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Research Article

Examination of Diabetes Knowledge Levels of Sedentary and Sports Students

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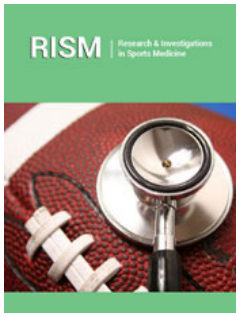

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Abstract

Introduction: Sedentary lifestyle is a significant factor that increases the risk of diabetes. Sports and physical activity play a critical role in the management and prevention of diabetes. Regular exercise helps control blood sugar levels by improving insulin sensitivity.

Aim: The aim of this study is to examine the diabetes awareness levels of students who have received elderly care training, both those who engage in sports and those who do not.

Method: This descriptive study was conducted with the participation of 160 students, aged 18 and older, who are enrolled in the Elderly Care Program at a university located in the Black Sea Region. The participants include both professional and amateur athletes, as well as sedentary individuals. The data collection tools used were a sociodemographic form and the Adult Diabetes Knowledge Scale. Descriptive statistics (frequency, mean, standard deviation, minimum, maximum) were used in the data analysis.

Result: The results revealed that there were gaps in the students' knowledge and awareness of diabetes. Although both the physically active and sedentary groups possessed some level of diabetes knowledge and awareness, uncertainties and knowledge deficiencies were still observed. It was found that elderly care students, who will work actively with the elderly population, which has a higher incidence of diabetes, do not have sufficient levels of knowledge regarding the relationship between exercise, diabetes awareness and diabetes knowledge.

Conclusion: The results of this study are expected to help students understand the importance of physical activity and emphasize the role of exercise and care in the prevention and management of diabetes, particularly in the elderly. Consequently, it is recommended to reduce the societal impact of diabetes and raise individuals' health awareness.

Keywords: Awareness; Diabetes; Sedentary lifestyle; Sports

Introduction

Currently, over half a billion people worldwide are living with diabetes. The prevalence of diabetes is rapidly increasing in both developed and developing countries. The number of people with diabetes globally was approximately 537 million in 2021 and it is projected to rise to 643 million by 2030 and 789 million by 2045 [1-4]. The main factors contributing to this increase in diabetes prevalence include poor nutrition, obesity, advanced age, reduced physical activity and exercise, population growth and lifestyle factors [5]. Exercise can delay the onset of diabetes in individuals with impaired glucose tolerance and by improving glucose metabolism and insulin sensitivity, it aids in the management of diabetes while potentially reducing the need for oral medications or insulin use [6-8]. In individuals with type 1 diabetes, exercise can reduce insulin requirements and help improve blood glucose control. In individuals with type 2 diabetes, regular exercise reduces insulin resistance and serves as an effective tool in managing blood glucose levels. Furthermore, engaging in exercise can decrease the risk of other diabetes-related health issues, such as cardiovascular diseases and hypertension [9,10]. Participation in team sports during early life has been associated with a reduction in macrovascular complications and mortality rates in individuals with type 1 diabetes [7,11,12].

Sedentarism is a condition characterized by a lack of physical activity and has become more prevalent as a result of modern lifestyle. A sedentary lifestyle is a significant factor that increases the risk of diabetes. Physical inactivity can negatively affect blood glucose levels by increasing insulin resistance in the body [13,14]. Specifically, the risk of type 2 diabetes is heightened in the absence of regular physical activity. A sedentary lifestyle can have adverse effects on metabolism, laying the groundwork for the development of chronic health issues such as obesity, cardiovascular diseases and diabetes. Research has shown that the lack of regular physical activity impairs insulin sensitivity, significantly increasing the risk of developing diabetes [15,16].

The prevalence of diabetes increases with age, particularly in individuals aged 65 and older. In this age group, the risk of diabetes rises due to a decrease in metabolic rate, an increase in insulin resistance and changes in body composition ([17] Additionally, a sedentary lifestyle is one of the key factors triggering the development of diabetes in older adults. Insufficient physical activity negatively impacts insulin sensitivity, making it more difficult to regulate blood glucose levels, which in turn increases the risk of developing diabetes. A sedentary lifestyle contributes to the prevalence of diabetes, along with obesity and cardiovascular diseases, particularly among older adults. Therefore, encouraging older individuals to increase their physical activity is of great importance for the prevention and management of diabetes [15,18]. As the prevalence of diabetes increases among older adults, it is crucial for professionals involved in their care to have in-depth knowledge of disease management and treatment. Given the direct impact of a sedentary lifestyle and exercise habits on diabetes, it is essential for students to be well-informed about this issue. Their awareness not only plays a significant role in the prevention and treatment of diabetes but also contributes to improving the quality of life of older adults. The aim of this study is to examine the level of diabetes awareness among students trained in elderly care, comparing those who engage in sports with those who do not.

