




Saudi Arabian Physical Therapists' Knowledge, Attitudes, and Clinical Practice in Diabetes Prevention and Management

Ahmed S Alhowimel ¹, Abdullah A Alshahrani¹, Aseel A Abulaban¹, Areej M Althobeit¹, Aqeel M Alenazi ¹, Mohammed M Alshehri², Bader A Alqahtani¹, Faris Alodaibi ³

¹Department of Health and Rehabilitation Sciences, College of Applied Medical Science, Prince Sattam Bin Abdulaziz University, AlKharj, Saudi Arabia;

²Physical Therapy Department, Jazan University, Jazan, Saudi Arabia; ³Department of Rehabilitation Science, King Saud University, Riyadh, Saudi Arabia

Correspondence: Ahmed S Alhowimel, Department of Health and Rehabilitation Sciences, College of Applied Medical Sciences, Prince Sattam Bin Abdulaziz University, AlKharj, 11942, Saudi Arabia, Tel +966115886354, Email a.alhowimel@psau.edu.sa

Objective: This study explores physical therapists' current knowledge, attitudes, and practice toward the management and prevention of diabetes in Saudi Arabia.

Patients and Methods: A cross-sectional survey was distributed among physical therapists in Saudi Arabia. The questionnaire included several sections concerning their knowledge, attitude, and current practice toward diabetic management. A total of 301 physical therapists (32% female) participated in our study.

Results: The results suggest that only half of the participants agreed that diabetes management and prevention were within physical therapy's scope of service. However, approximately 30% of the participants did not regularly check or ask about the glucose levels of their patients with diabetes. Only 55% of the participants correctly answered the knowledge test questions.

Conclusion: This study found that physical therapists in Saudi Arabia have a modest level of diabetes knowledge. The findings indicate that physical therapy educational programs should address diabetes management. Furthermore, continued education is required for current practicing physical therapists in Saudi Arabia.

Keywords: diabetes, knowledge, practice, physical therapy

Background

Among healthcare providers, physical therapists have a unique role in maintaining, restoring, and improving individuals' activities, movements, and functioning. By doing so, they aid in a patient's performance and enhance their health and quality of life.¹ Diabetes mellitus (DM) is a group of diseases that cause an increase in the amount of glucose in the blood. It is usually divided into type 1 (lack of insulin) and type 2 (insulin resistance) diabetes. Owing to the disease's nature, patients with diabetes face many side effects and complications in their lives, which have the potential to compromise their quality of life.²⁻⁴ As the number of cases of DM is rising in the Kingdom of Saudi Arabia,⁵ the role of physical therapy in the current clinical practice of disease treatment is critical to prevent and manage complications. Hence, physical therapists practicing in Saudi Arabia should have sound, up-to-date knowledge about this disease to prevent its rise and manage its complications.

Many patients with neurological and orthopedic conditions who are treated by physical therapists also have DM. In the chronic stages of DM, blood circulation decreases, sensations are altered, and patients may feel premature fatigue, experience hypoglycemia during exercise sessions, or have difficulty with wound healing.⁶⁻⁸ Hence, physical therapists' knowledge of this disease is essential in managing day-to-day care in physical therapy clinics and departments. Noncommunicable diseases, particularly diabetes, have become common in Saudi Arabia. They contribute significantly to mortality and morbidity,⁹ and type 2 diabetes affects an estimated 14.1% of the Saudi Arabian population.¹⁰ In other

words, many patients are likely to have diabetes as their main or secondary illness. This makes screening even more important to reduce the risks of hypoglycemia and hyperglycemia during physiotherapy.

Doehring et al¹¹ surveyed 401 Canadian physical therapists about their knowledge, attitudes, and practices toward DM prevention and management. It revealed that physical therapists were most confident in providing exercise education, but lacked confidence in providing care in crucial areas, including managing secondary complications, glucose level control, and weight management. Moreover, by identifying this clinical gap, they provided some important recommendations, such as providing more education related to DM in entry-level programs, and enhancing continuing physical therapy education opportunities to improve physical therapists' knowledge of DM.¹¹ However, these findings may not be generalizable to other physical therapists, particularly in the Kingdom of Saudi Arabia, because of differences in cultural backgrounds, educational systems, and healthcare policies, which may affect physical therapist practices in the Kingdom.

