Knowledge of diabetic foot care management among medical students at King Abdulaziz University Hospital, Jeddah, Saudi Arabia

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ABSTRACT

الأهداف: هدفنا من هذا البحث تقييم الحصيلة المعرفية لطلبة الطب عن العناية بالقدم السكرية والعوامل المرتبطة بها.

المنهجية: هذه الدراسة الوصفية المستعرضة أُجريت على ٣٠٣ من طلبة الطب بمستشفى جامعة الملك عبدالعزيز. خلال شهر يونيو البيانات تم تجميعها عن طريق استبيان مكون من جزأين. الأول لمعرفة المعلومات الأساسية للطلبة، والآخر كان لقياس معرفتهم. يتكون الاستبيان الثاني من 68 سؤال بصيغة صواب أم خطأ ويتضمن على 4 أجزاء فرعية (جزء عوامل الخطر، جزء فحص القدم، جزء مضاعفات القدم وجزء اختيار الحذاء) كلما كانت الدرجة الكلية للطالب أعلى كلما كان مستوى المعرفة أعلى.

النتائج: درجة المتوسط الكلي لمعرفة الطلبة كانت 55.5±5.5 من أصل 68. كانت درجة المتوسط لجزء عوامل الخطر 14.11/16، فحص القدم 9.24/10، مضاعفات القدم 24.21/32 واختيار الحذاء 7.88/10. فقط 56.4% من الطلبة كانوا على بينة بخطورة القدم السكرية لمرضى السكري؛ في نفس الوقت فقط 63% منهم أجروا الفحوصات السريرية عليهم. الغالبية العظمى من الطلبة أجابوا بضرورة التعليم والتدريب عن كيفية اختيار الأحذية، مبادرات للوقاية من الإصابة بالقدم السكرية والفحوص السريرية المخصصة لها.

الخلاصة: وجدنا أن من حصلوا على نتائج عالية فيما يخص معرفتهم عن العناية بالقدم السكرية؛ كانوا أكثر الطلبة تعليماً للمرضى، واجراءً للفحوصات السريرية. بل وأيضاً قيامهم بتدريبات اختيارية «دورات تطوعية» عن العناية بالقدم السكرية.

Objectives: To evaluate medical students' knowledge of diabetic foot care management and its related factors.

Methods: This was a cross-sectional, descriptive study of 303 students studying at King Abdulaziz University Hospital, Jeddah, Saudi Arabia conducted from June to July 2019. Data were collected using a two-part questionnaire. The first one captured student information; the second assessed student knowledge. It consists of 68 true and false questions divided into 4 subscales (risk factors, foot examination, foot complications and footwear selection). The higher the total score is, the higher the students' knowledge.

Results: The total average knowledge score was 55.5±5.5 out of 68. While the mean score was 14.11/16 for risk factors, 9.24/10 for foot examination, 24.21/32 for foot complications, and 7.88/10 for footwear selection subscales. Only 56.4% of students educated diabetic patients about diabetic foot risks;concurrently, only 63% performed foot examinations in diabetes patients. Students who educated diabetic patients, preformed foot exam, or attended extra elective clinical rotation in a diabetic foot team, had a significantly higher knowledge level.

Conclusion: Students were found to have high level of knowledge regarding diabetic foot management. Students who educated patients about diabetic foot risk, performed foot examination on patients and students who took elective rotations in a diabetic foot care team had a higher knowledge level.

Keywords: diabetic foot, Saudi Arabia, medical students, medical education, microvascular complication

