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PHYSIOTHERAPIST'S INSIGHTS AND INTERVENTIONS IN DIABETES CARE: A KNOWLEDGE-TO-PRACTICE PERSPECTIVE

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Abstract

Background: *Diabetes mellitus (DM) is a major global health concern and a leading cause of morbidity and disability. Physiotherapists play a vital role in diabetes prevention and management through exercise prescription, patient education, and lifestyle modification. However, variations in physiotherapists' knowledge, attitudes, and clinical practices can influence the quality and consistency of diabetes care.*

Objective: *This study aimed to assess the knowledge, attitudes, and practices of physiotherapists regarding diabetes prevention and management in Hyderabad, Sindh, Pakistan*

Methodology: *A descriptive cross-sectional survey was conducted among 134 practicing physiotherapists from various hospitals and clinics in Hyderabad. Data were collected using a structured, self-administered questionnaire. Descriptive statistics were analyzed using SPSS version 22 to summarize the findings as frequencies and percentages.*

Results: *Most participants were aged 24–32 years (mean 30.37 ± 6.33), with 53% males and 47% females. Overall, 80.5% agreed that diabetes prevention and management fall within the physiotherapy scope, and 85.1% felt adequately prepared to treat diabetic patients. While 61.9% provided counselling and 84.3% reported having emergency plans for hypoglycemia, only 37.3% treated diabetes-related complications directly. Knowledge levels were moderate in 56% of respondents, low in 33.6%, and high in 10.4%. Major barriers included lack of training (47.1%) and time constraints (15.7%).*

Conclusion: *Physiotherapists demonstrated positive attitudes and a strong sense of professional responsibility toward diabetes management but exhibited moderate knowledge and inconsistent clinical practices. Integrating diabetes-focused education into physiotherapy curricula, organizing continuous professional development workshops, and establishing standardized clinical guidelines are essential to bridge the knowledge–practice gap and enhance physiotherapists' contribution to multidisciplinary diabetes care.*

INTRODUCTION

1. Diabetes Mellitus

Diabetes mellitus (DM) is a long-term metabolic disease in which blood glucose values remain elevated because of insufficient insulin secretion, impaired insulin action, or

combination of both. Insulin, a hormone secreted by the pancreatic β-cells, plays a central role in maintaining glucose homeostasis by facilitating glucose uptake into muscle and adipose tissue and by inhibiting hepatic glucose production. When insulin production is impaired, or peripheral tissues develop resistance to insulin, blood glucose levels rise, leading to the clinical manifestation of diabetes (1).The hallmark of diabetes is chronic hyperglycemia, but the implications of this condition extend far beyond elevated glucose. Prolonged high blood sugar initiates a cascade of pathological processes that damage both large and small blood vessels, impair organ function, and predispose individuals to acute life-threatening metabolic complications. In addition, chronic hyperglycemia accelerates atherosclerosis and causes cumulative damage to organs such as the eyes, kidneys, and nerves(2) The impact of diabetes extends beyond hyperglycemia, as it is associated with serious complications that affect multiple organ systems. Chronic hyperglycemia contributes to vascular damage, neuropathy, nephropathy, retinopathy, and cardiovascular disease, which collectively account for high morbidity and mortality rates (3).

In addition, diabetes is associated with reduced quality of life, increased healthcare costs, and significant economic burden, particularly in low- and middle-income countries where access to care may be limited (4). Given its multifactorial etiology and wide-ranging consequences, diabetes requires a comprehensive approach that includes early detection, lifestyle modification, pharmacological treatment, and multidisciplinary care. Health professionals, including physicians, dietitians, and physiotherapists, play vital roles in managing diabetes and preventing its complications. With its rising global prevalence, diabetes is now recognized as both a clinical and social challenge, necessitating urgent action at community, national, and international levels.(5)

2. Types of Diabetes Mellitus:

Diabetes mellitus is classified into several distinct types based on its etiology and clinical presentation.

The main categories include type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), gestational diabetes mellitus (GDM), and other specific forms arising from genetic or secondary causes(6)

2.1 Type 1 Diabetes Mellitus (T1DM):

Is an autoimmune condition characterized by the destruction of pancreatic β-cells, leading to absolute insulin deficiency? It commonly presents in childhood or adolescence but can occur at any age. The autoimmune process is mediated by genetic susceptibility and environmental triggers such as viral infections, with patients typically requiring lifelong insulin therapy(7).Although T1DM accounts for only 5–10% of all diabetes cases, its onset is often acute and associated with severe metabolic decompensation, including diabetic ketoacidosis (8).

Type 2 Diabetes Mellitus (T2DM):

Is the most prevalent form, representing more than 90% of diabetes cases worldwide.It is characterized by a combination of insulin resistance and progressive β-cell dysfunction.Unlike T1DM, T2DM develops gradually and is strongly linked to modifiable risk factors such as obesity, sedentary lifestyle, and unhealthy diets (9).Although traditionally considered a disease of adults, its incidence among children and adolescents has increased in recent years due to rising obesity rates .T2DM is often asymptomatic in its early stages, which delays diagnosis until complications appear, highlighting the importance of effective screening strategies (10).

2.2 Gestational Diabetes Mellitus (GDM):

Is defined as glucose intolerance that develops during pregnancy, typically in the second or third trimester. It is associated with adverse maternal and neonatal outcomes, including pre-eclampsia, macrosomia, and increased risk of cesarean delivery (11).Women with a history of GDM face a significantly higher risk of developing T2DM later in life, making

postpartum monitoring essential. The rising prevalence of obesity has contributed to increasing rates of GDM globally(12).

2.3 Other types:

Less common but clinically important forms of diabetes also exist. Monogenic diabetes, including Maturity-Onset Diabetes of the Young (MODY), arises from single-gene defects that impair insulin secretion. Secondary diabetes can occur as a consequence of other medical conditions or treatments—for example, chronic pancreatitis, hormonal disorders such as Cushing's syndrome, or long-term use of glucocorticoids . While rare, these forms require specific diagnostic tests and individualized management strategies, as their treatment may differ significantly from T1DM or T2DM(13,14)

2.4 Prediabetes and Intermediate Hyperglycemia:

Before diabetes develops, many individuals pass through a stage of "prediabetes," where blood glucose levels are higher than normal but not yet in the diabetic range (15). Clinically, prediabetes is defined by the presence of impaired fasting glucose or impaired glucose tolerance on diagnostic testing. Prediabetes is not benign—it is associated with an increased risk of cardiovascular disease and often progresses to T2DM if left unaddressed. Importantly, early intervention with diet, structured exercise, and weight management has been shown to prevent or significantly delay progression to diabetes(16)

3. Pathophysiology of Diabetes Mellitus :

The pathophysiology of diabetes mellitus varies depending on its type, but all forms share the common feature of disrupted glucose homeostasis (6).

3.1 Type 1 Diabetes Mellitus (T1DM)

Is an autoimmune condition where genetic predisposition and environmental triggers lead to immune-mediated destruction of pancreatic β-cells (7). This results in absolute insulin deficiency, with autoantibodies against islet cells, insulin, or glutamic acid decarboxylase (GAD) serving as biomarkers of disease progression . The lack of insulin causes unchecked hepatic glucose production and impaired cellular glucose uptake, leading to persistent hyperglycemia (8).

3.2 Type 2 Diabetes Mellitus (T2DM)

The development of type 2 diabetes mellitus is primarily driven by a combination of insulin resistance and gradual impairment of pancreatic β-cell function. Peripheral tissues such as skeletal muscle, liver, and adipose tissue become resistant to insulin's actions, forcing the pancreas to increase insulin secretion. Over time, β-cells fail to sustain this increased demand, resulting in relative insulin deficiency (6). Chronic exposure to elevated glucose and lipid levels further aggravates β-cell dysfunction, creating a cycle of worsening hyperglycemia often referred to as "glucotoxicity" and "lipotoxicity" (9).

3.3 Gestational Diabetes Mellitus (GDM)

During pregnancy, hormonal changes—particularly increased levels of human placental lactogen, cortisol, and progesterone—induce a physiological state of insulin resistance . Normally, pancreatic β-cells adapt by enhancing insulin secretion, but in women predisposed to metabolic dysfunction, this compensation is inadequate, resulting in hyperglycemia (11). GDM thus represents a transient but clinically significant form of impaired glucose regulation that often predicts later development of T2DM(12).Bottom of Form.

4. Epidemiology of Diabetes Mellitus

4.1 Prevalence

The prevalence of diabetes mellitus has risen at an alarming rate, making it a leading global health problem. According to the International Diabetes Federation (IDF), more than 537 million adults were living with diabetes in 2021, and this figure is projected to reach 643 million by 2030 and 783 million by 2045 if current trends persist (4). Type 2 diabetes mellitus (T2DM) represents over 90% of all cases, with its incidence continuing to grow in both developed and developing nations [2].

Once considered a disease of older adults, T2DM is now increasingly diagnosed in children and adolescents, largely due to the rising prevalence of obesity and physical inactivity (9). Type 1 diabetes mellitus (T1DM), though less common, is also increasing globally, with an annual growth rate of approximately 3–4% in many high-income regions [6]. Gestational diabetes mellitus (GDM) adds to the burden, especially in populations with high obesity rates and advanced maternal age (11).

4.2 Morbidity

Beyond prevalence, diabetes is a leading contributor to long-term morbidity. Chronic hyperglycemia damages blood vessels and nerves, leading to microvascular complications such as retinopathy, nephropathy, and neuropathy, as well as macrovascular diseases including stroke and ischemic heart disease (3). These complications significantly reduce quality of life and are major drivers of disability worldwide . In many low- and middle-income countries, where access to timely diagnosis and treatment is limited, diabetes-related complications occur earlier and with greater severity (4). The increasing number of individuals living with complications places a heavy burden on health systems and reduces productivity, particularly among working-age populations (5).

4.3 Mortality

Diabetes Mellitus remains a mjor global contributior to shortened life expectancy. It is estimated to be directly responsible for about 6.7 million deaths globally in 2021, largely through cardiovascular complications such as myocardial infarction and stroke (4). People with diabetes have a two- to three-fold higher risk of cardiovascular mortality compared to the general population
. Mortality is further increased in patients with poor glycemic control, comorbid hypertension, or obesity (2). Although advancements in healthcare and improved treatments have reduced mortality rates in high-income countries, many low-resource settings continue to experience high diabetes-related death rates due to delayed diagnosis and management(4)

5. Risk Factors of Diabetes Mellitus

The development of diabetes mellitus is influenced by a complex interaction of genetic, environmental, and lifestyle factors. While type 1 diabetes mellitus (T1DM) is primarily associated with autoimmune and genetic predisposition, type 2 diabetes mellitus (T2DM) and gestational diabetes mellitus (GDM) are more strongly linked to modifiable risk factors such as obesity, sedentary behavior, and dietary patterns(2,6).

5.1 Genetic and Family History

Genetic susceptibility is a well-established risk factor for both T1DM and T2DM. In T1DM, specific human leukocyte antigen (HLA) genotypes are associated with increased autoimmune destruction of pancreatic β-cells (7). Similarly, individuals with a family history of T2DM have a two- to four-fold greater risk of developing the disease, reflecting the combined influence of genetic inheritance and shared environmental exposures (6). Monogenic forms of diabetes, such as maturity-onset diabetes of the young (MODY), further highlight the role of single-gene mutations in disease development (13)

5.2 Obesity and Sedentary Lifestyle

Excess body weight, particularly central obesity, is the strongest modifiable risk factor for T2DM. Adipose tissue dysfunction promotes insulin resistance through increased release of free fatty acids and inflammatory mediators (9). Physical inactivity further exacerbates this process, as regular exercise improves insulin sensitivity and glucose utilization in skeletal muscle. With global increases in obesity, especially among younger populations, the risk of T2DM has risen dramatically in parallel (2).

5.3 Dietary Habits

Unhealthy dietary patterns, including high intake of refined carbohydrates, saturated fats, and sugar-sweetened beverages, contribute significantly to insulin resistance and weight gain (2). Conversely, diets rich in whole grains,

fiber, and antioxidants are protective against T2DM development
. The increasing consumption of processed foods in both developed and developing countries has therefore played a major role in the diabetes epidemic(9)

5.4 Age and Gender

Advancing age is another important risk factor, as the prevalence of T2DM rises sharply after the age of 40 due to progressive β-cell dysfunction and increased insulin resistance (6). Gender differences have also been observed: men tend to develop T2DM at lower body mass indices compared to women, while women are more likely to experience GDM during pregnancy (11).

5.5 Other Risk Factors

Additional contributors include stress, poor sleep quality, and exposure to certain medications such as glucocorticoids, which impair insulin sensitivity (13). In many low- and middle-income countries, rapid urbanization and limited access to healthy food or safe spaces for physical activity further increase population-level risk (4).
In summary, while some risk factors such as genetics cannot be modified, many—including obesity, physical inactivity, and unhealthy diets—are preventable. Targeting these modifiable risks through health promotion and lifestyle interventions remains a cornerstone of global diabetes prevention strategies (5).