Another cross-sectional study was conducted in the United States to assess the knowledge, clinical practices, attitudes, and beliefs of physical therapists toward patients with prediabetes.¹² The majority of the 63 physical therapists who had participated agreed that detecting prediabetes in their patients was crucial. They were aware of the important clinical diagnostic tests required for the identification of DM, but not of the prediabetic stage. Many of the physical therapists were unaware of prediabetes screening, and their knowledge of correct weight loss and physical activity recommendations was also poor. Hence, the authors recommended more educational services for physical therapists to combat the disease in its early stages.¹² The current literature emphasizes the need for physical therapists to have proper education in the prevention and management of DM; however, research on physical therapists' current knowledge in preventing and managing DM is lacking. Moreover, the current clinical practices and attitudes of physical therapists in Saudi Arabia need to be explored to clarify future research directions to combat the high prevalence of this disease.

Since physical therapists play an important role in prevention and lifestyle modification for people with DM, understanding the needs in physical therapy practices might help in improving the healthcare system for this population. Therefore, this study quantifies the knowledge, attitudes, and current clinical practices of physical therapists in managing and preventing DM in the Kingdom of Saudi Arabia.

Method

Study Design

This cross-sectional study used a convenience sample of physical therapists practicing in Saudi Arabia.

Sample Size Calculation

According to the Saudi Commission for Health Specialties (SCFHS),¹³ there were around 6028 registered physical therapists in the Kingdom of Saudi Arabia in 2018. In addition, the SCFHS reported that approximately 920 new physical therapists are credentialed every year. In light of these considerations, we estimated setting the number of physical therapists somewhere between 8500 and 9000. Confidence was set at 90%, while the margin of error was fixed at 5%. Based on these considerations, we determined that a sample size of 265 physical therapists would be adequate for this cross-sectional study.

Inclusion Criteria

The inclusion criteria were any licensed physical therapist practicing in Saudi Arabia, of any gender or educational background.

Exclusion Criteria

Interns and students of physical therapy who had not obtained their practice licenses were excluded from the study.

Procedure

Permission from Doehring et al¹¹ was first obtained to use their questionnaire in the Kingdom of Saudi Arabia. The institutional ethical committee was then approached for their approval (RHPT/021/019). After obtaining ethical

approval, the questionnaire was converted to an online format using Google Forms, and an online link was created. This online questionnaire (Google Drive survey) was shared with practicing Saudi Arabian physical therapists in various settings (hospitals, clinics, primary care, and home care), either full- or part-time, in the private or public health sectors, and at all educational levels (bachelor's, master's, and PhD). All participants gave their consent to participate in the study and the (SCFHS) registration number was used to verify licensed therapists. All regions in Saudi Arabia were included. The questionnaire was conducted online to make distribution more accessible and at no cost. Data were collected at a single point in time over the course of two months, and captured on Microsoft Excel (version 2010) spreadsheets before being statistically analyzed using IBM's Statistical Package for Social Sciences (SPSS, Version 23; IBM Corp, Armonk, NY).

Outcome Measure

An existing questionnaire tool had been developed and used by Doehring et al¹¹ to assess the present knowledge, practice, beliefs, and attitudes of physical therapists dealing with patients with diabetes in Canada. Approval to use this questionnaire was received from the authors before conducting this study. The questionnaire consisted of 40 questions divided into four sections:

- Section 1: demographic data.
- Section 2: educational background; the domains of attitudes and beliefs about the physical therapist's role in preventing and managing DM complications.
- Section 3: current clinical practice.
- Section 4: DM knowledge.

A cover letter explained the purpose of the study to the participants. This survey included closed-ended and multiple-choice questions (yes or no, and Likert-type questions on a 5-point rating scale), and participants were able to furnish further details (if required). All the questions were mandatory, with no identifier information questions. The Google Drive survey settings were set to reject multiple responses from the same IP address.

Questionnaire Validity

The questions were checked by giving the questionnaire to a group of 15 physical therapists from different backgrounds and receiving their feedback concerning clarity, length of time, and relevance.

Questionnaire Distribution

We distributed the questionnaire between November 2021 and February 2022, using an anonymous and voluntary electronic survey and posting it on Twitter, which is one of the most popular social media apps used by health care providers in Saudi Arabia to share health information with the public.^{13,14} In addition, we used WhatsApp, which is another commonly used app among health care staff for both formal and informal use.^{15,16} These two applications were appropriate ways to broadcast the survey among registered physical therapists in all provinces of Saudi Arabia (Riyadh, Makkah, Eastern, Al-Baha, Al-Jawf, Northern borders, Al-Qassim, Hail, Tabuk, Asser, Jizan, and Najran).