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Diabetes mellitus (DM), defined as a group of chronic metabolic diseases of high blood glucose (hyperglycemia) that result from a defect in insulin action, secretion, or both, is considered one of the major public health problems worldwide.[1] Over time, it can lead to multi-organ damage.[2] Patients with diabetes have an increased risk of developing serious health problems associated with high morbidity and mortality, which increase the cost of medical care.[3] According to the International Diabetes Federation (IDF), 425 million (8.8%) adults (age 20-79 years) worldwide currently have DM, and DM accounted for 10.7% of global all-cause mortality in this age group. Further, the IDF reports that Saudi Arabia has the highest diabetes prevalence in the Middle East and North Africa at approximately 18.5%.[4] Diabetes is associated with various complications. Patients with poorly controlled hyperglycemia may develop multiple, predominantly vascular, complications that affect large vessels (macrovascular), small vessels (microvascular), or both. The World Health Organization (WHO) and the International Working Group on the Diabetic Foot (IWGDF) define diabetic foot disease as a state where the foot of a patient with diabetes presents with ulceration, infection, and/or destruction of the deep tissues, associated with various degrees of peripheral vascular disease and neurological abnormalities in the lower limb.[5-8] Diabetic foot disease is a serious and potentially devastating complication of diabetes. In extreme cases, it can result in non-trauma-related lower extremity amputation. Diabetes-related foot ulcers account for more than 80% of all amputations, which are a significant cost burden on healthcare systems. Overall, diabetic foot is associated with high cost of treatment and significant morbidity and mortality, but it can be prevented by early diagnosis, treatment, and suitable patient education.[9]

The worldwide prevalence of diabetic foot is approximately 6.3%,[10] with 15-20% of patients undergoing amputations.[11] At the moment, there are no data on the annual rate of amputations in Saudi Arabia. However, a 2012 study by a Saudi physician estimated that approximately 325 amputations are likely to occur annually in the city of Jeddah alone and 3,970 throughout Saudi Arabia.[12] The management of DM is complicated and requires patients and healthcare providers to acquire suitable knowledge and skills. Early detection and management of high-risk patients is important to prevent ulceration and amputation of a diabetic foot.[13] For early detection of the disease, a low-risk diabetes patient must be examined once a year, while high-risk patients should be examined every 3-6 months. All patients with diabetes should examine their feet daily.[14] Repeated trauma and uncontrolled hyperglycemia are the major risk factors for developing diabetic foot disease, in addition to other risk factors, such as poor hygiene, dry skin, callus formation, fungal infection, improper toenails cutting, foot deformity, and wearing poorly fitted footwear.[15-17] Preventive measures include lifestyle modification, blood pressure control, lipid management, glycemic control, and smoking cessation.[13] Nevertheless, optimal care of diabetic foot depends on the treating physician's understanding of the pathophysiology of the disease, familiarity with principles of treatment, and a multidisciplinary team approach. Used together, these factors have been shown to improve the likelihood of the limb being salvaged.[18] For example, a recent systemic review showed an improvement in patients with a diabetic foot ulcer who received care from a multidisciplinary team compared to patients who did not receive such care.[19] Furthermore, patient education about the proper diabetic foot care has also been shown to reduce the risk of foot lesions.[20]

Studies have shown that involving medical students in patient education contributes to the improvement of patient's awareness of the disease, including knowledge of complications and signs of hypoglycemia, as well as the patient's ability to communicate with their healthcare team. This, in turn, improves the patient's treatment compliance, commitment to a diabetic diet, and undertaking regular foot exams at home.[21,22] Furthermore, when medical students participate in patient education, they have an opportunity to increase their own knowledge as well as the quality of patient care. This can be achieved through students working in patient education clinics, participating in outreach programs, clerks hips on patient education, and student health coaching.[23] Notably, establishing a student-patient relationship is a skill in itself. A good relationship is dependent on the atmosphere that the student creates around a patient; if a student creates a good atmosphere, the patient is an active partner in the student's learning experience. Otherwise, the relationship is one way and lacks sufficient knowledge and information exchange, which is detrimental to the student's and patient's learning.[24]

There is no information publicly-available from any official educational or medical institute that

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describes whether medical students are being assessed on diabetic foot disease management. This study attempts to measure medical students' knowledge of diabetic foot care in different years of clinical training at King Abdulaziz University Hospital (KAUH) to identify the potential educational needs and areas for improvement in curriculum, as well as, to examine the factors contributing toward improved knowledge about diabetic foot care.

Methods. This was a cross-sectional study of KAUH students based in the city of Jeddah, Saudi Arabia conducted from June to July 2019. Jeddah is one of the biggest cities in the Western region of Saudi Arabia, located near the Red Sea, with a population of 3.5 million. King Abdulaziz University Hospital is an 800-bed hospital and is one of the biggest tertiary referral and teaching centers in the Western region of Saudi Arabia.