6. Complications of Diabetes Mellitus

Diabetes mellitus is associated with a wide range of complications that contribute significantly to morbidity, mortality, and reduced quality of life. These complications are broadly categorized into acute and chronic forms, with the latter further divided into microvascular and macrovascular complications. The risk and severity of complications are closely linked to the degree and duration of hyperglycemia, as well as the presence of comorbidities such as hypertension and dyslipidemia (8).

6.1 Acute Complications

Acute metabolic disturbances are life-threatening consequences of uncontrolled diabetes. In type 1 diabetes mellitus (T1DM), diabetic ketoacidosis (DKA) is the most serious acute complication, resulting from absolute insulin deficiency and excessive ketone production. In type 2 diabetes mellitus (T2DM), hyperosmolar hyperglycemic state (HHS) can occur, characterized by extreme hyperglycemia, dehydration, and altered mental status (6). Both DKA and HHS require urgent medical management and are major causes of hospitalization among people with diabetes. Severe hypoglycemia, often a result of insulin or sulfonylurea therapy, is another acute complication that can lead to seizures, loss of consciousness, and, in rare cases, death (2).

6.2 Chronic Microvascular Complications

Chronic hyperglycemia damages small blood vessels, leading to microvascular complications. Diabetic retinopathy is a leading cause of vision impairment and blindness worldwide, with risk increasing alongside poor glycemic and blood pressure control . Diabetic nephropathy, resulting from glomerular damage, is one of the most common causes of end-stage renal disease (3). Diabetic neuropathy involves damage to peripheral and autonomic nerves , resulting in pain , altered sensation and greater susceptibility to foot ulcers and amputations (5). These microvascular complications not only reduce quality of life but also increase healthcare costs substantially (17)

6.3 Chronic Macrovascular Complications

Diabetes-related macrovascular complications are a key driver of both morbidity and mortality. Diabetes accelerates atherosclerosis, leading to higher rates of coronary artery disease, stroke, and peripheral arterial disease (17,5). Cardiovascular disease remains the leading cause of death among individuals with diabetes, with patients facing two- to three-fold higher risk compared to those without the condition . Poor lipid control, smoking, and hypertension further amplify macrovascular risks (4).

6.4 Other Long-Term Complications

In addition to vascular complications, diabetes is associated with impaired wound healing, increased susceptibility to infections, and musculoskeletal problems such as limited joint mobility . Cognitive decline and depression are also more prevalent among individuals with diabetes, underscoring the broad systemic impact of the disease (5).

7. Medical Management of Diabetes Mellitus

The management of diabetes mellitus focuses on achieving and maintaining optimal blood glucose levels, preventing complications, and improving quality of life. Treatment strategies vary depending on the type of diabetes, disease severity, comorbidities, and individual patient needs.

7.1 Lifestyle Modification

The primary basis of diabetes care, regardless of type, lies in lifestyle interventions. Dietary changes, including reduced intake of refined carbohydrates and saturated fats, along with increased consumption of whole grains, fruits, and vegetables, are recommended to improve glycemic control (2). Regular physical activity enhances insulin sensitivity, facilitates weight management, and lowers cardiovascular risk (9). In patients with prediabetes or early-stage type 2 diabetes mellitus (T2DM), lifestyle changes alone can significantly delay or prevent progression to overt diabetes (16).

7.2 Pharmacological Therapy

Pharmacological interventions are often necessary when lifestyle modifications alone are insufficient. In type 1 diabetes mellitus (T1DM), exogenous insulin therapy is essential to replace deficient insulin. Advances in insulin formulations, including rapid-acting analogs, long-acting basal insulins, and continuous subcutaneous insulin infusion via pumps, have improved flexibility and glycemic outcomes (6).

In T2DM, initial management often begins with metformin, which improves insulin sensitivity and reduces hepatic glucose production. Other oral and injectable medications may be added based on patient response, including sulfonylureas, Dipeptidyl Peptidase -4 inhibitors, Glucagon Like Peptide -1 receptor agonists, and SGLT2 inhibitors (2). GLP-1 receptor agonists and Sodium Glucose Co Transporter inhibitors (SGLT2) are increasingly emphasized due to their cardiovascular and renal protective effects . Insulin therapy may eventually be required in advanced T2DM when β-cell function declines significantly (5).

7.3 Gestational Diabetes Mellitus (GDM)

Gestational diabetes is primarily controlled through lifestyle measures, including tailored diet plans, exercise, and ongoing blood glucose monitoring. When non-pharmacological measures are inadequate, insulin is the preferred pharmacological treatment as it does not cross the placenta . Early diagnosis and strict glycemic control are essential to reduce risks for both mother and fetus(11)

7.4 Comprehensive Care

Beyond glucose control, comprehensive management includes addressing hypertension, dyslipidemia, and obesity, as these comorbidities significantly contribute to long-term complications (4). Regular screening for microvascular and macrovascular complications, patient education, and psychosocial support are integral parts of diabetes management (5).

8. Role of Physiotherapists in Diabetes Care

Physiotherapists are now acknowledged as key contributors within the team-based management of diabetes mellitus. Their expertise extends beyond physical rehabilitation to include exercise prescription, patient education, and long-term lifestyle support (18).

8.1 Exercise Therapy

Exercise is a key component of diabetes management, and physiotherapists are well positioned to design and monitor individualized programs. Aerobic exercise, resistance training, and flexibility exercises improve insulin sensitivity, aid weight control, and reduce cardiovascular risk . Supervised exercise interventions have been shown to lower HbA1c

and improve overall functional capacity in individuals with both T1DM and T2DM (9,6).

8.2 Prevention of Complications

Physiotherapists also contribute to preventing and managing diabetes-related complications. Structured physical therapy helps reduce the risk of peripheral neuropathy–related foot ulcers by improving balance, strength, and mobility (17). In patients with established complications such as cardiovascular disease, physiotherapists play a role in safe exercise progression and rehabilitation (5).

8.3 Education and Lifestyle Counseling

Physiotherapists provide education on safe physical activity, foot care, and strategies to incorporate exercise into daily life . They also support behavior change through motivational strategies, helping patients adhere to lifestyle recommendations(18)

8.4 Rehabilitation and Quality of Life

For patients with advanced complications, such as amputations or stroke, physiotherapists are integral in rehabilitation, restoring mobility, independence, and quality of life . Their role extends to psychosocial well-being, as participation in structured activity reduces symptoms of depression and improves self-efficacy (3)

2.LITERATURE REVIEW

Doehring et al. 2016 conducted a cross sectional study on the knowledge, attitudes, and practices of Canadian physiotherapists regarding diabetes prevention and management. A web-based survey of 401 physiotherapists revealed that 82.1% believed diabetes care was within their professional scope, yet only 32.4% provided patient counselling. While 94.3% correctly identified treatment for hypoglycemia, only 46.6% knew aerobic activity guidelines, and 16.7% were aware of national policies. It was concluded that physiotherapists recognize their role but show gaps in confidence and knowledge, emphasizing the need for curriculum reforms and continuing education(21)

Morris et al. (2016) investigated physiotherapists' perceptions of barriers to diabetes care integration in South Africa. A cross sectional survey of 260 practitioners revealed that 79% believed physiotherapists should play a greater role in diabetes prevention, yet 55% cited institutional neglect and 48% identified lack of continuing education as barriers. It was concluded that systemic reforms and access to professional training are required to enable physiotherapists to fully engage in diabetes management.(22)

Shaw and Singh (2017) examined exercise prescription practices of Australian physiotherapists in diabetes care. A national cross sectional survey of 340 respondents revealed that 84% routinely encouraged exercise, yet only 36% conducted structured risk assessments prior to prescribing activity.

Additionally, 42% identified lack of referral pathways as a barrier to effective care. It was concluded that while physiotherapists strongly support exercise interventions, gaps in safety protocols and referral systems limit consistent practice, highlighting the need for improved integration and standardized approaches.(23)

Anderson et al. (2017) evaluated physiotherapists' knowledge of exercise recommendations for diabetes in the United States. A cross-sectional survey of 325 clinicians revealed that 85% routinely advised exercise, yet only 43% correctly identified the American College of Sports Medicine (ACSM) guidelines for aerobic and resistance training. Additionally, 38% reported low confidence in managing diabetes-related complications. It was concluded that although physiotherapists strongly endorse exercise, improved emphasis on evidence-based education and training is essential to enhance clinical practice.(24)

Mayer-Davis et al. (2017) analyzed national data on diabetes trends among youths in the United States. Results showed that type 1 diabetes incidence increased by 1.8% annually, while type 2 diabetes rose by nearly 4.8% per year between 2002 and 2012. It was concluded that physiotherapists can contribute to reversing

these trends by promoting early physical activity interventions and reducing sedentary behaviors among children and adolescents (10).

Al-Eisa et al. (2018) investigated Saudi physiotherapists' readiness to contribute to diabetes management. A cross-sectional survey of 200 clinicians found that 72% expressed willingness to provide lifestyle counselling, but only 28% had received diabetes-specific training. Moreover, 64% reported low confidence in advising on nutrition or blood sugar monitoring. It was concluded that structured professional development programs are essential to strengthen physiotherapists' competencies in diabetes care(25)

Zheng et al. (2018) reported that more than 90% of global diabetes cases are type 2 diabetes, with prevalence rising sharply in low- and middle-income countries. The study noted that structured lifestyle programs, particularly exercise, reduced diabetes risk by 30–60% when implemented consistently. It was concluded that physiotherapists are well positioned to lead such interventions and improve patient outcomes in both prevention and management of the disease (5)

Lim et al. (2019) investigated physiotherapists' practices in Malaysia concerning diabetes management. A cross sectional survey of 220 practitioners revealed that 80% promoted exercise interventions, but only 37% followed structured exercise guidelines. Barriers included lack of guideline awareness (52%) and limited time (46%). It was concluded that dissemination of evidence-based guidelines and institutional support are necessary to improve physiotherapy practice in diabetes care(26)

Tobin et al. (2019) examined the confidence and competence of UK physiotherapists in diabetes management. A cross-sectional survey of 187 participants revealed that 67% felt confident in providing exercise counselling, yet fewer than 40% reported being prepared to address complications such as neuropathy. Additionally, only 31% collaborated regularly with dietitians or diabetes nurses. It was concluded that interprofessional education and clearer role definitions are necessary to enhance physiotherapists' contributions to diabetes care.(27) Kaur et al. (2020) explored the exercise prescription practices of Indian physiotherapists treating patients with type 2 diabetes. A survey based cross sectional design of 250 clinicians showed that 81% prescribed exercise at least occasionally, but only 29% followed evidence-based guidelines. Barriers included lack of time (63%) and insufficient follow-up systems (47%). It was concluded that guideline dissemination and institutional support are critical to improve physiotherapists' role in diabetes care(28).

Lee et al.2020 assessed the effects of physiotherapist-led lifestyle interventions on glycemic control among adults with type 2 diabetes in South Korea. In this randomized controlled trial of 180 participants, the intervention group that received structured exercise and dietary counselling demonstrated a 0.9% reduction in HbA1c and a 15% improvement in cardiorespiratory fitness after 12 weeks compared to controls. It was concluded that physiotherapist-supervised programs significantly enhance glycemic outcomes and promote sustained behavioral change in diabetic populations. (29)

Okafor et al. (2021) explored the involvement of Nigerian physiotherapists in diabetes management. A survey of 198 participants indicated that 83% recognized their role in exercise counselling, but only 33% engaged in multidisciplinary collaboration. Furthermore, just 26% had access to continuing education on diabetes. It was concluded that while physiotherapists demonstrate supportive attitudes, resource limitations and lack of professional training hinder effective practice.(30)

Yang et al. (2021) performed a meta-analysis of randomized controlled trials evaluating the effects of exercise on glycemic control in type 2 diabetes. Results showed that structured physical activity led to an average reduction of 0.67% inHbA1c and a 12 mg/dl decrease in fasting blood glucose compared to control groups. It was concluded that physiotherapist-led exercise programs significantly enhance glycemic outcomes and should be considered a

cornerstone in diabetes management.(31)

Mohd et al. 2021 investigated Malaysian physiotherapists' knowledge and attitudes toward physical activity prescription in diabetes management. Among 240 respondents, 87% recognized exercise as a core therapeutic tool, yet only 42% followed international guidelines such as the ACSM standards. Major barriers included inadequate training (38%) and lack Of multidisciplinary coordination (33%). It was concluded that structured education and standardized referral systems are essential to bridge the knowledge–practice gap. (32)

Alotaibi et al. (2022) assessed Saudi physiotherapists' knowledge, attitudes, and practices regarding diabetes prevention and management. A cross-sectional survey of 278 physiotherapists showed that 88% agreed diabetes management was part of their professional role, but only 35% routinely engaged in patient counselling. While 91% identified hypoglycemia symptoms, only 29% knew recommended physical activity levels, and 21% were familiar with national guidelines. It was concluded that physiotherapists in Saudi Arabia hold positive attitudes but display knowledge and practice gaps, emphasizing the need for targeted education.(33)