Data Analysis

The normal distribution of the data was analyzed using frequency histograms. The univariate analysis of the single variable for mean, mode, median, minimum, maximum, range, percentages, ratios, standard deviations, and standard errors was calculated using descriptive statistics and frequencies. For data analysis and grouping responses that were similar, some responses were included in one category. Responses in the attitudes and beliefs section of "strongly agree" and "agree" were categorized as one group, "neutral" formed one group, and "disagree" and "strongly disagree" were another group. Concerning the current practice data, we categorized "always" and "most of the time" as one group, "sometimes" as another group, and "infrequently" and "never" as a third group.

Results

A total of 301 individuals participated in this study, 96 of whom were women. The age range was 20–50 years. However, a majority of the sample (68.4%) was in the 20–29 age group. Around 50.8% were new graduates with less than two years of experience (50.1%) who worked in the government sector at an outpatient clinic (41.9%). A vast majority of the sample (71.8%) had a minimum of a bachelor's degree in physical therapy, with no further training in DM (73.4%). Table 1 contains further details regarding the participants' demographic characteristics and practice-related information.

The answers to the individual items were grouped into three sections: attitude and behavior, the therapist' current practice and knowledge about DM, and the role of the physical therapist in treating DM difficulties.

Table 1 Demographic Characteristics of the Participants

Demographic Variable	n (%)
Gender, female	96 (31.9)
Age group (Years)	
20–29	206 (68.4)
30–39	70 (23.3)
40–49	24 (8)
50 and above	1 (0.3)
Years of experience	
<2	153 (50.8)
2–4	72 (23.9)
5–9	42 (14)
10–14	22 (7.3)
15 and above	12 (4)
Practice setting	
Outpatient facility, government practice	126 (41.9)
Inpatient facility, government practice	41 (13.6)
Outpatient facility, private practice	96 (31.9)
Inpatient facility, private practice	13 (4.3)
Home care	9 (3)
Academic institution	16 (5.3)
Highest level of education	
Bachelor of Physical Therapy	216 (71.8)
Master of Physical Therapy	63 (20.9)
Ph.D. in Physical Therapy	10 (3.3)
Doctor of Physical Therapy	8 (2.7)
Other (Such as diplomas)	4 (1.3)
Special education related to DM	80 (26.6)
Primary patient population seen by the therapist	
Musculoskeletal	209 (69.4)
Neurological	49 (16.3)
Cardiorespiratory	6 (2)
Pediatrics	23 (7.6)
Other	14 (4.7)
Number of patients seen per day	
0–5	138 (45.8)
6–10	116 (38.5)
11–15	34 (11.3)
More than 15	13 (4.3)

(Continued)

Table 1 (Continued).

Demographic Variable	n (%)
Percentage of patients with DM seen by the therapist	
0–25%	168 (55.8)
26–50%	102 (33.9)
51–75%	26 (8.6)
76–100%	5 (1.7)
Therapist's family history of DM	202 (67.1)
Experience with diabetes-related complications	159 (52.8)

Attitudes and Behavior

The findings revealed that the therapists' attitudes and conduct toward patients with diabetes varied. Although they felt that the therapist played an important role in prescribing exercise (88%), they believed their role was less important with DM-related management, such as nutrition, managing weight, blood glucose, stress, and secondary problems. Physical therapists were most confident in exercise prescriptions (87%), compared with other treatment options. Approximately 75% of the physical therapists felt physical therapy might play a preventive role, and knew when and where to recommend patients for the appropriate treatment. [Table 2](#) presents detailed answers from the study sample.