Inclusion criteria involved all clinical year (fourth, fifth and sixth year) medical students who studied in the Faculty of Medicine, King Abdulaziz University. No exclusion criteria were applied. The educational system of the University consists of 6 years, the first year is the foundation year which is a general year for all students coming to the university, after that a 2 years of basic medical sciences (second and third basic medical years) followed by 3 years of clinical sciences (fourth, fifth and sixth year), in these clinical years students have the chance of being a part of the medical team in which ever department they rotate in (Internal Medicine, Surgery, Pediatrics, and so forth), they have a role in taking history, doing physical examination, and attending clinics (in which they have the chance of educating patients regarding there disease under the supervision of their attending consultant).With this in mind, we randomly selected 303 students enrolled in the fourth, fifth and sixth year of medical training. The required sample size was calculated as follows. The estimated total student population across the 3 clinical years was 1,000. Using Raosoft Sample size calculator tool,[25] we set a 5% margin of error and a 95% confidence level, which yielded a required sample of 278. By the end of the survey period, after adjusting for non-response, the sample size was 303 students.

We used a standardized, confidential, self-administered questionnaire designed using Google forms. Data distribution and collection were performed using Google spreadsheets. The questionnaire we used was adapted from a study conducted by Kaya et al, which assessed nurses' knowledge on diabetic foot management,[26] the questionnaire was validated through taking the opinion of 5 different experts in the field and the items in the questionnaire was assessed in terms of clarity of the questions itself and the content validity, in terms of reliability, the questionnaire found to have a high reliability coefficient (Cronbach's α = 0.90). This is the only questionnaire available that assesses knowledge of diabetic foot management in healthcare professionals. After obtaining permission to use this questionnaire, we modified the first section to suit our targeted population. The questionnaire is divided into 2 sections: the first collected student's information, including sociodemographic and diabetes management-related questions, while the second part consisted of 68 true/false questions about diabetic foot management. This was further divided into 4 subsections: "risk factors," "foot examination," "foot complications," and "footwear selection." The sections contained 16, 10, 32, and 10 questions, respectively. Each correct answer was given a score of 1, and each incorrect answer was given the score of 0, giving an overall score between 0 and 68. The higher the total score, the better the student's knowledge of diabetic foot management. In this study, the opinions of experts in diabetic foot management in KAUH were obtained to assess the items in terms of clarity of statement and content validity in the questionnaire form. Furthermore, a high reliability coefficient for the entire form (Cronbach's α) was found to be 0.80.

This study was approved by the Research Committee of Unit of Biomedical Ethics of KAUH (Reference No. 567-19). Participation in this study was voluntary. The participants were informed about the aim, purpose, and procedure of the study. The students were not offered incentives to participate (such as class credit). Verbal consent was obtained from each participant before data collection.

Statistical analysis. Data were reviewed for accuracy in Microsoft Excel 2016. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 25 (IBM, Armonk, NY, USA). Frequencies and percentages were calculated for categorical variables, and measures of central tendency were calculated for the continuous variables. Statistical differences between groups defined by each demographic variable (for example, clinical year, nationality) were examined through the Chi-square test, independent t-test for 2-group comparisons, and one-way ANOVA for more than 2-group comparisons. A $p<0.05$ was considered significant.

Results. A total of 303 medical students consented to participate in this study. Of them, 158 (52.1%) were

men, and 145 (47.9%) were women. The majority (95.7%) of the students were single, with an average age of 22.7±1.1 years (range: 20-26 years). Furthermore, when divided into academic years, 34.7% were in their fourth year, 32.7% in fifth, and 32.7% were in sixth year (**Table 1**). Most of the students (95.4%) had received training on diabetic foot management. While the majority (95.4%) of them received training as part of the curriculum in the College of Medicine, only two-thirds (61%) performed foot examination on patients with diabetes, while only slightly more than half (56.4%) have previously educated patients with diabetic foot on associated risks or management priorities. Asked what aspects of diabetic foot management they needed training in, the majority reported training needs in footwear selection(72.3%), initiatives to prevent diabetic foot (70.95%), details of foot examination (64.4%), and diabetic foot risk factors and etiology (50.8%) (**Table 1**).