Methods

This descriptive study was conducted with students in the Elderly Care Program at a university in the Black Sea Region. The population of the study consisted of students enrolled in the elderly care program during the Fall semester of the 2024-2025 academic year (N=182). The sample size was determined using the known population sample calculation formula ($n = [(N.t^2.p.q) / d^2.(N-1) + t^2.p.q]$), resulting in a sample size of 124. The study was completed with a total of 160 students. It was determined that the sample had a 75% representativeness of the population. The inclusion criteria for the study were the student's willingness to participate and being over the age of 18. The exclusion criteria were the student's unwillingness to participate or their decision to withdraw from the study at any point. The study utilized the Sociodemographic Information Form and the Adult Diabetes Knowledge Scale. This form, designed by the researchers, consists of seven questions addressing participants' gender, age, body weight, height, engagement in sports, the type of sport they practice, and their average weekly frequency of physical activity. The Adult Diabetes Knowledge Scale was developed by Yavuz K et al. [19] to assess the knowledge levels of adults with diabetes. The scale consists of five main subdimensions and a total of 28 items: General Information About Diabetes (6 items), Blood Glucose Measurement and Values (5 items), Diabetes Risk Factors (4 items), Diabetes Symptoms (8 items) and Diabetes Complications (5 items). Responses are presented in two groups: true and false options. Individuals who answer yes/no/don't know questions correctly receive 1 point, while those who provide incorrect or unsure answers receive 0 points. The highest possible score on the scale is 28 and the lowest score is 0.

Throughout the study, the principles of the Helsinki Declaration were adhered to. Approval for the research was obtained from the Scientific Research and Publication Ethics Committee of Artvin Çoruh University (Date: 11.05.2024, No: E-134501). Participants who volunteered for the study were informed about the purpose of the research and were made aware that they could withdraw from the study at any time without providing a reason. Written and verbal consent was obtained from all voluntary participants. IBM SPSS Statistics 25.0 software was used for data analysis. Additionally, parametric tests were conducted based on normality tests. Before starting the analysis of the obtained data, normality assumptions and homogeneity tests were applied. The results of the Shapiro-Wilk and Levene tests indicated that the data followed a normal distribution ($p>0.05$). Parametric tests, including frequency and mean analyses, were performed to examine the relationship between participants' responses and independent variables. Furthermore, descriptive statistics were used in the analyses and the arithmetic mean, standard deviation, minimum and maximum values were calculated.

Result

The average age of participants who engage in sports is 20.88 ± 1.595 years, with an average height of 167.65 ± 8.057cm, an average body weight of 63.15 ± 11.150kg and an average Body Mass Index (BMI) of 22.41 ± 3.283. For participants who do not engage in sports, the average age is 20.72 ± 2.270 years, the average height is 163.55 ± 7.140cm, the average body weight is 61.03 ± 12.592kg and the average BMI is 22.74 ± 3.959 (Table 1). According to the first question, 75% of those who engage in sports and 78% of those who do not correctly identify that diabetes is associated with elevated blood sugar levels. Regarding the cause of diabetes, 66.7% of participants who engage in sports and 75% of those who do not correctly understand that it is caused by insulin deficiency or insufficiency. The proportion of those who believe diabetes is congenital and cannot develop later is very low in both groups, with 6.7% in the sports group and 6% in the non-sports group. However, 51.7% of participants who engage in sports and 60% of those who do not know that diabetes is a lifelong disease. The proportion of participants who agree that diabetes has no cure but can be controlled is 71.7% in the sports group and 82% in the non-sports group. Finally, the percentage of individuals who believe that diabetes is a contagious disease is very low in both groups, with 1.7% in the sports group and 1% in the non-sports group (Table 2).