Table 2 Descriptive Data for Attitudes and Beliefs

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Diabetes prevention and management fall within the scope of physiotherapy practice.	19 (29.9)	147 (48.8)	47 (15.6)	12 (4)	5 (1.7)
My entry-level physiotherapy schooling adequately prepared me to effectively assess and treat persons with diabetes.	49 (16.3)	122 (40.5)	77 (25.6)	40 (13.3)	13 (4.3)
Having diabetes will affect a patient's physical response to physiotherapy.	94 (31.2)	153 (50.8)	43 (14.3)	11 (3.7)	0 (0)
To effectively work with a person who has diabetes, a physical therapist requires specialized diabetes education/certification.	66 (21.9)	126 (41.9)	76 (25.2)	27 (9)	6 (2)
Patients with, or at risk of developing, diabetes are receptive to counseling and/or lifestyle education from physical therapists.	85 (28.2)	139 (46.2)	54 (17.9)	19 (6.3)	4 (1.3)
It is my responsibility to offer resources to patients to manage their diabetes if required.	72 (23.9)	130 (43.2)	74 (24.6)	23 (7.6)	2 (0.7)
It is my responsibility to refer patients with diabetes to other health care practitioners to help manage their diabetes if required.	141 (43.8)	103 (34.2)	45 (15)	10 (3.3)	2 (0.7)
I believe physical therapists can play a role in the prevention of diabetes.	122 (40.5)	111 (36.9)	54 (17.9)	11 (3.7)	3 (1)
Question	Question Details			Number (%)	
When working with a person with diabetes, physical therapists have a role in one of the following areas?	Exercise			265 (88)	
	Diet and Nutrition			97 (32.2)	
	Weight Management			154 (51.2)	
	Blood Glucose Control			101 (33.6)	
	Stress Management			105 (34.9)	
	Secondary Complications			159 (52.8)	
I am confident in my ability to educate people with diabetes with regard to	Exercise			262 (87)	
	Diet and Nutrition			104 (34.6)	
	Weight Management			130 (43.2)	
	Blood Glucose Control			92 (30.6)	
	Stress Management			102 (33.9)	
	Secondary Complications			123 (40.9)	

Current Practice

Many physical therapists (73.4%) had no specialized education related to DM, and most of the treated patient group complained of musculoskeletal diseases (69.4%). The majority of the therapists (84.3%) saw up to 10 patients with DM every day, and almost 50% of their total patients suffered from DM (89.7%).

According to the responses, the current practice of physical therapy for patients with DM varied. Only 70% of physical therapists checked their patients for DM, and only 70% inquired about blood glucose management if their patients reported having DM. Half of the participants asked patients to monitor their blood glucose levels. Interestingly, only 53% watched for low blood glucose warning indicators during exercise and therapy. However, 60% stated that they were counseling patients with DM. The impediments to counseling were a lack of time (18%), lack of training (18%), and a notion that DM was beyond their scope of practice (16%). [Table 3](#) illustrates detailed responses from the sample.

Table 3 Descriptive Data for Current Practices

Question	Always	Most of the Time	Sometimes	Infrequently	Never
I specifically screen for diabetes during my initial assessments.	141 (46.8)	74 (24.6)	56 (18.6)	16 (5.3)	14 (4.7)
In patients with diabetes, I specifically ask about blood glucose control.	149 (49.5)	73 (24.3)	52 (17.3)	19 (6.3)	8 (2.7)
In patients with diabetes, I specifically ask patients to test their blood glucose levels.	89 (29.6)	66 (21.9)	65 (21.6)	35 (11.6)	46 (15.3)
I encourage patients to bring equipment to check their low blood glucose levels during their treatment.	66 (21.9)	58 (19.3)	55 (18.3)	38 (12.6)	84 (27.9)
I monitor patients with diabetes for low blood glucose warning signs during treatment/exercise.	132 (43.9)	56 (18.6)	68 (22.6)	19 (6.3)	26 (8.6)
I provide education around diabetes management and control when a patient with diabetes comes to see me with a different primary issue.	79 (26.2)	87 (28.9)	76 (25.2)	34 (11.3)	25 (8.3)
Question					Number (%)
I treat patients specifically for diabetes-related complications.			Yes	169 (56.1)	
I have a treatment plan/policy in place in case a patient with diabetes experiences low blood glucose levels.			Yes	182 (60.5)	
I refer patients to the following to augment/help in the care of their diabetes:					
Physician					233 (77.4)
Community nurse					65 (21.6)
Dietician					139 (46.2)
Chiropracist					20 (6.6)
Occupational therapist					29 (9.6)
Social worker					31 (10.3)
Multidisciplinary clinic					59 (19.6)
Any Association for diabetes					91 (30.2)
Other resources					49 (16.3)
Do you offer counsel to patients regarding diabetes management or prevention?					
Yes					180 (59.8)
If no, why?					
Lack of time					53 (17.6)
Lack of training					55 (18.3)
Lack of comfort					27 (9)
Diabetes is outside my scope of practice					47 (15.6)
Other					9 (3)

Table 4 Descriptive Data for Knowledge

Question	Correct Response, n (%)
When treating someone with low blood glucose levels, which of the following is the most appropriate? (One cup of diet soda, half a cup of fruit juice, half a chocolate bar, one cup of Glucerna/Ensure/Boost drink)	174 (57.8)
In a patient using insulin, what is recommended as the minimum capillary blood glucose level for participation in exercise? (3.5 mmol/L, 5.5 mmol/L, 8.5 mmol/L, 10 mmol/L)	162 (53.8)
What is the recommended amount of weekly aerobic activity for people with diabetes? (70 minutes, 100 minutes, 150 minutes, 180 minutes, 210 minutes)	141 (46.8)
What is the best type of exercise for people with diabetes? (Aerobic, Resistance, Aerobic and resistance, None of the above)	161 (53.5)
Do you think that a Web-based learning module regarding the physiotherapy care of individuals with diabetes would be helpful? Yes	247 (82.1)

Knowledge

This part had two multiple-choice questions on exercise type and intensity, as well as two questions about the management of low blood glucose in practice. In all four questions, the response rate of correct answers was less than 55% (Table 4).