The mean score on the total level of knowledge was 55.45±5.5, with the fifth year students scoring the highest (56.2±5.5), and the fourth year students scoring the lowest (54.7±5.5) (**Table 2**). There was no significant correlation between the students' stage in clinical training and their level of knowledge, except for the score on the "foot examination" subscale (p=0.002), where the sixth year students scored the highest (9.5±0.9), while the fourth year students scored the lowest (9.0±1.2).

Most of the students (98.7%) knew that "poor glycemic control" and "neuropathic foot" were major risk factors associated with diabetic foot. Similarly, the majority of students knew that in patients with diabetes, "feet should be checked every day by a patient, or a relative by eye, hand, and mirror." Finally, students (99.3%) also knew that "shoes should be checked for foreign bodies such as nails, gravel." **Table 3** details the students' correct scores.

In contrast, over a third (36.3%) of students incorrectly identified "presence of foot edema" as a risk factor for diabetic foot. In addition, nearly a quarter (23.4%) of students declared they thought that "toenails are not part" of a foot exam. Finally, over two-thirds (66.3%) thought "direct heat sources" do not cause complications. **Table 3** contains the details of students' incorrect answers.

There were no significant differences between knowledge level scores and the participants' age, marital status, nationality, cumulative GPA, or clinical interest. However, on the "foot examination" subscale, women

Table 1 - Sociodemographic characteristics and data on diabetic foot care of students.

Characteristics	n	(%)
Age (years), median (range)	22.73±1.12 (range, 20-26)	
Gender		
Male	158	(52.1)
Female	145	(47.9)
Marital status		
Single	290	(95.7)
Married	13	(4.3)
Academic year		
4th year	105	(34.7)
5th year	99	(32.7)
6th year	99	(32.7)
Nationality		
Saudi	282	(93.1)
Non-Saudi	21	(6.9)
Cumulative general point average		
4.5-5	124	(40.9)
3.75-4.49	153	(50.5)
2.75-3.74	26	(8.65)
What is your clinical interest		
Internal medicine	65	(21.5)
General surgery	69	(22.8)
Obstetrics	15	(4.95)
Pediatrics	30	(9.9)
Family	30	(9.9)
Emergency	16	(5.3)
I do not know	78	(25.7)
Have you received any training on diabetic foot care?		
Yes	289	(95.4)
No	14	(4.6)
Where did you get this training on diabetic foot care? Only YES (can choose more than one)		
Within the curriculum of the College of Medicine	288	(95.0)
Within an elective training program	39	(12.9)
I attended courses, seminars, and symposium programs related to the subject	23	(7.6)
Do you educate patients with diabetic foot risk or problems?		
Yes	171	(56.4)
No	132	(43.6)
Do you perform foot examinations for diabetic patients in your unit?		
Yes	191	(63.0)
No	112	(37.0)
What training do you need in diabetic foot care? (can choose more than one)		
Diabetic foot risk factors and etiology	154	(50.8)
Foot examination	195	(64.4)
Initiatives to prevent diabetic foot	215	(71.0)
Footwear selection	219	(72.3)

Table 2 - Students' knowledge level on diabetic foot care management for each subscale stratified by clinical years

Knowledge level form scores	Potential distribution	Mean±SD				Range	P value
		4th year	5th year	6th year	Total		
(F1) Risk factors	0-16	14.0±1.9	14.4±1.7	14.0±2.0	14.1±1.9	8-16	0.266
(F2) Foot examination	0-10	9.0±1.2	9.2±1.2	9.5±0.9	9.2±4.1	4-10	0.002
(F3) Foot complications	0-32	23.9±3.1	24.7±3.3	24.1±3.3	24.2±3.3	10-30	0.177
(F4) Footwear selection	0-10	7.8±1.1	7.9±1.0	7.9±0.9	7.9±1.0	4-10	0.731
Total score	0-68	54.7±5.5	56.2±5.5	55.5±5.5	55.45±5.51	35-65	0.148

Note: The significant factors were indicated by p values in bold. Test used: one-way ANOVA.

Table 3 - Students' knowledge level on diabetic foot care managements.