Farias et al. (2022) examined the impact of exercise-based rehabilitation led by physiotherapists on functional capacity among Brazilian patients with diabetic neuropathy. A controlled intervention involving 120 participants showed that supervised balance and resistance training reduced fall risk by 26% and improved walking speed by 18% compared to usual care. It was concluded that physiotherapists play a critical role in mitigating neuropathic complications through tailored exercise therapy. (34)

Khalid et al. (2023) evaluated Pakistani physiotherapists' awareness and engagement in diabetes care across tertiary hospitals. A cross-sectional study of 210 practitioners revealed that 79% supported integrating diabetes education into physiotherapy curricula, but only 31% routinely counselled patients on physical activity. The study concluded that curriculum development and national clinical guidelines are urgently needed to strengthen physiotherapists' participation in diabetes management. (35)

Alhowimel et al. (2023) examined the knowledge, attitudes, and practices of physiotherapists in Saudi Arabia regarding physical activity prescription for patients with diabetes. A cross-sectional survey of 312 physiotherapists across hospitals and private clinics showed that 86% acknowledged exercise as a cornerstone of diabetes management, yet only 39% routinely prescribed individualized exercise programs. Knowledge gaps were evident, with just 28% correctly identifying international activity guidelines. Reported barriers included lack of time (41%) and insufficient training (36%). It was concluded that although physiotherapists demonstrate positive attitudes toward diabetes care, structured education and systematic training are required to close the gap between knowledge and practice.(36)

Blais et al. (2024) conducted a Delphi study in Canada to identify referral pathways and competency profiles for physiotherapists and kinesiologists in diabetes-related physical activity interventions. Consensus among 32 experts indicated that physiotherapists require advanced competencies in exercise prescription, motivational interviewing, and risk stratification to support diabetic populations. It was concluded that clearer role definitions and interprofessional frameworks can enhance the effectiveness of diabetes care models involving physiotherapists. (37)

DeFronzo et al. (2015) reviewed strategies for type 2 diabetes management and reported that structured exercise programs improved insulin sensitivity by approximately 25% and lowered HbA1c levels by nearly 1% in patients following supervised interventions. It was concluded that physiotherapists, through tailored exercise therapy, provide an effective non-pharmacological approach that complements medical treatment and reduces long-term cardiovascular risks (9).

Objective of the Study

To determine the knowledge, attitudes, and

practices of physiotherapists regarding diabetes prevention and management

Rationale of the study

Diabetes is a growing health challenge that affects patients' recovery and long-term well-being. Physical therapists frequently work with individuals who may have diabetes, yet their role in addressing diabetes-related concerns is not well explored. Limited evidence exists on how confident physical therapists feel in managing such issues as part of rehabilitation(21). This study is being conducted to assess their self-perceived confidence, identify gaps in knowledge or training, and justify the need for strengthening their role in diabetes management within clinical practice,leading to better patient outcomes, more efficient care delivery and reduce complications(22)

Significance of the study

Diabetes is one of the leading chronic conditions and a major cause of death worldwide. It significantly affects an individual's quality of life, functional capacity, and ability to engage in daily activities. Physiotherapists play an important role in assessing and managing functional impairments such as balance and gait disturbances, and in addressing complications like neuropathy. They prescribe and monitor exercise programs as a non-pharmacological approach and support behavioral changes that encourage long-term self-management. Regular physical activity not only enhances glycemic control but also improves muscle strength, body composition, and overall quality of life (19). By applying physiotherapy knowledge and translating evidence into clinical practice, physiotherapists can help create more effective, patient-centered models of diabetes care in primary healthcare settings . Such approaches can promote better resource utilization and ultimately lead to improved health outcomes for individuals living with diabetes(20)

1. MATERIAL AND METHODS

1.1 Study design:

This research was conducted as a cross-sectional study with an aim to determining the knowledge, attitudes, and practices of physical therapists regarding diabetes management and prevention.

1.2 Study setting

Participants were recruited from different hospitals and clinics of Hyderabad.

1.3 Duration of study

The study was carried out over a period of six months following the approval of the research synopsis.

1.4 Sampling Technique:

Participants were selected using a purposive sampling technique.

1.5 Sampling Selection:

1.5.1 Inclusion: Physiotherapist currently working in clinical settings with at least 6 months of experience, including both male and female participants.

1.5.2 Exclusion: Physiotherapists who are unwilling to participate and undergraduate physiotherapy technicians are excluded from the study.

1.6 Sample Size:

Sample size of 134 participants was selected by keeping the confidence interval of 95% and margin of error of 3%.

1.7 Data Collection Method:

The data was collected by distributing questionnaires among clinical physical therapists.

1.8 Data Collection Tool:

A standardized questionnaire was used, adapted from existing research on "Physiotherapists' knowledge, attitudes, and practices related to diabetes management by Doehring et al. in 2016. It was consist primarily of closed-ended and multiple-choice questions , with Likert Scale items ranging from 1 (strongly agree) to 5 (strongly disagree) covering all study domains.

1.9 Data Analysis Procedure:
Statistical analysis was performed using SPSS version 22. Descriptive statistics were applied to summarize the findings. The demographic profile and study variables were analyzed and reported using frequencies and percentages. This approach allowed for a comprehensive understanding of participants' characteristics and the overall distribution of responses.

1.10 Budget:
The estimated budget for the study was approximately 60,000 to 65,000.

1.11 Ethical Considerations:
Questionnaire's were distributed after the review of department ethical committee of Isra Institute Of Rehabilitation Sciences, Isra University, Hyderabad. Consent form was attached with the questionnaire and the privacy of participants was maintained. Data was only used for research purpose and remained confident

RESULT
Descriptive statistics were used to summarize participants' demographic and professional characteristics, including age, gender, workplace setting, education, years of experience, and clinical exposure to patients with diabetes also the data for attitudes and beliefs, Current practice and knowledge were summarized by descriptive statistics too.
For the question of age, the total number of participants included in this research study were134 physiotherapists. According to their age distribution, 5 participants were 23 years old (3.1%), 27 participants were 24 years old (16.8%), 7 participants were 25 years old (4.3%), 5 participants were 26 years old (3.1%), and 8 participants were 27 years old (5.0%). Furthermore, 7 participants were 28 years old (4.3%), 11 were 29 years old (6.8%), and 14 were 30 years old (8.7%).In addition, 5 participants were 31 years old (3.1%),
7 participants were 32 years old (4.3%), while 5 participants each were aged 33, 34, and 36 years (3.1%). Smaller groups included 1 participant each aged 35, 37, 42, and 44 years (0.6%), 2 participants each aged 39, 40, and 48 years (1.2%), and 3 participants each aged 45 and 46 years (1.9%). The mean was 30.37 while the standard deviation was 6.331 as shown in Table IV-1 and Figure IV-1.
Out of 134 respondents, 71 (53.0%) were maleand63 (47.0%) were female, showing a nearly equal gender distribution as shown in t=Table IV-2 and Figure IV-2.
In terms of professional experience, 53 (39.6%)had3–5 years of experience, followed by36 (26.9%)with1–3 years, and27 (20.1%) with over 5 years of practice. Only 18 (13.4%) had less than one year of experience as shown in Table IV-3 and FigureIV-3.
Regarding education, the majority held a Doctorof Physical Therapy (DPT) degree (n=55, 41.0%), followed by Master's degree (n=43, 32.1%), MPhil (n=30, 22.4%), and Post-graduation diploma (n=6, 4.5%). This distribution suggests a highly qualified respondent pool , as shown in TableIV-3 and Figure IV-3.
Nearly half of the participants were employed in private clinics (n=66, 49.3%), followed by private hospitals (n=32, 23.9%), government hospitals (n=28, 20.9%), and other settings (n=8, 6.0%). These results indicate that physiotherapy services related to diabetes care are most commonly provided in private sector facilities as shown in TableIV-5 and Figure IV-5.
In Table IV-7 and Figure IV-7 A majority of the respondents (n=71, 53.0%) worked in musculoskeletal physiotherapy, followed by neurological (n=19, 14.2%),general (n=28, 20.9%), and geriatric or pediatric practice (n=6 each, 4.5%). Only 3 (2.2%) practiced in cardiopulmonary and 1 (0.7%)inother areas. These results show that most physiotherapists treating diabetic patients are from musculoskeletal and general practice settings. A large proportion, 105 (78.4%), reported having experience with patients exhibiting critically high or low blood sugar levels, whereas 29 (21.6%) had not. This highlights that the majority of physiotherapists encounter and

manage patients with diabetes-relate d complications during clinical care.

Most physiotherapists reported spending 51–70% (n=52, 38.8%) of their work week providing direct patient care, followed by 26–50% (n=48, 35.8%).

Regarding exposure to diabetic patients, 44.0% (n=59) treated diabetic patients 26–50% of the time, while 32.8% (n=44)had0–25% diabetic patients in their caseload. Only 1.5% (n=2) reported treating diabetic patients more than 70% of their work week as shown in Table IV-8 and Figure IV-8

A large proportion, 105 (78.4%),reported have experience with patients exhibiting critically high or low blood sugar levels, whereas 29 (21.6%) had not. This highlights show that the majority of physiotherapist encounter and manage patients with diabetes-related complications during clinical care , as shown in Table IV-10 and Figure-IV-10''

In table IV-11 and Figure IV-11: Out of 134 physiotherapists, 27 (20.1%) strongly agreed and 81 (60.4%) agreed that diabetes prevention and management fall within the scope of physiotherapy practice. Meanwhile, 18 (13.4%) remained neutral, 6 (4.5%) disagreed, and only 2 (1.5%) strongly disagreed. Overall, 108 participants (80.5%) agreed or strongly agreed, demonstrating broad consensus that diabetes-related care aligns with physiotherapy's professional role.

In Table IV-12 and Figure IV-12 Among participants, 28 (20.9%) strongly agreed and 86 (64.2%) agreed that their physiotherapy education adequately prepared them to assess and treat individuals with diabetes. Additionally, 18 (13.4%) were neutral and 2 (1.5%) strongly disagreed. A combined 114 respondents (85.1%) expressed agreement, reflecting strong confidence in their academic preparation for diabetes management within physiotherapy.

In Table IV-13 and Figure IV-13 A large majority of physiotherapists recognized that diabetes influences physical therapy outcomes, with 33 (24.6%) strongly agreeing and 90 (67.2%) agreeing with the statement. Only 7 (5.2%) were neutral, 3 (2.2%) disagreed, and 1 (0.7%) strongly disagreed. In total, 123 respondents (91.8%) agreed or strongly agreed, indicating high awareness of diabetes' clinical impact on physiotherapy interventions.

In Table IV-14 and Figure IV-14 when asked about their responsibility to offer resources for diabetes management, 44 (32.8%) strongly agreed, 55 (41.0%) agreed, and 30 (22.4%) were neutral. Only 5 (3.7%) disagreed. Altogether, 99 respondents (73.9%) expressed agreement, reflecting that most physiotherapists recognize an active role in patient education and support regarding diabetes management.

In Table IV-15 and Figure IV-15 A s
respondents (93.2%) endorsed the statement, suggesting a high level of professional accountability and collaborative attitude. In Table IV-16 and Figure IV-16 Regarding entry-level preparation, 21 (15.7%) strongly agreed and 77 (57.5%) agreed that their training equipped them to manage diabetic patients effectively. Meanwhile, 32 (23.9%) were neutral, 3 (2.2%) disagreed, and 1 (0.7%) strongly disagreed. Together, 98 respondents (73.1%) expressed agreement, suggesting most participants felt
well-prepared by their undergraduate education.

In Table IV-17 and Figure IV-17 A total of 41 (30.6%) strongly agreed and 51 (38.1%) agreed that physiotherapists need specialized diabetes education or certification. Meanwhile, 27 (20.1%) were neutral, 14 (10.4%) disagreed, and 1 (0.7%) strongly disagreed. Overall, 68.7% supported the idea,
showing openness to further professional development in diabetes-specific care.

In Table IV-18 and Figure IV-18 In this item, 24 (17.9%) strongly agreed and 95 (70.9%) agreed that patients with or at risk of diabetes are receptive to lifestyle counselling from physiotherapists. Ten (7.5%) were neutral, 3 (2.2%) disagreed, and 2 (1.5%) strongly disagreed. A total of 119 respondents (88.8%) agreed, demonstrating strong confidence in patients' acceptance of physiotherapist-led education.

In Table IV-19 and Figure IV-19 Participants identified several domains where

physiotherapists play an active role. Out of all responses, 105 (34.9%) indicated exercise, 83 (27.6%) weight management, 52 (17.3%) diet and
nutrition, 19 (6.3%) blood sugar control, 11 (3.7%) stress management, and 31 (10.3%) secondary complications. Exercise and weight management were the most frequently endorsed areas, reflecting physiotherapists' primary contribution to diabetes care.

In Table IV-20 and Figure IV-20 When evaluating confidence in providing diabetes-related education, 102 (33.0%) responses were related to *exercise*, 82 (26.5%) to *weight management*, 52 (16.8%) to *diet and nutrition*, 22
(7.1%) to *blood sugar control*, 12 (3.9%) to *stress management*, and 39 (12.6%) to *secondary complications*. The highest confidence was in exercise and weight management, highlighting physiotherapists' strengths in lifestyle-based interventions.