Discussion

This was the first study in Saudi Arabia to assess physical therapists' knowledge, attitudes, and existing practices in relation to DM prevention and management. The findings highlighted that although 75% of the surveyed sample acknowledged the role of a physical therapist in the management and prevention of DM, only 30% screened for DM before therapy, and half of the sample did not monitor warning signs for blood glucose during exercise. Furthermore, the knowledge part of the survey revealed that half of the participants lacked knowledge about DM management.

Most participants in this study believed that physiotherapy was a significant health provision in preventing and treating DM. This was in line with the World Health Organization's global action plan (2013–2020) for all health professionals to have a role in non-communicable disease prevention and control.¹⁷ Physical therapists played an important role in the multidisciplinary healthcare team through at least three different means, including recommending physical activity to patients, identifying diabetes risk factors, and advocating for regular physical activity as an essential component of managing chronic diseases.¹⁸

The majority (72%) believed that physical therapists should counsel and educate patients with DM, or those at risk of getting it, on the importance and relevance of lifestyle changes. It was also suggested that physical therapists played coaching roles in the prevention and management of diabetes through a variety of means, beginning with exercise and physical activity prescription, diet and weight management, glucose education, and the management of secondary complications.^{19–22}

These findings may represent a mismatch between the expected and current practices of a physical therapist in Saudi Arabia, which may be explained by an absence of diabetes knowledge and clinical practice in formal education.²³ A lack of confidence might be a result of insufficient knowledge or practical experience of the issues affecting patients with primary or secondary diabetes, suggesting the need to modify the education curriculum to include a focus on DM management and prevention. Moreover, current clinical practice needs to adapt to the International Classification of Functioning, Disability, and Health's contextual factors, which are supported by the second physical therapy summit on global health for health promotion in daily practice to reduce the burden of non-communicable diseases.^{20,21}

Doehring et al¹¹ surveyed 401 Canadian physical therapists about their knowledge, attitudes, and practice toward DM prevention and management. It transpired that physical therapists were most confident in providing exercise education, but lacked confidence in providing care in crucial areas, including managing secondary complications, glucose level control, and weight management. By identifying this clinical gap, they provided some important recommendations, such as providing more education related to DM in entry-level programs and enhancing continuing physical therapy education

opportunities to improve physical therapists' knowledge of DM.¹¹ However, these findings may not be generalizable to other physical therapists, particularly in the Kingdom of Saudi Arabia, because of differences in cultural backgrounds, educational systems, and healthcare policies, which may affect physical therapist practices in the Kingdom.

Another cross-sectional study was conducted in the United States to assess the knowledge, clinical practices, attitudes, and beliefs of physical therapists toward patients with prediabetes.¹² The majority of the 63 physical therapists who had participated agreed that detecting prediabetes in their patients was crucial. They were aware of the important clinical diagnostic tests required for the identification of DM, but not of the prediabetic stage. Many of the physical therapists were unaware of prediabetes screening, and their knowledge of correct weight loss and physical activity recommendations was also poor. Hence, the authors recommended more educational services for physical therapists to combat the disease in its early stages.¹² Existing literature emphasizes the need for physical therapists to have proper education in the prevention and management of DM, but research on physical therapists' current knowledge in preventing and managing DM is lacking. Moreover, the current clinical practices and attitudes of physical therapists in Saudi Arabia need to be explored to clarify future research directions to combat the high prevalence of this disease.

Only 57% of the participants knew that a patient with diabetes with low blood glucose levels should be treated with half a cup of fruit juice, while the other half (43%) treated them incorrectly, such as with chocolate bars, diet soda, or nutritional drinks. Knowledge of the treatment is fundamental for providing first aid to patients with DM. This information is readily available online and in community education to raise awareness on how to manage patients with diabetes with low blood glucose levels; such material is for the cognizance of the general public, not just healthcare providers.^{11,21} A surprising result was that less than half of those surveyed recognized the volume and intensity of weekly aerobic activities suggested for DM patients. The American College of Sports Medicine's 2nd edition on physical activity guidelines for adults and adult patients with diabetes include guidelines for all people who engage in physical activity, not just patients with DM.^{24,25} This is similar to the findings of prior research by Canadian physical therapists.¹¹ Furthermore, only half of the participants understood the best types of exercises for patients with DM, suggesting that physical therapists need further training to help healthcare professionals treat DM.