Knowledge level	True		False	
Risk factors				
Poor glycemic control	299*	(98.7)	4	(1.3)
Presence of sense of chill, pain, burning, tingling, and tenderness in foot	229*	(75.6)	74	(24.4)
Neuropathic foot (loss of sensorimotor function)	299*	(98.7)	4	(1.3)
Peripheral vascular disease	295*	(97.4)	8	(2.6)
Inadequate foot care and lack of hygiene	290*	(95.7)	13	(4.3)
Presence of foot edema	193*	(63.7)	110	(36.3)
Presence of foot callus	258*	(85.1)	45	(14.9)
Dry and cracked foot skin	268*	(88.4)	35	(11.6)
History of diabetic foot or diabetic ulcers in opposite extremity	282*	(93.1)	21	(6.9)
Infection (redness, tenderness, and temperature increase in the foot)	282*	(93.1)	21	(6.9)
Traumas (barefoot walking, ill-fitting shoes, accident, foreign body in shoes)	297*	(98.0)	6	(2.0)
Foot deformity (mallet toes, claw toes, hallux valgus, amputation, Charcot deformity, low foot, and so forth)	269*	(88.8)	34	(11.2)
Smoking	252*	(83.2)	51	(16.8)
Obesity	247*	(81.5)	56	(18.5)
Age 65 years and above	241*	(79.5)	62	(20.5)
Patients not trained in diabetic foot care	277*	(91.4)	26	(8.6)
Foot examination				
Foot skin (color change, edema-atrophy, dryness, crack, callus, and ulcer) is evaluated	301*	(99.3)	2	(0.7)
Color control (pale, cyanosis, and red) is made	290*	(95.7)	13	(4.3)
Temperature control (temperature, coldness) is made	294*	(97.0)	9	(3.0)
Presence of neuropathy in foot (pain, tingling, burning, tenderness, and sensory loss) is evaluated	292*	(96.4)	11	(3.6)
Muscle functions (atrophy due to motor damage in the muscles) are assessed	252*	(83.2)	51	(16.8)
Circulatory control (foot is pale and cyanosis) is made	294*	(97.0)	9	(3.0)
Presence of ulcer on foot (temperature increase in foot, redness, edema, and tenderness) is evaluated	299*	(98.7)	4	(1.3)
Presence of deformity (hammer finger, claw, hallux valgus, amputation, Charcot deformity, and low foot) is evaluated	283*	(93.4)	20	(6.6)
Toenails (thickening, ingrowth, and length) are controlled	232*	(76.6)	71	(23.4)
Shoe suitability is assessed	263*	(86.8)	40	(13.2)
Method for preventing foot complications				
Feet should be checked every day by the patient or a relative by eye, hand, and mirror (callus, crack, redness, bulla, and open wound)	298*	(98.3)	5	(1.7)

Table 3 - Students' knowledge level on diabetic foot care managements. (continued)