In Table IV-21 and Figure IV-21 Most physiotherapists recognized a preventive role in diabetes care. Specifically, 48 (35.8%) selected response option 1(strongly agree), 72 (53.7%) selected 2 (Agree),13 (9.7%) selected
(Disagree), and 1 (0.7%) selected 4 (Strongly Disagree), Combined, 89.5% of participants supported physiotherapists' involvement in diabetes prevention, emphasizing their proactive approach toward public health and disease prevention.

In Table IV-22 and Figure IV-22 For the statement "I specifically screen for diabetes during initial assessment," 25.4% of physical therapists reported that they always screen for diabetes, while 49.3% do so most of the time. In contrast, 14.9% sometimes screen for diabetes, 7.5% do so infrequently, and 3.0% never screen for diabetes during the initial patient assessment. This indicates that the majority of respondents are proactive in identifying diabetes early in their clinical evaluations.

Regarding the statement "I ask diabetic patients to test blood sugar levels," 46.3% of the participants always ask patients to check their blood sugar, whereas 26.1% reported doing so most of the time. Additionally, 16.4% of respondents sometimes ask patients to test, 3.0% do so infrequently, and 8.2% never ask patients to test their blood sugar. These findings show that most therapists incorporate blood glucose monitoring as part of their practice as shown in Table IV-23 and Figure IV-23.

When asked whether they "treat patients specifically for diabetes-related complications," 37.3% of physical therapists responded "Yes," while 62.7% answered "No." This suggests that only a limited portion of respondents engage directly in treatment addressing diabetes-specific complications as shown in Table IV-24 and Figure IV-24 .

For the statement "I encourage patients to bring their glucose-monitoring equipment," 13.4% of participants always encourage patients to bring their
equipment, 22.4% do so most of the time, and 32.1% encourage sometimes. Additionally, 22.4% reported doing so infrequently, while 9.7% never encourage this practice. These findings indicate that while some therapists promote patient preparedness, others may overlook this aspect , as shown in Table IV-25 and Figure IV-25

In response to "I monitor patients for low blood sugar during treatment/exercise," 46.3% of respondents stated that they always monitor patients, 26.1% do so most of the time, 16.4% sometimes monitor, 3.0% infrequently, and 8.2% never monitor for hypoglycemia during treatment sessions. This shows that most physical therapists remain cautious about hypoglycemia risks during exercise or therapy as shown in Table IV-26 and Figure IV-26

When asked "I have an emergency plan for hypoglycemia," a large majority, 84.3%, reported having an emergency plan in place, whereas 15.7% did not. This demonstrates a strong awareness of the importance of safety measures in managing hypoglycemia. Lastly, for the statement "I offer counseling for diabetes management/prevention," 61.9% of participants said "Yes," indicating they provide such counseling, while 38.1% said "No." This

shows that most physical therapists engage in patient counseling related to diabetes management or prevention, though some still do not integrate this practice into their clinical routines, as shown in Table IV-27 and Figure IV-27

For the statement "I provide education about diabetes management even if they come for other issues," 47.0% of participants reported always offering diabetes education, while 34.3% do so most of the time. Meanwhile, 13.4% provide education sometimes, 4.5% do so infrequently, and 0.7% never offer such education. These results highlight a generally positive attitude toward patient education regarding diabetes management as shown in Table IV-28and Figure IV-28

In Table IV-29 and Figure IV-29: The majority referred diabetic patients to physicians (64.9%) and dietitians (17.9%), while only a few referred to occupational therapists (3.7%) or multidisciplinary clinics (3.0%).

Reported barriers included lack of training (47.1%),belief that diabetes care is beyond physiotherapy scope (23.5%), time constraints (15.7%), and lack of confidence (5.9%). These barriers highlight areas for professional develop.

Lastly for the statement "I offer counseling for diabetes management/prevention",61.9% of participants said ''yes'', indicating they provide such counselling In Table IV-30 and Figure IV-30 ,while 38.1%said ''No''. This shows that most physical therapists engage in patient counseling related to diabetes management or prevention, though some still do not integrate this practice into their clinical routines as shown in TableIV-30 , and Figure IV-30

In Table IV-31and Figure IV- 31: Analysis of the six knowledge questions revealed variable levels of awareness among participants. For the question regarding treatment of low blood sugar, only 47 (35.1%) answered correctly, while 87 (64.9%) provided incorrect responses. In identifying the minimum capillary blood sugar level, 55 participants (41.0%) responded correctly and 79 (59.0%) answered incorrectly.For the question on recommended weekly aerobic activity, correct and incorrect responses were equally distributed, with 67 (50.0%) each. Regarding the best type of exercise, 55 (41.0%) answered
correctly and 79 (59.0%) incorrectly.

In terms of awareness of clinical guidelines, 72 (53.7%) answered correctly while 62 (46.3%) were incorrect. Similarly, for web-based learning awareness, 120 (53.7%) participants responded correctly and 14 (46.3%) incorrectly. Overall, correct responses ranged between 35.1% and 53.7%, suggesting moderate knowledge levels.

In Table IV-32 and Figure IV- 32 Based on total scores, out .of 134 respondents 45 respondents (33.6%) demonstrated low knowledge, while 75 (56.0%) were categorized as having moderate knowledge. Since the moderate range represents adequate comprehension, this indicates that the majority of physiotherapists possessed a moderate level of understanding of diabetes management. Overall, the results reflect a reasonable foundation of awareness among participants, although continued professional training could further strengthen their competence and confidence in this area. T

Table IV 1 AGE

	Age	Frequency	Percent	Valid Percent	Cumulative Percent
Age	23	5	3.1	3.7	3.7
Age	24	27	16.8	20.1	23.9
Age	25	7	4.3	5.2	29.1
Age	26	5	3.1	3.7	32.8
Age	27	8	5.0	6.0	38.8
Age	28	7	4.3	5.2	44.0
Age	29	11	6.8	8.2	52.2

Age	30	14	8.7	10.4	62.7
Age	31	5	3.1	3.7	66.4
Age	32	7	4.3	5.2	71.6
Age	33	5	3.1	3.7	75.4
Age	34	5	3.1	3.7	79.1
Age	35	1	0.6	.7	79.9
Age	36	5	3.1	3.7	83.6
Age	37	1	0.6	.7	84.3
Age	38	5	3.1	3.7	88.1
Age	39	2	1.2	1.5	89.6
Age	40	2	1.2	1.5	91.0
Age	41	2	1.2	1.5	92.5
Age	42	1	0.6	.7	93.3
Age	44	1	0.6	.7	94.0
Age	45	3	1.9	2.2	96.3
Age	46	3	1.9	2.2	98.5
Age	48	2	1.2	1.5	100.0
Total	134	83.2	100.0	100.0	

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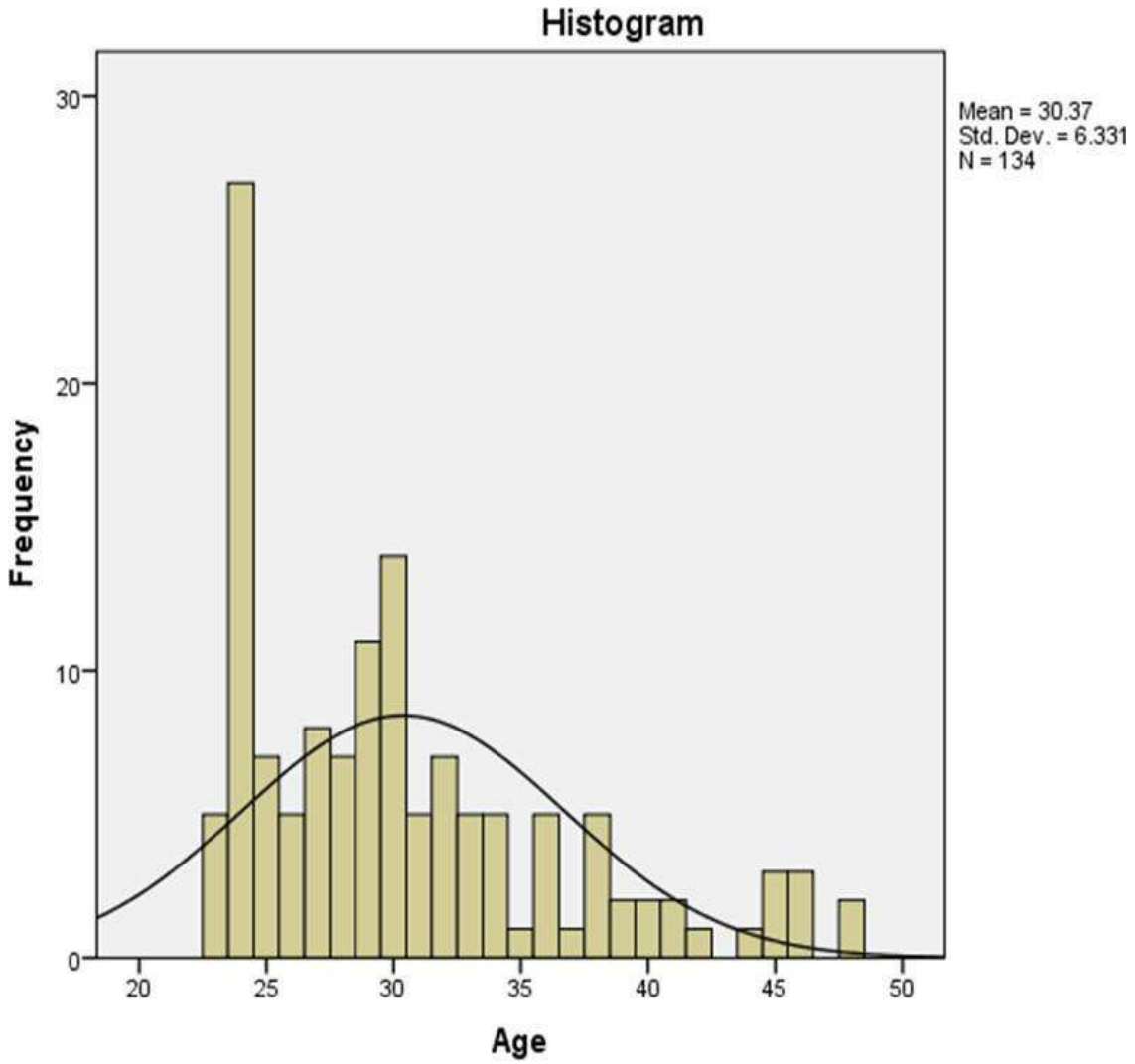


Figure IV 1 Age

Table IV 2 Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	71	53.0	53.0	53.0
	Female	63	47.0	47.0	100.0
	Total	134	100.0	100.0	

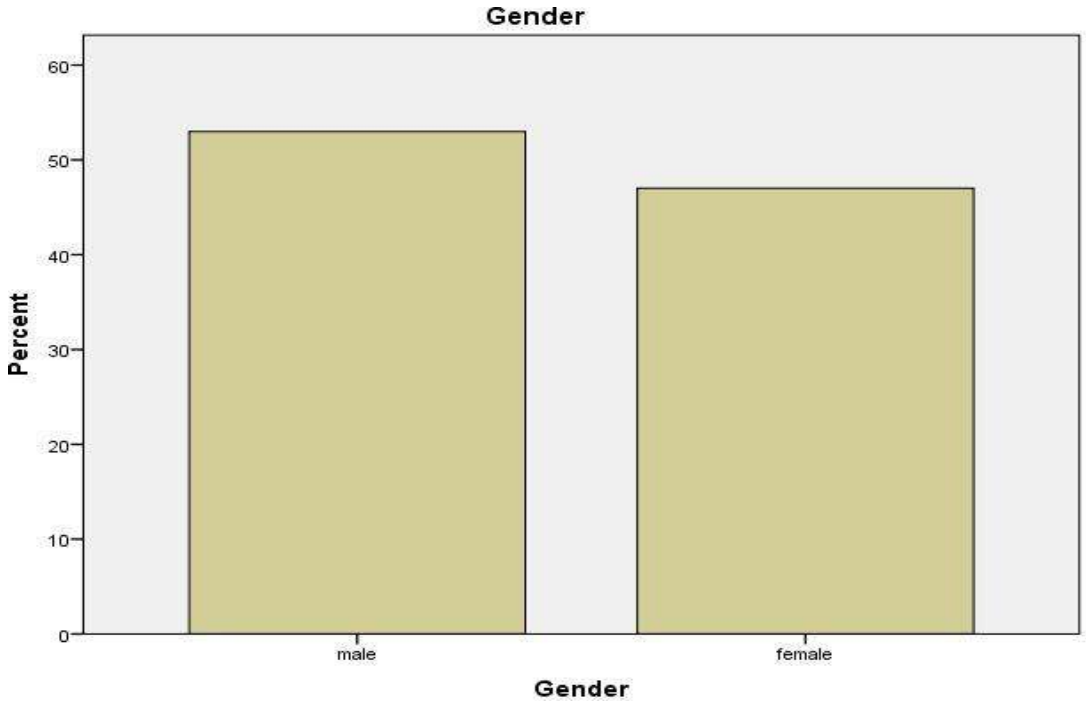


Figure IV 2Gender

Table IV 3 Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Doctor of physical therapy	55	41.0	41.0	41.0
	Masters in physical therapy	43	32.1	32.1	73.1
	Mphil in physical therapy	30	22.4	22.4	95.5
	Post graduation in physical therapy	6	4.5	4.5	100.0
	Total	134	100.0	100.0	