A few participants stated that their entry-level education did not adequately educate them on how to cope with patients with DM. By contrast, a sizable proportion (82.4%) believed the opposite. This result was explained by the significant number of surveyed physical therapists who opined that extra education or sub-specialties in diabetes were necessary. All these findings point to a significant dearth of understanding of DM as a disease and its care in entry-level education. This could explain why 82% of the participants believed that a web-based learning module on DM patient physiotherapy would be effective. There is evidence of the effectiveness of providing continuing medical education on DM to healthcare workers in improving their knowledge and clinical practices.²⁶ To address these gaps, changes in practice are required, and consideration should be given to the possibility of establishing higher education or diploma courses in DM for registered Saudi physical therapists to help them gain additional specific knowledge, thereby allowing them to better care for patients with DM.

For the current practice of physical therapists, less than half (46.8%) always screened for DM during initial evaluations, and only half (50%) frequently inquired about blood glucose management. It should be mentioned that frequent blood glucose checks are important for those who are recently diagnosed with diabetes, but they are probably unnecessary for those who have had diabetes for a while, or who are active in their leisure or occupation. In fact, for the light to moderate exercise conducted within a physiotherapy clinic, blood glucose is likely to temporarily rise, and then decline substantially > 0.5–1 hour after the cessation of exercise.²⁷ A similar study in Nigeria was conducted among physical therapists on how frequently they asked older people about previous falls during first evaluations, and the results revealed that approximately half of them (56.5%) regularly asked their patients about that.²⁸ This shows that physical therapists may not be very good at screening during the first examination, and that interdisciplinary training was insufficient. To minimize exercise-related damage, pre-evaluation measures are required before beginning any physical activity training, as is modifying medication dosage for insulin consumption in patients with DM to avoid hypoglycemia throughout the session.^{29–31}

The results highlight that more than half of the participants were aware of the minimal capillary blood glucose level required for a patient to begin a physical activity in order to prevent further difficulties and dangers. However, only

a handful required patients with DM to carry their equipment so as to constantly monitor their blood glucose levels throughout treatment. This signifies a failure to assess blood glucose levels before beginning exercises, which may result in significant safety concerns, a high risk of hypoglycemia during physical therapy sessions, and other consequences for patients with DM.

Physical therapists agreed that they could assist patients with DM, but they perceived hurdles to controlling the disease, such as a lack of specialized professional training or understanding. Our study showed that most physical therapists identified a role for themselves in preventing and managing DM. They could demonstrate sound knowledge in this regard; however, physical therapists with many years of experience or a higher academic degree performed only averagely when dealing with patients with DM. Physical therapists who had undergone DM management courses displayed a wealth of information and improved performance and outcomes with their patients with DM. Their expertise appeared to be positively reflected in their practice routines.

This study has some limitations. First, despite the fact that we included all genders in our study, we received fewer responses from female therapists. Second, most participants were under 30 years old and had less than five years' experience. This study's sample size was appropriate, but the diversity of participants' practice locations was limited, which may not accurately represent the viewpoint of the entire country. Consequently, future research should ensure equitable gender, age, and location distribution in its sample. In addition, the study indicated that 46% of the participants saw < 5 patients per day; academic physical therapists and physical therapists with limited experience (ie, < 2 years of experience) dealt with only a few patients per day. Future researchers should control for years of experience to better evaluate factors associated with diabetes management and physical therapists' practice in Saudi Arabia. If similar numbers of participants were recruited from all regions, the outcomes would be more generalizable. This study may foster a new perspective on the role physical therapists play in DM management. It may also serve as a springboard for further research into current knowledge, attitudes, and practices among physical therapists regarding DM, and help guide future research on how to support physical therapists in caring for their patients with DM.

Conclusion

This study found that physical therapists in Saudi Arabia had a modest level of diabetes knowledge and a positive attitude toward exercise education, but they exhibited lower educational behaviors in other areas. In their regular clinical practice, many of them do not screen for DM or assess blood glucose during exercise sessions for patients with DM. This indicates a need to develop educational programs and clinical practice guidelines that address DM for practicing physical therapists in Saudi Arabia. The healthcare system in Saudi Arabia must provide physical therapists with the education and tools for quality DM assessment and management.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author (Ah.A) upon reasonable request.