Feet should be washed with warm water every day	218*	(71.9)	85	(28.1)
The water temperature used for washing feet should be checked	262*	(86.5)	41	(13.5)
Feet, especially spaces between toes, should be dried thoroughly after each wash	294*	(97.0)	9	(3.0)
Moisturizing cream should be applied to the feet	262*	(86.5)	41	(13.5)
Moisturizing cream should be applied to spaces between toes	203	(67.0)	100	(33.0)
Toes should be kept dry to protect from fungal growth	275*	(90.8)	28	(9.2)
8. Cutting tools and chemicals should not be used to remove calluses or hardened skin areas.	253*	(83.5)	50	(16.5)
9. Callus and skin stiffness should be thinned with a pumice stone.	173*	(57.1)	130	(42.9)
10. Exercise in the form of twisting and stretching toes several times a day should be carried out to prevent foot corn and callus formation.	203*	(67.0)	100	(33.0)
11. There is no inconvenience to use callus band and plaster.	161	(53.1)	142	(46.9)
12. Only socks should be worn to warm feet.	144*	(47.5)	159	(52.5)
13. Direct heat sources (radiators, hot-water bottle, and electrical appliances) should be used to warm feet.	102	(33.7)	201	(66.3)
14. Socks should not be torn, wrinkled, or oversized.	250*	(82.5)	53	(17.5)
15. Socks should be checked for wetness and color darkness.	275*	(90.8)	28	(9.2)
16. Socks should be changed every day.	279*	(92.1)	24	(7.9)
17. Rubber socks impeding circulation should not be worn.	249*	(82.2)	54	(17.8)
18. Wool socks should be worn in winter, and mercerized socks should be worn in summer.	237*	(78.2)	66	(21.8)
19. Never walking bare foot.	286*	(94.4)	17	(5.6)
20. Pressure on feet should be avoided by not standing for long periods.	269*	(88.8)	34	(11.2)
21. Legs should not be crossed when sitting on a chair.	165*	(54.5)	138	(45.5)
22. If there is clawing of toes, massage should not be carried out to prevent joint stiffness.	136	(44.9)	167	(55.1)
23. Toenails should be controlled in terms of thickening, ingrowth, and length.	277*	(91.4)	26	(8.6)
24. Toenails should be cut flat.	218*	(71.9)	85	(28.1)
25. Skin around toenails should not be cut.	240*	(79.2)	63	(20.8)
26. The thickened nails should be cut with a special scissors after they are softened in warm water.	257*	(84.8)	46	(15.2)
27. Blind patients must never cut their own toes.	282*	(93.1)	21	(6.9)
28. The nails should be cut round.	207	(68.3)	96	(31.7)
29. Any changes to feet and toes (color, temperature, or shape) and signs of infection should be reported to the doctor immediately.	298*	(98.3)	5	(1.7)
30. Foot exercises should be carried out every day to help circulation.	278*	(91.7)	25	(8.3)
31. In case of any foot lesion, only shoes should be replaced to reduce the load on feet.	174	(57.4)	129	(42.6)
32. Smoking is strictly forbidden because it will reduce the amount of blood going to the feet.	261*	(86.1)	42	(13.9)
Footwear selection				
1. Shoes should fit and grasp feet.	229*	(75.6)	74	(24.4)
2. Soft-skinned and comfortable shoes should be preferred.	280*	(92.4)	23	(7.6)
3. Shoes should be checked for foreign bodies such as nail and gravel, before each wear.	301*	(99.3)	2	(0.7)
4. Shoes should be worn without socks.	77	(25.4)	226	(74.6)
5. If shoe insoles are worn off, they should be replaced.	269*	(88.8)	34	(11.2)
6. Shoes should not lose its exterior protection feature.	288*	(95.0)	15	(5.0)
7. Shoes should be painted frequently.	101*	(33.3)	202	(66.7)
8. New shoes should be worn-in before completing using them.	204*	(67.3)	99	(32.7)
9. High-heeled shoes tapering forward should be preferred.	108	(35.6)	195	(64.4)
10. If there is a deformity in the foot, a doctor should be consulted for proper treatment or orthopedic shoes should be used.	295*	(97.4)	8	(2.6)

Values are presented as number and percentage (%), *correct answers

(9.41±0.95) had a significantly higher score than men (9.1±1.3) (p=0.010).

Students who received lectures on diabetic foot management during elective rotations had a significantly higher "total score" (p=0.003) as well as the "foot examination" subscale score (p<0.001) than students who did not take elective rotations in a diabetic foot specialty team. Students with educated patients about diabetic foot risk or associated risks had a significantly higher score in the "foot examination" subscale (p=0.002), "foot complications" subscale (p=0.040), and "total score" (p=0.022). Students who performed foot examinations for patients with diabetes had a significantly higher knowledge scores in "risk factors" (p=0.013) and "foot examination" subscale (p=0.005), and "total score" (p=0.011) than those who did not do foot examination in patients with diabetes (**Table 4**).

Discussion. Diabetic foot disease is a devastating complication of diabetes mellitus.[5-8] Determining medical students' level of knowledge regarding diabetic foot complications and the factors that lead to a higher level, will contribute to an improvement in the curriculum material, as well as help in focusing on the factors that result in a higher knowledge level. This study assessed the level of knowledge regarding diabetic foot management and the factors contributing to improved knowledge of this disease among medical students in their clinical years at KAUH. We found that most of the students had received training on diabetic foot care (95.4%) (students who did not have training on diabetic foot care are the ones who were absent during the time period in which those sessions were given, which are part of the curriculum), with a total score of knowledge of 55.5±5.5 out of 68. They reported that most of their knowledge was provided through their curriculum in the medical school. This result is in line with previous studies of the same topic among working nurses.[26] Nevertheless, only 56.4% of the students educate the patients with diabetic foot about related risks, and only 63% preformed foot examination on patients with diabetes. Moreover, the majority of the sampled students required more training on footwear selection, initiatives to prevent diabetic foot, and foot examination. Previous research has shown that patients are more likely to show compliance with treatment if they have sufficient knowledge about their disease and effective ways of managing it.[27] Improving the physician's knowledge about foot care can result in enhanced functional ability of the patient, leading to independent living and self-management.[28] When we compared students who educated patients on the risks

Table 4 - Factors affecting knowledge about diabetic foot care management in students.