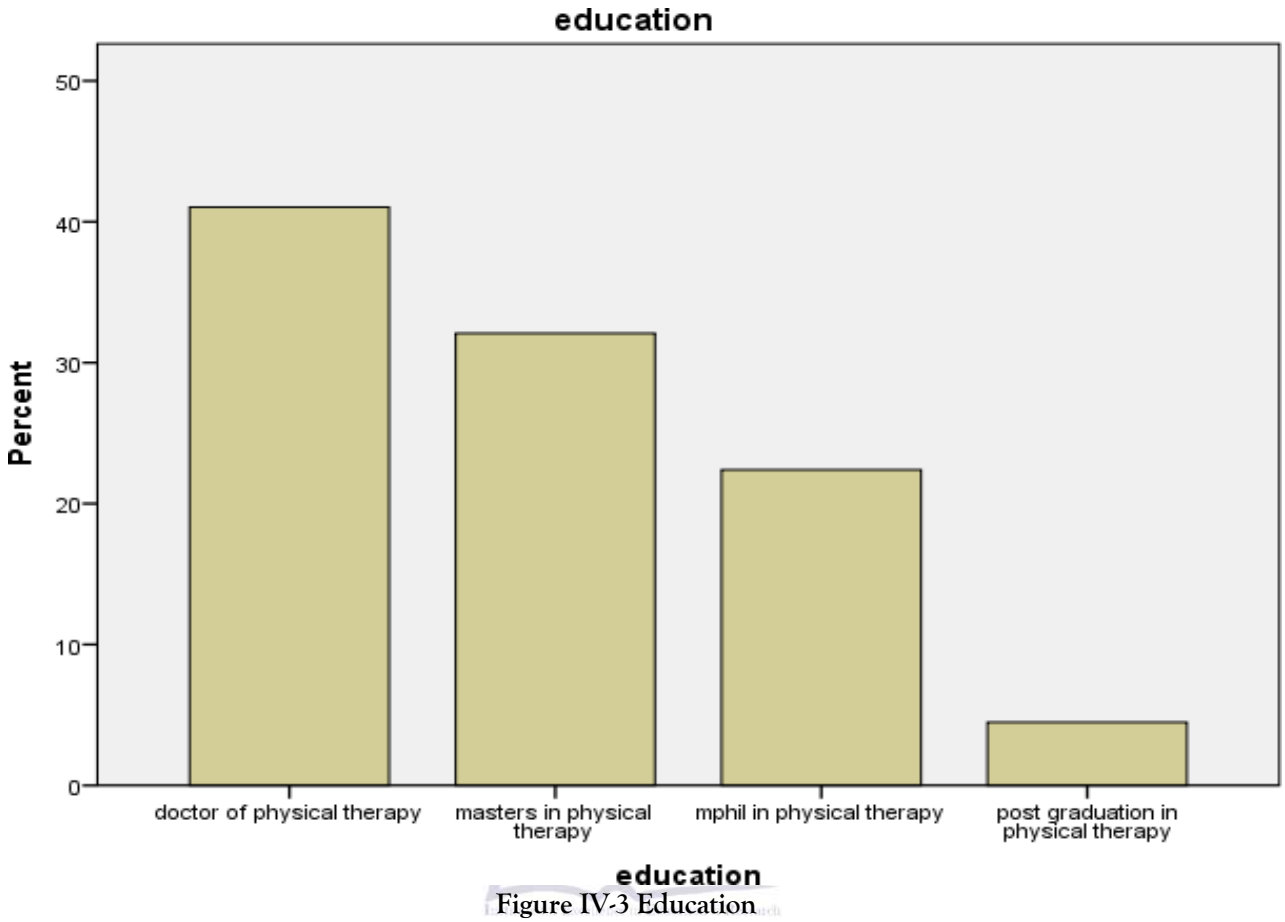


Figure IV-3 Education

Table IV 4How many years of experience do you have as a physical therapist?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than a year	18	13.4	13.4	13.4
	1-3 years	36	26.9	26.9	40.3
	3-5 years	53	39.6	39.6	79.9
	More than 5 years	27	20.1	20.1	100.0

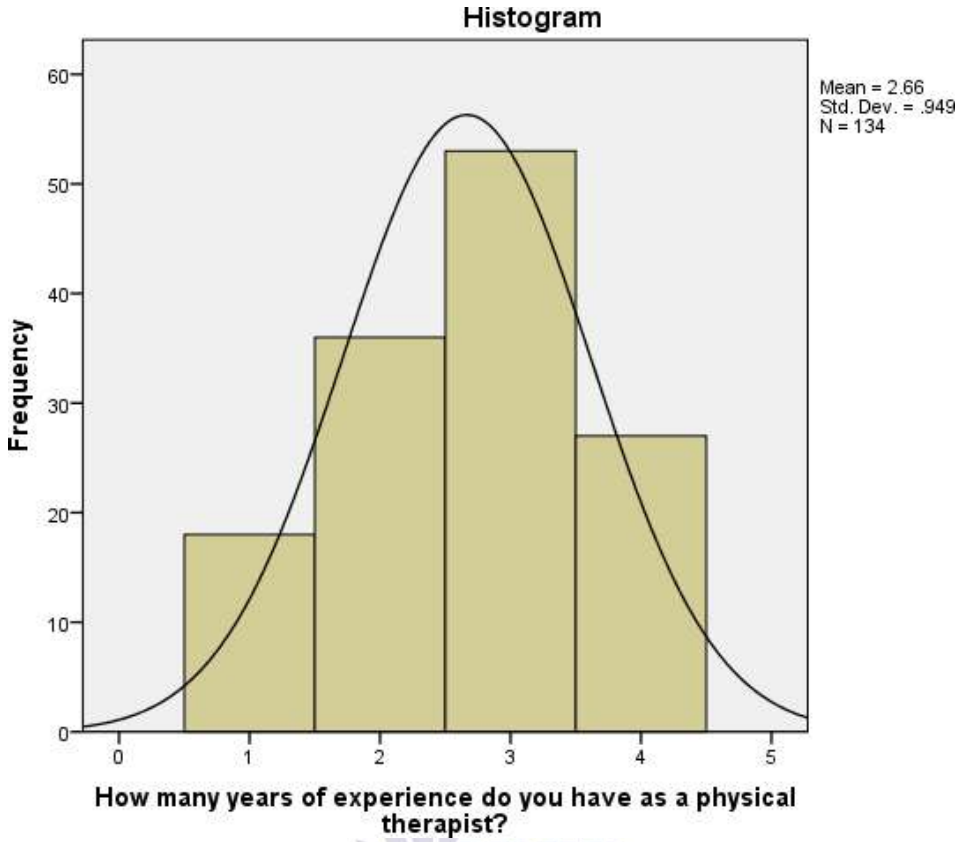


Figure IV 4How many years of experience do you have as a physical therapist?

Table IV 5 Current Workplace Setting:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Government hospital	28	20.9	20.9	20.9
	Private hospital	32	23.9	23.9	44.8
	Private clinics	66	49.3	49.3	94.0
	others	8	6.0	6.0	100.0
	Total	134	100.0	100.0	

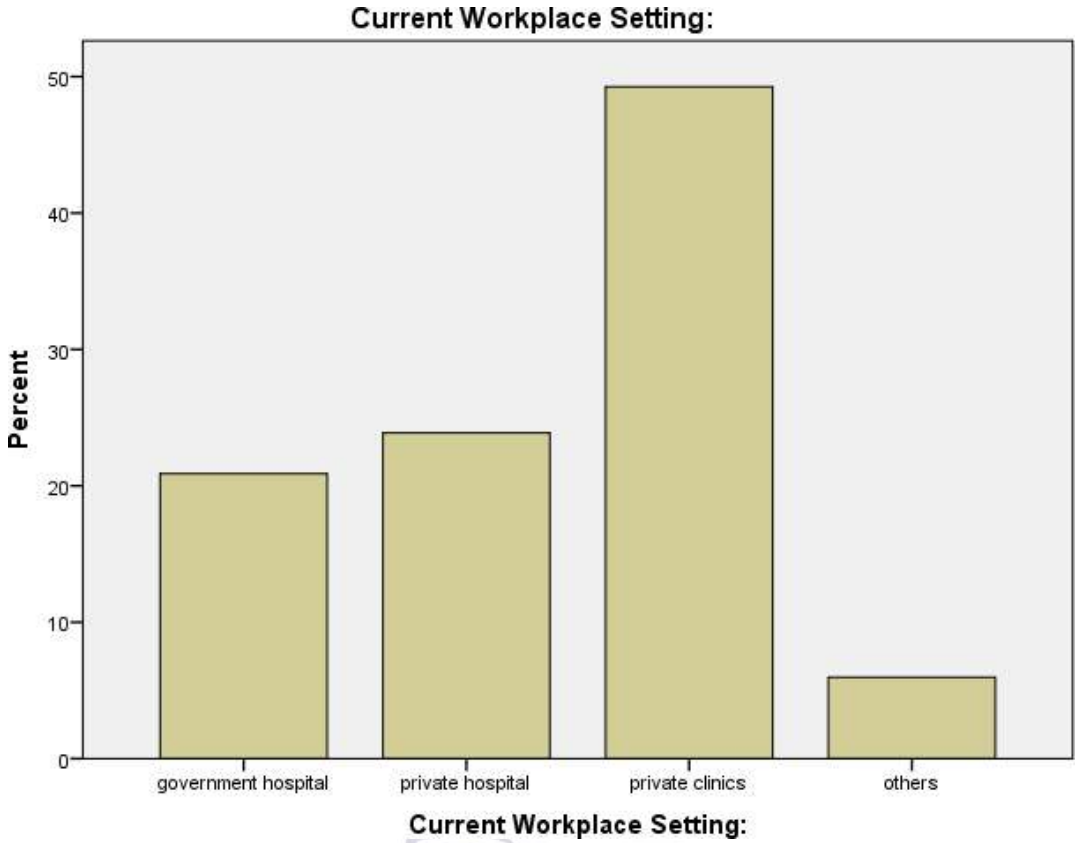


Figure IV 5 Current Workplace Setting

Table IV 6Have you completed any special certification, Education or training in diabetes management?

		Frequency	Percent	Valid Percent	mulative Percent
Valid	yes	57	42.5	42.5	42.5
	no	77	57.5	57.5	100.0
	Total	134	100.0	100.0	

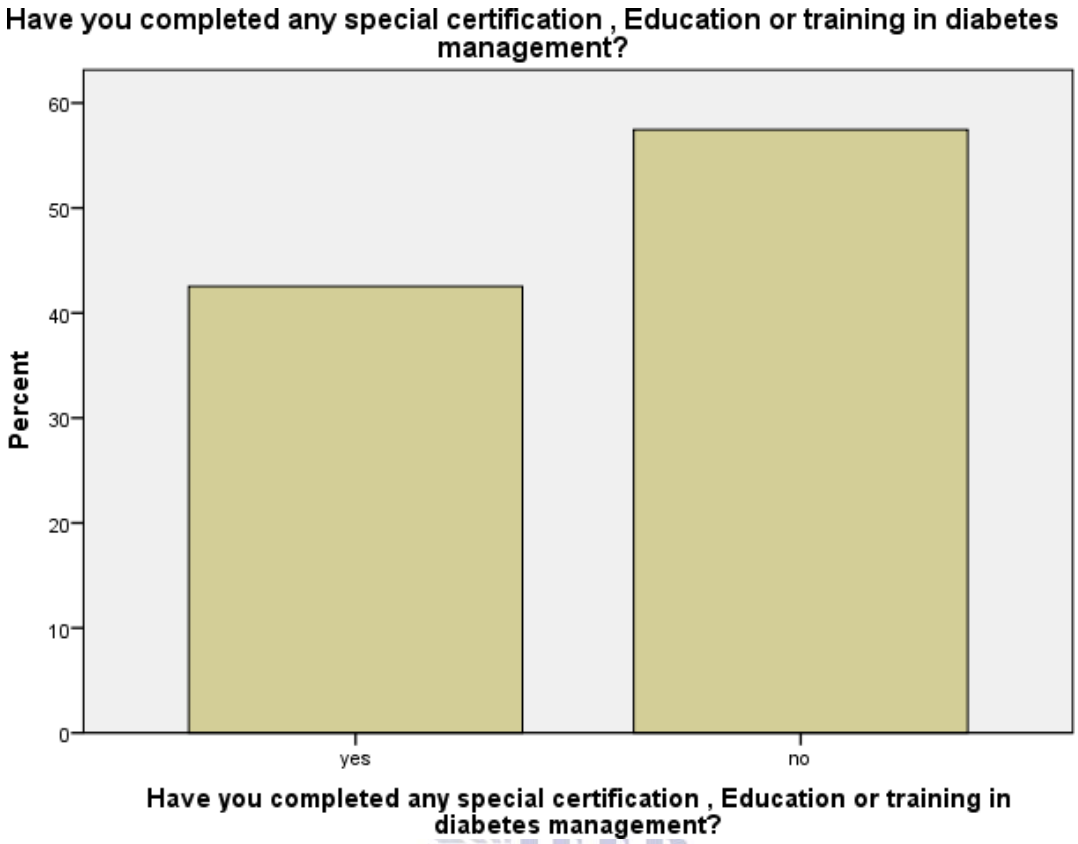


Figure IV 6 Have you completed any special certification , Education or training in diabetes management?