Ethics Approval and Consent to Participate

This project was approved by Prince Sattam Bin Abdulaziz University's Ethical Committee (RHPT/021/019). All methods were carried out in accordance with relevant guidelines and regulations according to the Declaration of Helsinki. The participants agreed to participate before the questionnaires were disseminated. Informed consent was obtained from all participants involved in the study.

Acknowledgments

We are immensely grateful to all participants in this study.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

Funding

The authors extend their appreciation to the Deputyship of Research and Innovation, Ministry of Education in Saudi Arabia for funding this research study, project number: IF2/PSAU/2022/03/21121.

Disclosure

The authors declare that they have no competing interests.

References

- Pagliarulo MA. *Introduction to Physical Therapy. E-book*. Elsevier Health Science; 2021. Available from: <https://books.google.com.sa/books?id=5DgEEAAAQBAJ>. Accessed September 12, 2023.
- Kaul K, Tarr JM, Ahmad SI, Kohner EM, Chibber R. Introduction to Diabetes Mellitus. In: Ahmad SI, editor. *Diabetes. Advances in Experimental Medicine and Biology*. Vol. 771. New York, NY: Springer; 2013:1–11.
- American Diabetes Association. Classification and diagnosis of diabetes: standards of medical care in diabetes—2019. *Diabetes Care*. 2019;42 (suppl 1):S13–S28. doi:10.2337/dc19-S002
- Al-Qerem W, Al-Maayah B, Ling J. Developing and validating the Arabic version of the Diabetes Quality of Life questionnaire. *East Mediterr Health J*. 2021;27(4):414–426. doi:10.26719/emhj.20.112
- Alotaibi A, Perry L, Gholizadeh L, Al-Ganmi A. Incidence and prevalence rates of diabetes mellitus in Saudi Arabia: an overview. *J Epidemiol Glob Health*. 2017;7(4):211–218. doi:10.1016/j.jegh.2017.10.001
- Cannata F, Vadalà G, Russo F, Papalia R, Napoli N, Pozzilli P. Beneficial effects of physical activity in diabetic patients. *J Funct Morphol Kinesiol*. 2020;5(3):70. doi:10.3390/jfmk5030070
- Papathodorou K, Banach M, Bekiari E, Rizzo M, Edmonds M. Complications of diabetes 2017. *J Diabetes Res*. 2018;2018:3086167. doi:10.1155/2018/3086167
- Das KV, Jayakumar RV, Unnikrishnan AG, Poulse KP. Complications of diabetes mellitus. In: *Textbook of Medicine*. Jaypee Brothers Medical Publishers Ltd; 2008:556. Available from: <https://www.jaypeedigital.com/book/9788184483888/chapter/ch91>. Accessed September 12, 2023.
- Mabry R, Koohsari MJ, Bull F, Owen N. A systematic review of physical activity and sedentary behaviour research in the oil-producing countries of the Arabian Peninsula. *BMC Public Health*. 2016;16(1):1003. doi:10.1186/s12889-016-3642-4
- Lee I-M, Shiroma EJ, Lobelo F, et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012;380(9838):219–229. doi:10.1016/S0140-6736(12)61031-9
- Doehring K, Durno S, Pakenham C, Versi B, DePaul VG. Knowledge, attitudes, and current practices of Canadian physical therapists in preventing and managing diabetes. *Physiother Can*. 2016;68(3):298–306. doi:10.3138/ptc.2015-63
- Ross M, Purrington B, Zuniga C, Farnand B, Pattaciatto F. Survey of physical therapists' knowledge of screening and management practices for patients with prediabetes. *Physiother Pract Res*. 2021;41(2):213–223.
- Saudi Commission for Health Specialties Health Workforce; 2018. Available from: <https://www.scfhs.org.sa/Media/DigitalLibrary/DocumentLibrary/OtherPublications/Pages/default.aspx>. Accessed December 3, 2022.
- Roland D, Spurr J, Cabrera D. Preliminary evidence for the emergence of a health care online community of practice: using a netnographic framework for Twitter hashtag analytics. *J Med Internet Res*. 2017;19(7):e252. doi:10.2196/jmir.7072
- Alassiri SA, Alowfi AS. Public's attitudes toward health information on Twitter: a cross-sectional survey based on the Saudi population. *Cureus*. 2019;11(10):e5863. doi:10.7759/cureus.5863
- Rashidi Y, Vaniea K, Camp JL. *Understanding Saudis' privacy concerns when using WhatsApp*. Usable Security and Privacy Conference. 2016;1–8. San Diego, CA.
- Pahwa P, Broughton E. Strengthening quality improvement work in hospitals using WhatsApp: an exploratory qualitative study from an Indian hospital. *Int J Qual Health Care*. 2017;29:25. doi:10.1093/intqhc/mzx125.37
- Ruof J, Cieza A, Wolff B, et al. ICF Core Sets for diabetes mellitus. *J Rehabil Med*. 2004;100–106. doi:10.1080/16501960410016802
- Harris-Hayes M, Schootman M, Schootman JC, Hastings MK. The role of physical therapists in fighting the type 2 diabetes epidemic. *J Orthop Sports Phys Ther*. 2020;50(1):5–16. doi:10.2519/jospt.2020.9154
- Dean E, Al-Obaidi S, De Andrade AD, et al. The first physical therapy summit on global health: implications and recommendations for the 21st century. *Physiother Theory Pract*. 2011;27(8):531–547. doi:10.3109/09593985.2010.544052
- Dean E, de Andrade AD, O'Donoghue G, et al. The Second Physical Therapy Summit on Global Health: developing an action plan to promote health in daily practice and reduce the burden of non-communicable diseases. *Physiother Theory Pract*. 2014;30(4):261–275. doi:10.3109/09593985.2013.856977
- Dean E, Skinner M, Myezwa H, et al. Health competency standards in physical therapist practice. *Phys Ther*. 2019;99(9):1242–1254. doi:10.1093/ptj/pzz087
- O'Brien MW, Shields CA, Campbell KL, Crowell SJ, Fowles JR. Perceptions and practices of providing physical activity counselling and exercise prescriptions among physical therapists in Nova Scotia. *Physiother Can*. 2020;72(3):230–238. doi:10.3138/ptc-2018-0098

