistically different according to specialty as endocrinologist practiced more referral (74.3%) compared to 61.2% for family medicine and 42.9% for GPs/interns. These findings can be used to guide a health education program for physicians dealing with diabetics.

Since there are no other studies to compare similarities or contrast differences from previous work, we reviewed some literatures which studied knowledge about diabetes guidelines and other diabetes related complications to get a general idea about the knowledge score related to different aspects of diabetes. In a study done in Saudi Arabia investigating physicians' knowledge regarding the criteria for the diagnosis of metabolic syndrome, more than half (51.7%) had low knowledge level. The mean knowledge score was significant with regards to specialty in favor of the Family Physicians.[17] Another recent study[18] showed the knowledge of family physicians about the diagnostic guidelines for diabetes and found that roughly 50% of family physicians selected the correct criteria for diagnosing diabetes. A similar study conducted in Riyadh, Saudi Arabia exploring the knowledge of the family physicians regarding the diabetes guidelines concluded that a large portion is not sufficiently aware of the recent guidelines of diabetes.[13]

Strengths of our study include its coverage of physicians in a variety of practice settings, the comprehensive nature of the survey, and the first study in the Saudi culture to address this issue. We believe that the main limitation of this study was the selection criteria which is based on a convenience sample, which might affect the generalizability of findings to the whole Saudi population.

Summary and Conclusion

Knowledge of physicians about diabetic dermopathy was substantially low, even the seniors and specialists scored fairly low. Overall, the attitude was acceptable, but the majority were not confident to diagnose diabetic dermopathy; hence, most of the participants feel the need for more workshops focusing on diabetic dermopathy. We recommend that physicians should be enrolled in educational programs targeting diabetes complications in order to stay updated. Emphasis should be laid on deficient areas during educational programs and misconceptions should be cleared. Screening for diabetic dermopathy is recommended in all patients on a regular basis. Evidence-based practices about dealing with diabetes complications and diabetic dermopathy research should be encouraged.

Highlights

This study provides an overview of the knowledge of diabetic dermopathy among physicians which may facilitate earlier detection and treatment of this disorder.

Financial support and sponsorship

The study was funded by the Deanship of Scientific Research at Princess Nourah bint Abdulrahman University through the fast track funding program.

Conflicts of interest

There are no conflicts of interest.

References

1. Kapitel 11 fra Folkesundhedsrapporten Danmark 2007. Available from: www.si folkesundhed.dk/upload/kap_11_diabetes.pdf. [Latest accessed on 2016 Apr. 29].
2. Braverman IM. Cutaneous manifestations of diabetes mellitus. Med Clin North Am 1971;55:1019-29.
3. Paron NG, Lambert PW. Cutaneous manifestations of diabetes mellitus. Prim Care 2000;27:371-83.
4. Huntley AC. The cutaneous manifestations diabetes mellitus J Am Acad Dermatol 1982;7:427-55.
5. Allen GE. Diabetes and the skin. Pract 1969;203:189-93.
6. Duff M, Demidova O, Blackburn S, Shubrook J. Cutaneous manifestations of diabetes mellitus. Clin Diabetes 2015;33:40-8.
7. Demirseren DD, Emre S, Akoglu G, Arpacı D, Arman A, Metin A, *et al.* Relationship between skin diseases and extracutaneous complications of diabetes mellitus: Clinical analysis of 750 patients. Am J Clin Dermatol 2014;15:65-70.
8. Bustan R, Wasim D, Yderstræde KB, Bygum A. Specific skin signs as a cutaneous marker of diabetes mellitus and the prediabetic state – a systematic review Dan Med J 2017;64:A5316.
9. Azizian Z, Behrangi E, Hasheminasabzavareh R, Kazemlo H, Esmaeeli R, Hassani P. Prevalence study of dermatologic manifestations among diabetic patients. Adv Prev Med 2019;2019:5293193. doi: 10.1155/2019/5293193.
10. Kong AS, Williams RL, Smith M, Sussman AL, Skipper B, Hsi AC, *et al.* Acanthosis nigricans and diabetes risk factors: Prevalence in young persons seen in southwestern US primary care practices. Ann Fam Med 2007;5:202-8.
11. Brickman WJ, Binns HJ, Jovanovic BD, Kolesky S, Mancini AJ, Metzger BE, *et al.* Acanthosis nigricans: A common finding in overweight youth. Pediatr Dermatol 2007; 24:601-6. doi: 10.1111/j.1525-1470.2007.00547.x..
12. Horton WB, Boler PL, Subauste AR. Diabetes mellitus and the skin: Recognition and management of cutaneous manifestations. South Med J 2016;109:636-46.
13. Amin H, Alkadhaib A, Modahi N, Alharbi A, Alkhelaif A. Physicians' awareness of guidelines concerning diabetes mellitus in primary health care setting in Riyadh KSA. J Taibah Univ Med Sci 2016;11:380-7.
14. Sameer KH. Zimmo prevalence of skin manifestations in diabetes mellitus at king Abdulaziz University Hospital. Saudi J Inter Med 2012;2:19-22.
15. Shahzad M, Al Robaee A, Al Shobaili H, Alzolibani A, Al

Marshood A, Al Moteri B. Skin manifestations in diabetic patients attending a diabetic clinic in the Qassim region, Saudi Arabia. Med Princ Pract 2011;20:137-41.

16. Horton W, Boler P, Subauste A. Diabetes mellitus and the skin: Recognition and management of cutaneous manifestations. South Med J 2016;109:636-46.
17. Alali AA, Albagshi NM, Albin Alshaikh SM, Almubarak AA. Primary care physicians' knowledge, attitudes and practices related to metabolic syndrome screening and management in Alahsa, Saudi Arabia. Diabetes Metab Syndr 2019;13:2689-97.
18. Tseng E, Greer R, O'Rourk P, Yeh HC, McGuire M, Albright A, *et al*. National survey of primary care physicians' knowledge, practices, and perceptions of prediabetes. J Gen Intern Med 2019;34:2475-81.