Table IV 7Primary patient population

Category	Frequency (n)	Percent (%)
Musculoskeletal	71	53.0
Neurological	19	14.2
Cardiopulmonary	3	2.2
Pediatrics	6	4.5
Geriatrics	6	4.5
General	28	20.9
Other	1	0.7
Experienced Critically High/Low Sugar: Yes	105	78.4
Experienced Critically High/Low Sugar: No	29	21.6

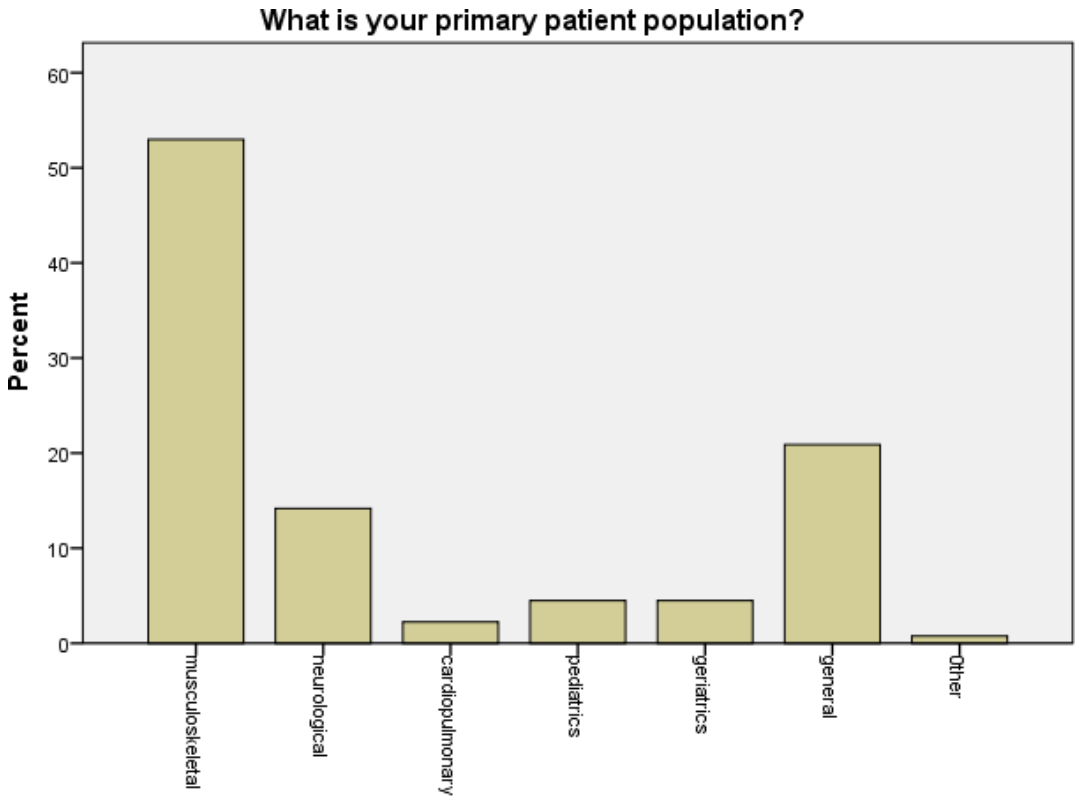


Figure IV 7 Primary patient population

Table IV 8How much of your work week do you spend in direct patient care?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-25%	19	14.2	14.2	14.2
	26-50%	48	35.8	35.8	50.0
	51-70%	52	38.8	38.8	88.8
	71-100%	15	11.2	11.2	100.0
	Total	134	100.0	100.0	

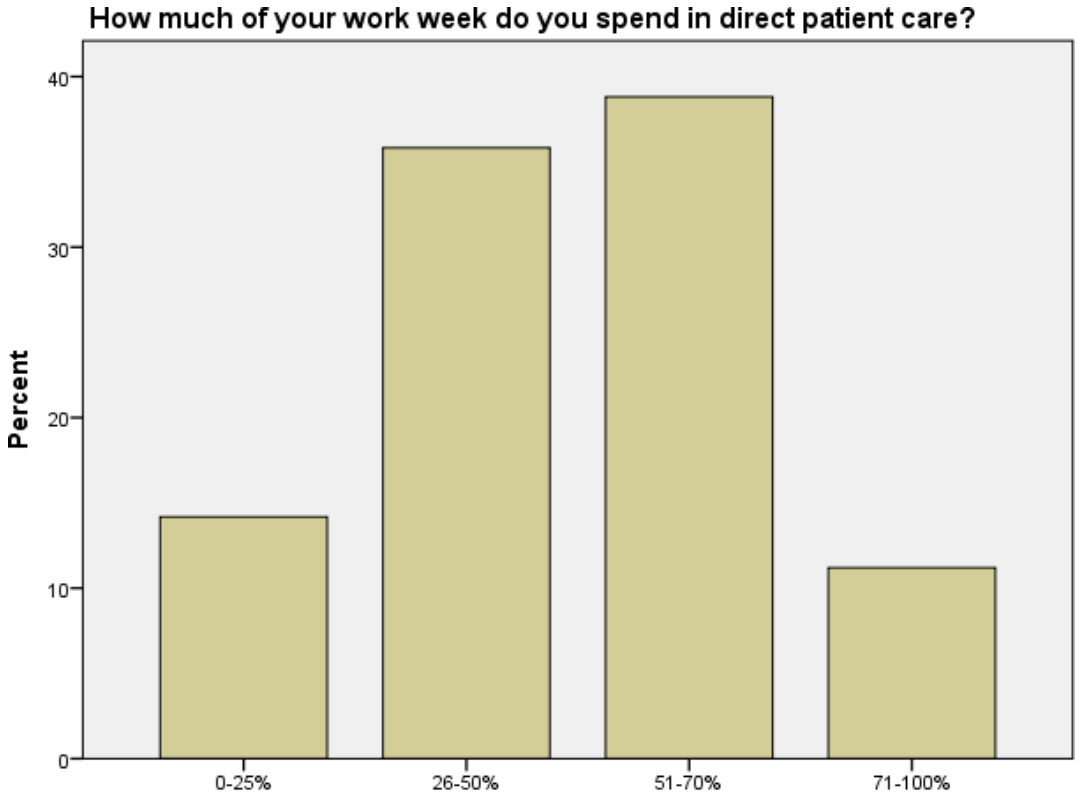


Figure IV 8How much of your work week do you spend in direct patient care?

Table IV 9How Many of your patient have diabetes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-25%	44	32.8	32.8	32.8
	26-50%	59	44.0	44.0	76.9
	51-70%	29	21.6	21.6	98.5
	71-100%	2	1.5	1.5	100.0
	Total	134	100.0	100.0	

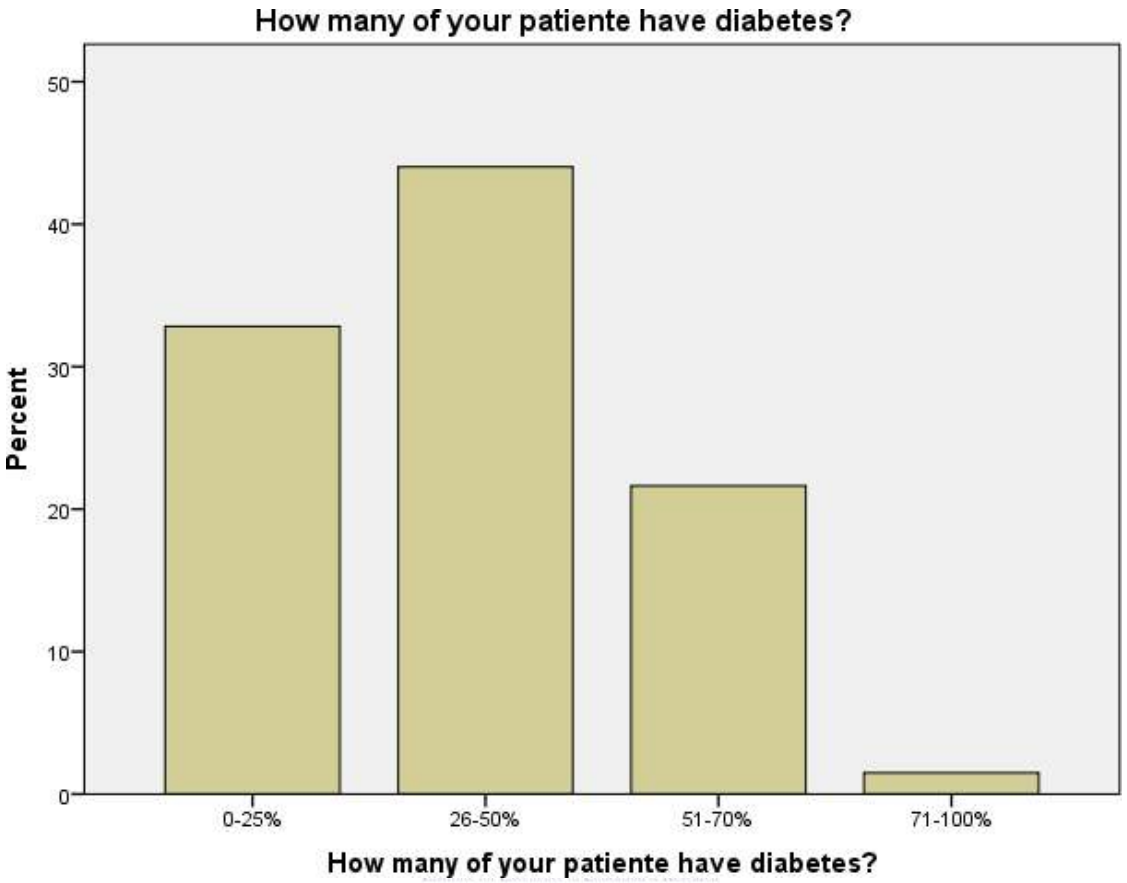


Figure IV 9 How Many of your patient have diabetes

Table IV 10Have you ever experienced a situation where a patient had critically low/high blood sugar levels in a clinical setting?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	105	78.4	78.4	78.4
	no	29	21.6	21.6	100.0
	Total	134	100.0	100.0	

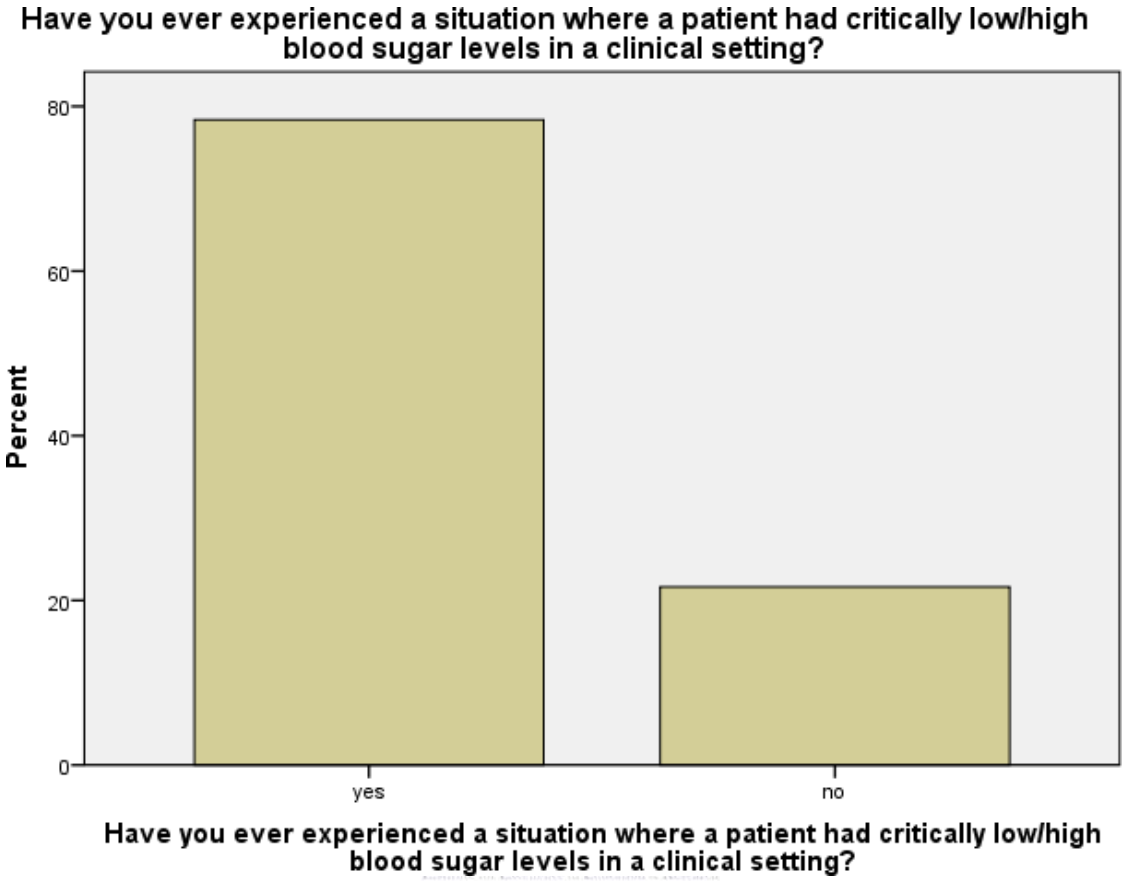


Figure IV 10 Have you ever experienced a situation where a patient had critically low/high blood sugar levels in a clinical setting?