Table 1: Demographic characteristics of the participants.

Group	Gender	Number of Participants	Age (Mean ± SD)	Height (cm, Mean ± SD)	Body Weight (kg, Mean ± SD)	Body Mass Index (Mean ± SD)
Sports	Woman	42	20,88±1,595	167,65±8,057	63,15±11,150	22,41±3,283
	Man	18				
Sedentary	Woman	93	20,72±2,270	163,55±7,140	61,03±12,592	22,74±3,959
	Man	7				

Table 2: Participants' general knowledge about diabetes.

Question	Group	YES	NO	UNKNOWN
Diabetes refers to an increase in blood glucose levels	Sports (n:60)	45	4	11
	Sedentary (n:100)	78	8	14
Diabetes is caused by a lack or insufficiency of insulin	Sports (n:60)	40	8	12
	Sedentary (n:100)	75	4	21
Diabetes is congenital and does not develop later in life	Sports (n:60)	4	51	5
	Sedentary (n:100)	6	81	13
Diabetes is a lifelong disease	Sports (n:60)	31	17	12
	Sedentary (n:100)	60	19	21
Diabetes has no cure, but it is a manageable condition	Sports (n:60)	43	8	9
	Sedentary (n:100)	82	6	12
Diabetes is an infectious disease.	Sports (n:60)	1	54	5
	Sedentary (n:100)	1	93	6

In the sports group, 78.3% are aware that the risk of diabetes is high for individuals aged 40 and above; 5.0% have incorrect information, while 16.7% are unaware of this risk. In the non-sports group, 76.0% are aware of this risk, 0% have incorrect information, and 24.0% are unaware of it. In the sports group, 41.7% know that the risk of diabetes is high for individuals who give birth to babies weighing 4kg or more; 13.3% have incorrect information, while 45.0% are unaware of this risk. In the non-sports group, 39.0% are aware of this risk, 4.0% have incorrect information, and 57.0% are unaware of it. In the sports group, 50.0% are aware that the risk of diabetes is high for individuals with elevated blood sugar levels during pregnancy; 6.7% have incorrect information, and 43.3% are unaware of this risk. In the non-sports group, 55.0% are aware of this risk, 5.0% have incorrect information, and 40.0% are unaware of it. In the sports group, 25.0% know that the risk of diabetes is high for individuals who have had infectious diseases; 48.3% have incorrect information and 26.7% are unaware of this risk. In the non-sports group, 22.0% are aware of this risk, 58.0% have incorrect information and 20.0% are unaware of it (Table 3).

Table 3: Participants' knowledge of diabetes risk factors.

Question	Group	YES	NO	UNKNOWN
The risk of diabetes is higher in individuals aged 40 and above.	Sports (n:60)	47 (78,3%)	3 (5,0%)	10 (16,7%)
	Sedentary (n:100)	76 (76,0%)	0 (0%)	24 (24,0%)
The risk of diabetes is higher in individuals who give birth to babies weighing 4kg or more.	Sports (n:60)	25 (41,7%)	8 (13,3%)	27 (45,0%)
	Sedentary (n:100)	39 (39,0%)	4 (4,0%)	57 (57,0%)
The risk of diabetes is higher in individuals who have high blood sugar during pregnancy.	Sports (n:60)	30 (50,0%)	4 (6,7%)	26 (43,3%)
	Sedentary (n:100)	55 (55,0%)	5 (5,0%)	40 (40,0%)
The risk of diabetes is higher in individuals who have had an infectious (microbial) disease.	Sports (n:60)	15 (25,0%)	29 (48,3%)	16 (26,7%)
	Sedentary (n:100)	22 (22,0%)	58 (58,0%)	20 (20,0%)