24. Alodaibi FA, Alotaibi MA, Almohiza MA, Alhowimel AS. Physical therapists' role in health and wellness promotion for people with musculoskeletal disorders: a cross-sectional description study conducted in Saudi Arabia. *J Multidiscip Healthc.* 2022;15:567–576. doi:10.2147/JMDH.S356932
25. Piercy KL, Troiano RP, Ballard RM, et al. The physical activity guidelines for Americans. *JAMA.* 2018;320(19):2020–2928. doi:10.1001/jama.2018.14854
26. Colberg SR. Key points from the updated guidelines on exercise and diabetes. *Front Endocrinol (Lausanne).* 2017;8:33. doi:10.3389/fendo.2017.00033
27. Lim SC, Mustapha FI, Aagaard-Hansen J, Calopietro M, Aris T, Bjerre-Christensen U. Impact of continuing medical education for primary healthcare providers in Malaysia on diabetes knowledge, attitudes, skills and clinical practices. *Med Educ Online.* 2020;25(1):1710330. doi:10.1080/10872981.2019.1710330
28. Moore J, Bartholomae EM, Ward K, Hooshmand S, Kressler J. Three minutes of moderate-intensity stair walking improves glucose and insulin but not insulin sensitivity or total antioxidant capacity. *Nutr Metab Cardiovasc Dis.* 2022;32(2):479–486. doi:10.1016/j.numecd.2021.10.016
29. Kalu ME, Vlachantoni A, Norman KE. Knowledge about risk factors for falls and practice about fall prevention in older adults among physical therapists in Nigeria. *Physiother Res Int.* 2019;24(1):e1742. doi:10.1002/pri.1742
30. Mendes R, Sousa N, Reis VM, Themudo-Barata JL. Prevention of exercise-related injuries and adverse events in patients with type 2 diabetes. *Postgrad Med J.* 2013;89(1058):715–721. doi:10.1136/postgradmedj-2013-132222
31. Colberg SR, Sigal RJ, Fernhall B, et al. Exercise and type 2 diabetes: the American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care.* 2010;33(12):e147–e167. doi:10.2337/dc10-9990

Diabetes, Metabolic Syndrome and Obesity

Dovepress

Publish your work in this journal

Diabetes, Metabolic Syndrome and Obesity is an international, peer-reviewed open-access journal committed to the rapid publication of the latest laboratory and clinical findings in the fields of diabetes, metabolic syndrome and obesity research. Original research, review, case reports, hypothesis formation, expert opinion and commentaries are all considered for publication. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/diabetes-metabolic-syndrome-and-obesity-journal>