Table IV 11 Diabetes prevention and management fall within the scope of physiotherapy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	27	20.1	20.1	20.1
	Agree	81	60.4	60.4	80.6
	Neutral	18	13.4	13.4	94.0
	Disagree	6	4.5	4.5	98.5
	Strongly disagree	2	1.5	1.5	100.0
	Total	134	100.0	100.0	

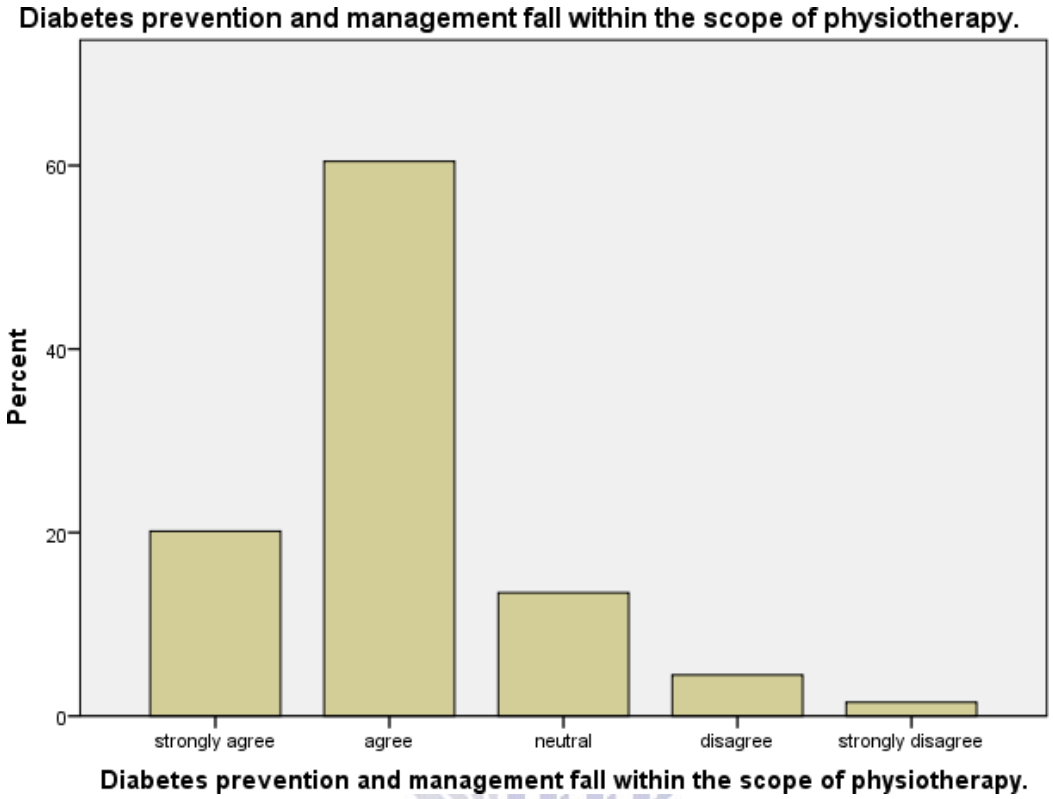


Figure IV 11Diabetes prevention and management fall within the scope of physiotherapy

Table IV 12 My physiotherapy education adequately prepared me to assess and treat persons with diabetes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	28	20.9	20.9	20.9
	Agree	86	64.2	64.2	85.1
	Neutral	18	13.4	13.4	98.5
	Strongly disagree	2	1.5	1.5	100.0
	Total	134	100.0	100.0	

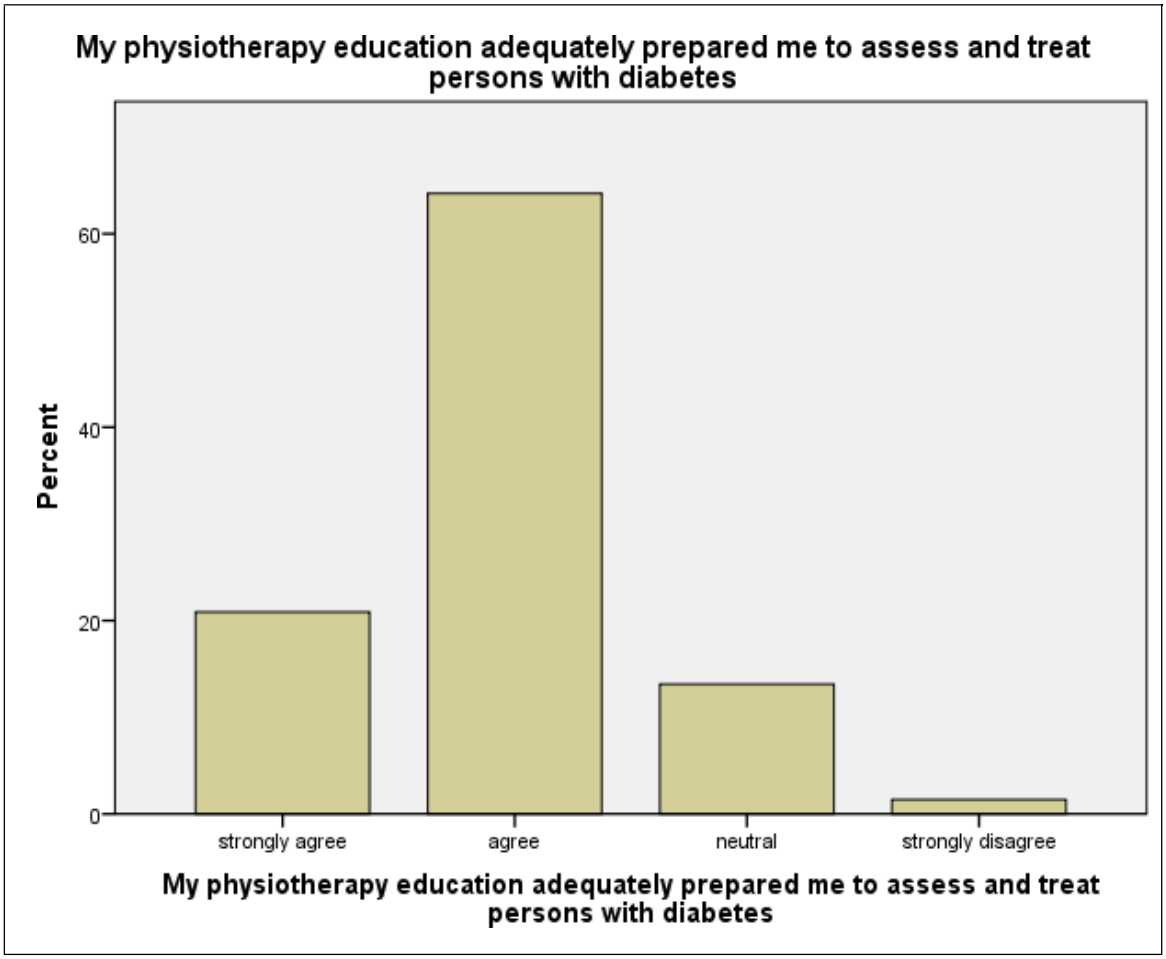


Figure IV 12 My physiotherapy education adequately prepared me to assess and treat persons with diabetes

Table IV 13 Having diabetes affects a patient's physical response to physiotherapy.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	33	24.6	24.6	24.6
	Agree	90	67.2	67.2	91.8
	Neutral	7	5.2	5.2	97.0
	Disagree	3	2.2	2.2	99.3
	Strongly disagree	1	.7	.7	100.0
	Total	134	100.0	100.0	

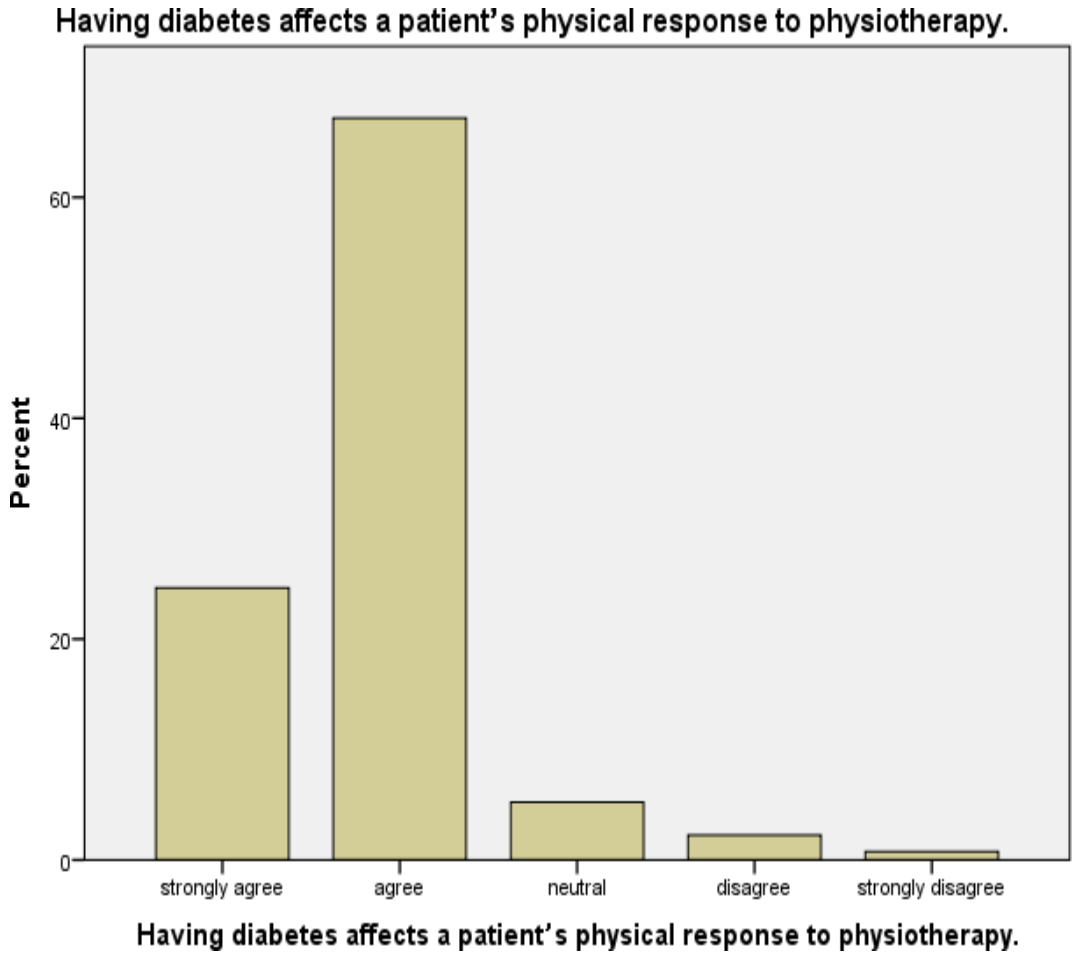


Figure IV 13Having diabetes affects a patient's physical response to physiotherapy.