In the sports group, 70.0% are aware that excessive thirst and frequent drinking are symptoms of diabetes; 13.3% have incorrect information, and 16.7% stated they do not know. In the non-sports group, 69.0% are aware of these symptoms, 8.0% have incorrect information and 23.0% stated they do not know. In the sports group, 71.7% know that frequent urination is a symptom of diabetes; 6.7% have incorrect information, and 21.7% stated they do not know. In the non-sports group, 72.0% are aware of this symptom, 6.0% have incorrect information, and 22.0% stated they do not know. Regarding the symptom of frequent urination at night, 71.7% of the sports group are informed, 6.7% have incorrect information and 21.7% stated they do not know. In the non-sports group, 65.0%

are aware of this symptom, 6.0% have incorrect information and 29.0% stated they do not know. Concerning increased appetite and overeating, 55.0% of the sports group are aware of this symptom, 18.3% have incorrect information and 26.7% stated they do not know. In the non-sports group, 64.0% are aware of this symptom, 3.0% have incorrect information and 33.0% stated they do not know. In the sports group, 36.7% know that blurred vision is a symptom of diabetes; 23.3% have incorrect information and 40.0% stated they do not know. In the non-sports group, 43.0% are aware of this symptom, 10.0% have incorrect information and 47.0% stated they do not know.

Regarding delayed healing of cuts and wounds, 53.3% of the sports group are aware of this symptom, 13.3% have incorrect information and 33.3% stated they do not know. In the non-sports group, 57.0% are aware of this symptom, 6.0% have incorrect information and 37.0% stated they do not know. In the sports group, 65.0% are aware that weakness and fatigue are symptoms of diabetes; 10.0% have incorrect information, and 25.0% stated they do not know. In the non-sports group, 59.0% are aware of this symptom, 7.0% have incorrect information and 34.0% stated they do not know. Regarding dry mouth, 63.3% of the sports group are informed, 10.0% have incorrect information and 26.7% stated they do not know. In the non-sports group, 70.0% are aware of this symptom, 3.0% have incorrect information and 27.0% stated they do not know (Table 4). In the sports group, 70.0% are aware of the effect of diabetes on kidney function; 6.7% have incorrect information and 23.3% stated they do not know. In the non-sports group, 69.0% know this information correctly; 1.0% have incorrect information and 30.0% stated they do not know. Regarding eye diseases that may lead to vision loss, the awareness level in the sports group is 61.7%, while 8.3% have incorrect information and 30.0% stated they do not know. In the non-sports group, 65.0% are correctly informed about these symptoms; 2.0% have incorrect information and 33.0% stated they do not know. The awareness level regarding hypertension in the sports group is 65.0%, with 10.0% having incorrect information and 25.0% stating they do not know. In the non-sports group, 62.0% correctly know this information; 3.0% have incorrect information and 35.0% stated they do not know. Regarding cardiovascular diseases, 75.0% of the sports group are informed, with no one having incorrect information, and 25.0% stated they do not know. In the non-sports group, 73.0% correctly know this information; 0.0% have incorrect information and 27.0% stated they do not know. Regarding limb loss, 56.7% of the sports group are informed, 10.0% have incorrect information and 33.3% stated they do not know. In the non-sports group, 74.0% correctly know this information; 1.0% have incorrect information and 25.0% stated they do not know (Table 5).

Table 4: Participants' knowledge of diabetes symptoms.

Question	Group	YES	NO	UNKNOWN
Excessive thirst and frequent urination are among the symptoms of diabetes.	Sports (n:60)	42 (70,0%)	8 (13,3%)	10 (16,7%)
	Sedentary (n:100)	69 (69,0%)	8 (8,0%)	23 (23,0%)
Frequent urination is one of the symptoms of diabetes.	Sports (n:60)	43 (71,7%)	4 (6,7%)	13 (21,7%)
	Sedentary (n:100)	72 (72,0%)	6 (6,0%)	22 (22,0%)
Frequent urination at night is one of the symptoms of diabetes.	Sports (n:60)	43 (71,7%)	4 (6,7%)	13 (21,7%)
	Sedentary (n:100)	65 (65,0%)	6 (6,0%)	29 (29,0%)
Increased appetite and overeating are among the symptoms of diabetes.	Sports (n:60)	33 (55,0%)	11 (18,3%)	16 (26,7%)
	Sedentary (n:100)	64 (64,0%)	3 (3,0%)	33 (33,0%)
One of the symptoms of diabetes is blurred vision.	Sports (n:60)	22 (36,7%)	14 (23,3%)	24 (40,0%)
	Sedentary (n:100)	43 (43,0%)	10 (10,0%)	47 (47,0%)
Delayed healing of cuts and wounds is a symptom of diabetes.	Sports (n:60)	32 (53,3%)	8 (13,3%)	20 (33,3%)
	Sedentary (n:100)	57 (57,0%)	6 (6,0%)	37 (37,0%)
Weakness and fatigue are among the symptoms of diabetes.	Sports (n:60)	39 (65,0%)	6 (10,0%)	15 (25,0%)
	Sedentary (n:100)	59 (59,0%)	7 (7,0%)	34 (34,0%)
Dry mouth is one of the symptoms of diabetes.	Sports (n:60)	38 (63,3%)	6 (10,0%)	16 (26,7%)
	Sedentary (n:100)	70 (70,0%)	3 (3,0%)	27 (27,0%)