Factors	Mean±SD	Mean±SD	t	*P*-value
Do you perform foot examinations for diabetic patients	**Yes (n=191)**	**No (n=112)**		
(F1) Risk factors	14.3 ± 1.8	13.75 ± 2.1	2.507	0.013*
(F2) Foot examination	9.4 ± 1.0	9.0 ± 1.3	2.825	0.005*
(F3) Foot complications	24.5 ± 2.8	23.8 ± 3.9	1.660	0.099
(F4) Footwear selection	7.9 ± 1.0	7.8 ± 0.9	0.919	0.359
Total score	56.1 ± 4.9	54.3 ± 6.3	2.580	0.011*
Do you educate patients with diabetic foot risk or problems	**Yes (n=171)**	**No (n=132)**		
(F1) Risk factors	14.2 ± 1.9	14.0 ± 1.9	1.138	0.256
(F2) foot examination	9.4 ± 1.0	9.0 ± 1.2	3.119	0.002*
(F3) Foot complications	24.6 ± 2.8	23.8 ± 3.7	2.061	0.040*
(F4) Footwear selection	7.9 ± 1.0	7.9 ± 1.0	-0.079	0.937
Total score	56.1 ± 5.0	54.6 ± 6.0	2.298	0.022*
Did you receive lectures on diabetic foot care management in an elective clinical rotation?	**Yes (n=39)**	**No (n=264)**		
(F1) Risk factors	14.45 ± 1.6	14.1 ± 1.9	1.206	0.229
(F2) Foot examination	9.8 ± 0.45	9.2 ± 1.2	6.490	0.000*
(F3) Foot complications	24.9 ± 2.2	24.1 ± 3.8	1.812	0.074
(F4) Footwear selection	8.1 ± 0.9	7.8 ± 1.0	1.664	0.097
Total score	57.3 ± 3.7	55.2 ± 5.7	3.046	0.003*

*significant factors, t - independent-samples t-test

of diabetes with those who did not, we found that students who did had a significantly higher level of knowledge. We found a similar result when comparing students who performed foot examinations with the students who did not. These findings were consistent with a previous study that showed that the core features of clinical learning are related to the amount of patient contact. Other factors that determine clinical learning are exposure to varied patient presentations and being part of a clinical team with a suitable student/patient and student/clinician ratio.[29]

In addition, 6th year students scored higher on physical examination and clinical skills than their younger counterparts, suggesting clinical knowledge improved with experience. This, in turn, suggests that increasing students' exposure to physical examination and encouraging students to take an active part during rounds may support development of accurate clinical judgment.[27,30] Thus, there should be an increase in patient contact and clinical experience as part of the curriculum for students in the beginning years of medical school. Changes to curriculum should also include all aspects of foot care, such as basic care and disease-specific problems. There was no other significant difference in knowledge when comparing by grades in any of the other subscale.

The following limitations need to be acknowledged. Due to resource constraints, we included only medical students studying in KAUH. The inclusion of more students from other universities could lead to more generally representative results. Furthermore, we focused on medical students only not including other colleges or the general population.

In conclusion, medical students are an important part of the medical team, and they play a major part in patients' education and care. Assessing their knowledge regarding common diseases is crucial to their future career and to patient care, particularly in those with diabetes, which is a common disease whose management requires a multidisciplinary approach. We found that students who educated patients regarding diabetic foot care and did foot examination on those patients, as well as attended elective rotations with a diabetic foot team, had better knowledge about diabetic foot management. Diabetic foot is one of the essential topics for medical students in their clinical year at KAUH. We recommend involving more students in any patient care plan and encouraging students to educate patients with diabetes about their disease, do more diabetic foot exams, and get involved in a diabetic foot care team at their hospitals to enhance their level of knowledge. These steps are beneficial to both student's knowledge and patients' outcome.

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