Table 5: Participants' awareness of diabetes complications.

Question	Group	YES	NO	UNKNOWN
If diabetes is not well managed, it can lead to impaired kidney function.	Sports (n:60)	42 (70,0%)	4 (6,7%)	14 (23,3%)
	Sedentary (n:100)	69 (69,0%)	1 (1,0%)	30 (30,0%)
If diabetes is not well managed, it can lead to eye diseases that may result in vision loss.	Sports (n:60)	37 (61,7%)	5 (8,3%)	18 (30,0%)
	Sedentary (n:100)	65 (65,0%)	2 (2,0%)	33 (33,0%)
If diabetes is not well managed, it can lead to high blood pressure-related diseases.	Sports (n:60)	39 (65,0%)	6 (10,0%)	15 (25,0%)
	Sedentary (n:100)	62 (62,0%)	3 (3,0%)	35 (35,0%)

If diabetes is not well managed, it can lead to heart and vascular diseases.	Sports (n:60)	45 (75,0%)	0 (0,0%)	15 (25,0%)
	Sedentary (n:100)	73 (73,0%)	0 (0,0%)	27 (27,0%)
If diabetes is not well managed, it can lead to limb loss (especially of the feet or hands).	Sports (n:60)	34 (56,7%)	6 (10,0%)	20 (33,3%)
	Sedentary (n:100)	74 (74,0%)	1 (1,0%)	25 (25,0%)

Discussion

In our country, some associations and organizations, in collaboration with the Ministry of Health, implement educational programs to Raise Diabetes (DM) awareness. After the implementation of these programs, the goal is to increase diabetes awareness within the community. For effective diabetes treatment, it is crucial that both the patient and the healthcare team have sufficient knowledge regarding diabetes. In this study, the diabetes knowledge levels of students who have received and are receiving training in elderly care services, comparing those who engage in physical activity and those leading a sedentary lifestyle, were assessed and evaluated. As a result of the findings, in the overall evaluation, no significant difference was found in the total scores between the active and sedentary students. In both groups, an average scale score was determined for the general knowledge level of diabetes based on the diabetes knowledge scale. In Steyl's study on physiotherapy students, the average knowledge level of the students was found to be 62.15%. Additionally, it was determined that approximately 40% of the students had an 'insufficient' or 'limited' level of knowledge.

In studies conducted by El-Deirawi KM et al. [20] and Scheiderich SD et al. [21] the diabetes knowledge level of nurses was reported to range between 62% and 75%. In a study conducted with students from non-health-related fields, it was found that their knowledge about diabetes was inadequate and it was emphasized that diabetes education programs should be developed [20,21]. When examining the general knowledge level about diabetes, some differences were observed between students in the elderly care program who engage in physical activity and those who do not. Among students who engage in physical activity, 73.33% have accurate knowledge about diabetes, 11.67% have incorrect information and 15% are uncertain about the topic. In sedentary students, 78.17% have accurate knowledge, 7.33% have incorrect information and 14.50% are uncertain. These findings suggest that sedentary students are slightly more knowledgeable in terms of general knowledge, but both groups show knowledge gaps and uncertainties. In a study conducted with students from non-health-related fields, it was found that their knowledge about diabetes was inadequate and it was stated that this deficiency could be addressed through diabetes education programs [22]. In Istanbul, approximately one-third of adults [23], in India, approximately three-quarters of adults [24] and in Saudi Arabia, about one-third of adults have reported awareness of diabetes [25].

In our study, the average score for sedentary students was calculated as 15.44, with this group consisting of 100 participants and a standard deviation of 6.923. The average score for the athletes' group was determined as 15.68, with this group consisting of 60 participants and a standard deviation of 6.275. These results indicate that there are small differences in the total scores between the two groups, but both groups have similar average diabetes knowledge levels, suggesting an average level of knowledge. The differences in our findings compared to previous studies are believed to stem from variations in the age groups of the sample, differences in educational levels and disparities in the societal incidence of diabetes. In the study by Mercan Y et al. [26] a correct response rate of 47.6% was found regarding diabetes risk factors in adolescents [26]. In the study by Ergan M et al. [27] and colleagues, although the students' knowledge of risk factors was somewhat lower compared to other studies, they found significant knowledge about risk factors other than high cholesterol (74.3%), smoking (69.3%) and high blood pressure (55.0%) [27]. In Steyl T [28] study, seven of the risk factors were easily identified by 89.7% of the students [28]. A study among medical students indicated that 95% of those in clinical practice and 86% of those not yet in clinical practice had significant knowledge of diabetes risk factors [29]. When examining the knowledge levels of students regarding diabetes risk factors, both the athletes and non-athletes' groups yielded very similar results. In our study, 48.75% of the athlete students correctly identified diabetes risk factors, 18.33% had incorrect information and 32.92% reported lacking knowledge on the topic. In sedentary students, 48.00% correctly identified diabetes risk factors, 16.75% had incorrect information, and 35.25% expressed a lack of knowledge. These results show that the knowledge levels regarding diabetes risk factors were largely similar between the athletes and sedentary students, but there is a significant issue with a lack of knowledge in both groups.

In the study by Mercan Y et al. [26] a low correct response rate of 28.7% was found regarding diabetes symptoms in children during adolescence [26]. In our study, when examining the knowledge levels of both athletes and non-athletes regarding diabetes symptoms, notable similarities were observed between the two groups. 60.83% of the athlete students correctly identified diabetes symptoms, 12.71% had incorrect information and 26.46% stated they had no knowledge about the symptoms. Similarly, 62.38% of the sedentary students correctly identified diabetes symptoms, 6.13% had incorrect information and 31.50% expressed a lack of knowledge about these symptoms. These data indicate that while athlete students are slightly more aware of diabetes symptoms, there is still a significant level of knowledge deficiency in both groups.

Steyl T [28] reported that 83.1% of students recognized the key role of physical activity in the prevention of diabetes and its complications. In the study conducted, 82.3% of students were found to acknowledge the significant role of physical activity in the prevention and management of diabetes [28]. Another study indicated that the highest level of diabetes knowledge was found among individuals with a master's degree, with no significant

differences between high school, associate degree, and bachelor's degree graduates [30]. This finding was attributed to the more effective diabetes education provided at the master's level. In our study, when examining the awareness of diabetes complications, some differences were observed between athletes and non-athletes. 65.67% of the athlete students had correct knowledge about diabetes complications, 7.00% had incorrect information, and 27.33% were unsure about this topic. Among the sedentary students, 68.60% had accurate knowledge about diabetes complications, 1.40% had incorrect information and 30.00% were uncertain. These results show that both groups possess a certain level of knowledge regarding diabetes complications, but there are still uncertainties and knowledge gaps present.

In our study, setting the sample size to represent 75% of the population significantly enhanced the power of the research. This study provides data on the diabetes knowledge levels of elderly care students who follow an active or sedentary lifestyle and could serve as a reference for similar studies. The data were obtained solely from the sociodemographic information forms and responses to the scale completed by students who agreed to participate in the study. Additionally, the fact that the study was conducted in a single university and program may be considered one of the limitations of the research. The findings of the study are generalizable only to the students enrolled in the elderly care program at the relevant university.

Conclusion

This study focuses on the elderly care program students at Artvin Çoruh University. The students in the elderly care program were subjectively evaluated. As a result, the existing data indicates a need for similar studies in this field. The study concludes that, although the diabetes knowledge and awareness levels of elderly care students at Artvin Çoruh University are close to an adequate level, there are still gaps in their understanding. Given that diabetes is most prevalent among elderly individuals, the insufficient knowledge among students trained to care for this population could lead to negative outcomes in patient education, managing complications and treatment. Therefore, it is essential for students to receive not only short-term education on diabetes and its risk factors but also long-term, continuous, repetitive and more detailed training to ensure effective diabetes care.

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