Table IV 14It is my responsibility to offer resources to patients to manage their diabetes if required

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	44	32.8	32.8	32.8
	Agree	55	41.0	41.0	73.9
	Neutral	30	22.4	22.4	96.3
	Disagree	5	3.7	3.7	100.0
	Total	134	100.0	100.0	

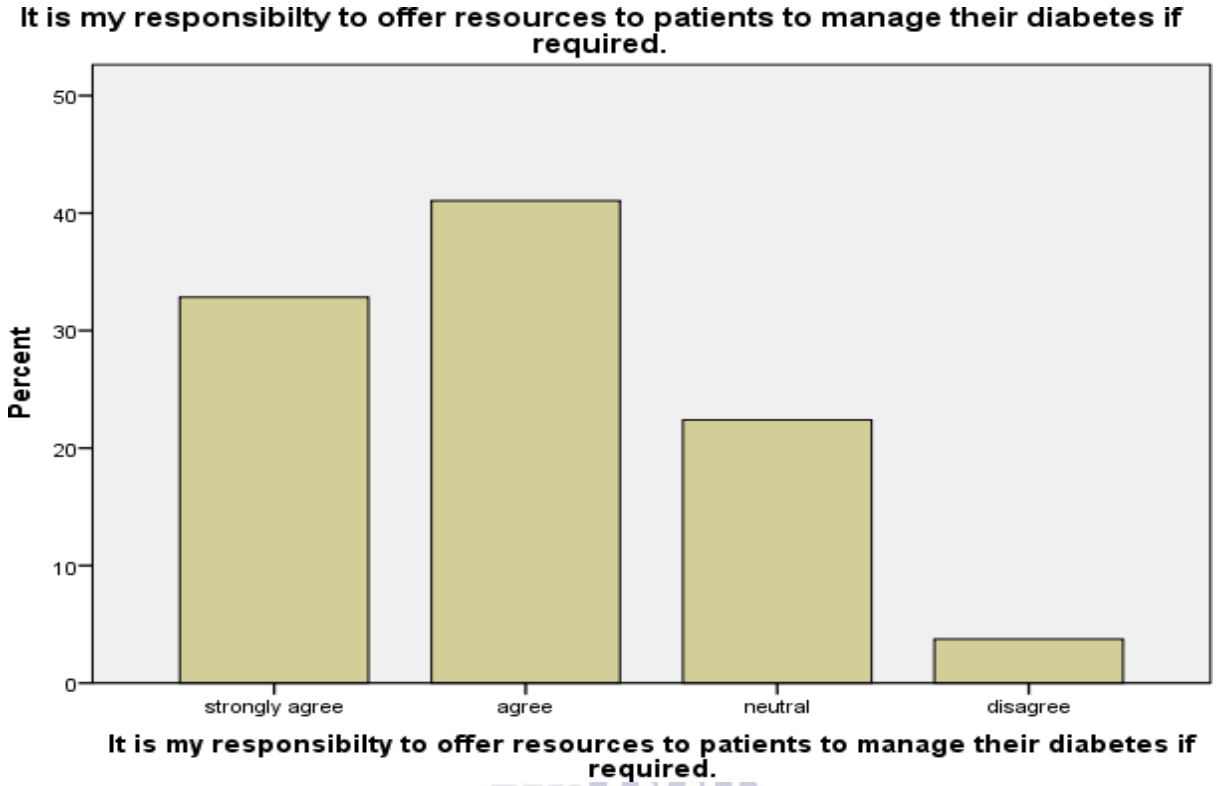


Figure IV 14It is my responsibility to offer resources to patients to manage their diabetes if required

Table IV 15It is my responsibility to refer patients with diabetes to other health care practitioners to help manage their diabetes if required.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	44	32.8	32.8	32.8
	Agree	81	60.4	60.4	93.3
	Neutral	6	4.5	4.5	97.8
	Disagree	1	.7	.7	98.5
	Strongly disagree	2	1.5	1.5	100.0
	Total	134	100.0	100.0	

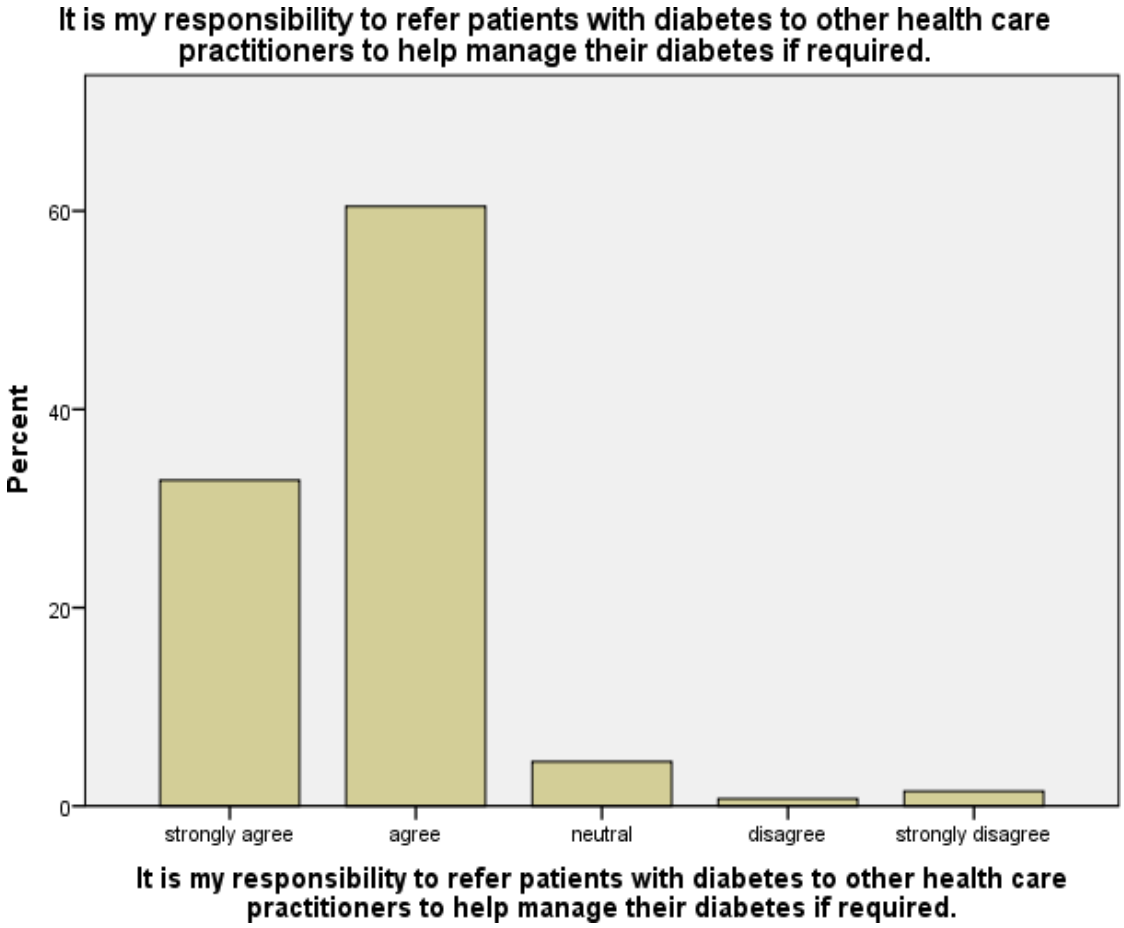


Figure IV 15It is my responsibility to refer patients with diabetes to other health care practitioners to help manage their diabetes if required.

Table IV 16My entry-level physiotherapy education adequately prepared me to effectively assess and treat persons with diabetes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	21	15.7	15.7	15.7
	Agree	77	57.5	57.5	73.1
	Neutral	32	23.9	23.9	97.0
	Disagree	3	2.2	2.2	99.3
	Strongly disagree	1	.7	.7	100.0

	Total	134	100.0	100.0	

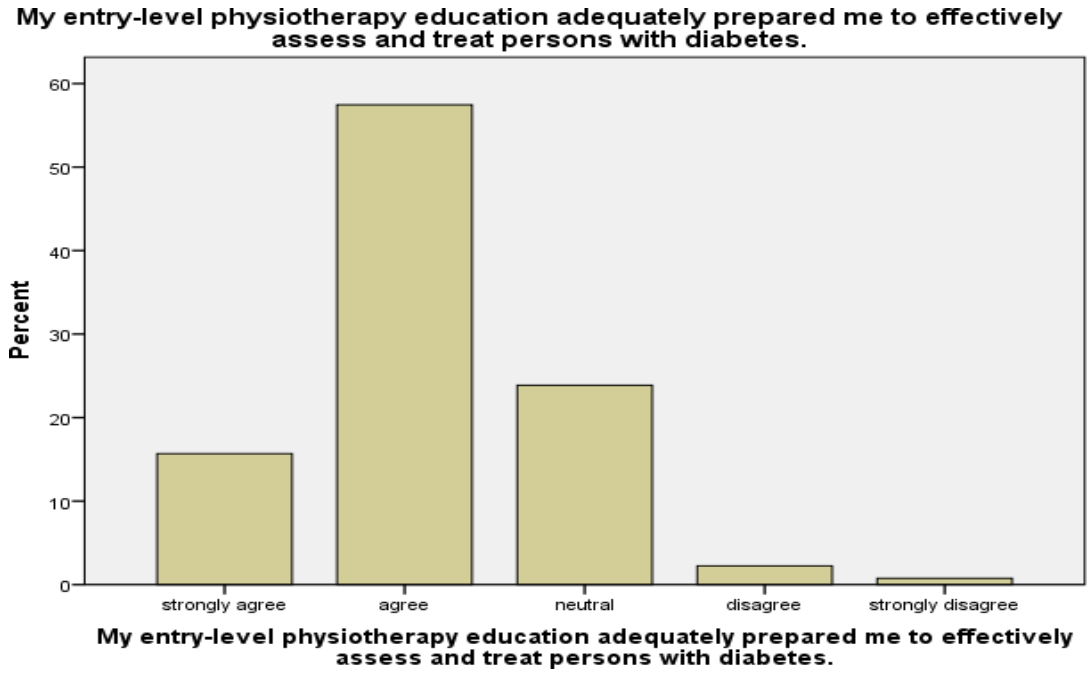


Figure IV 16My entry-level physiotherapy education adequately prepared me to effectively assess and treat persons with diabetes.

Table IV 17 In order to effectively work with a person who has diabetes, a physiotherapist requires specialized diabetes Education/Certification

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		Frequency	Percent	Valid Percent	Cumulative Percent
VALID	STRONGLY AGREE	41	30.6	30.6	30.6
	AGREE	51	38.1	38.1	68.7
	NEUTRAL	27	20.1	20.1	88.8
	DISAGREE	14	10.4	10.4	99.3
	STRONGLY DISAGREE	1	.7	.7	100.0
	TOTAL	134	100.0	100.0	

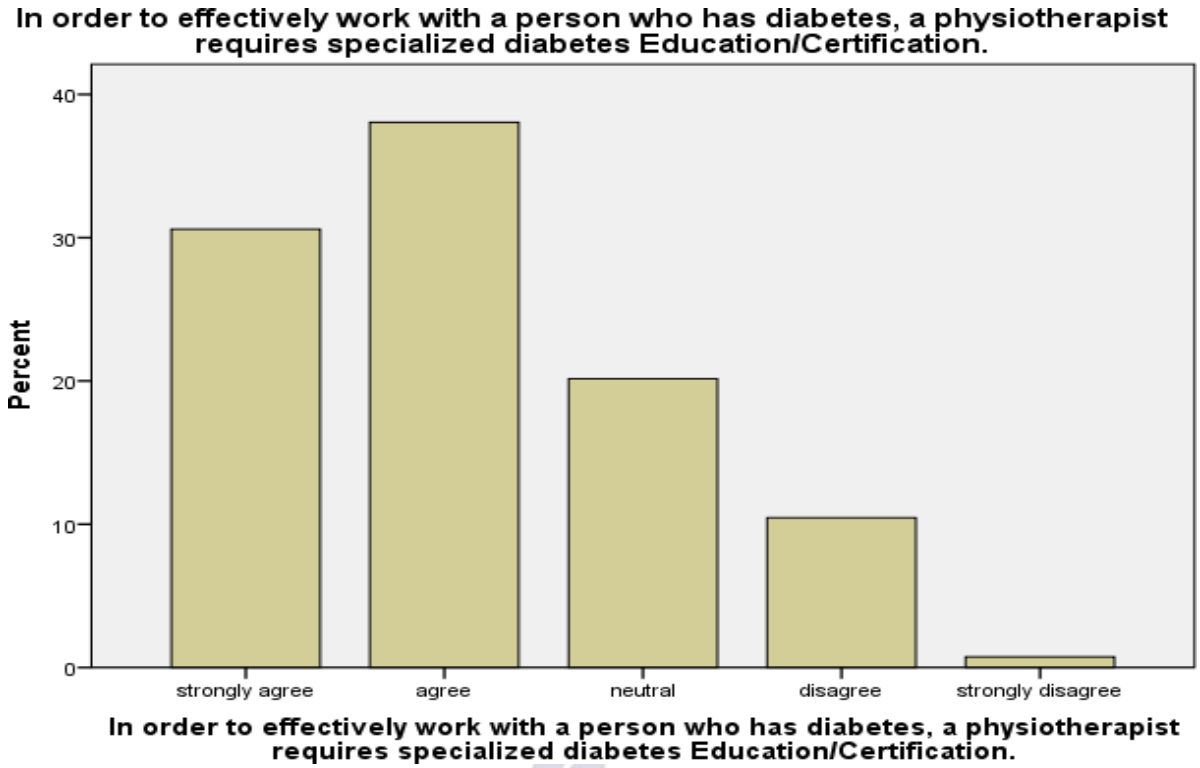


Figure IV 17In order to effectively work with a person who has diabetes, a physiotherapist requires specialized diabetes Education/Certification

Table IV 18 Pateintswith , or at a risk of developing, diabetes are receptive to counselling and/ or lifestyle education from physiotherapists.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	24	17.9	17.9	17.9
	Agree	95	70.9	70.9	88.8
	Neutral	10	7.5	7.5	96.3
	Disagree	3	2.2	2.2	98.5
	Strongly disagree	2	1.5	1.5	100.0
	Total	134	100.0	100.0	

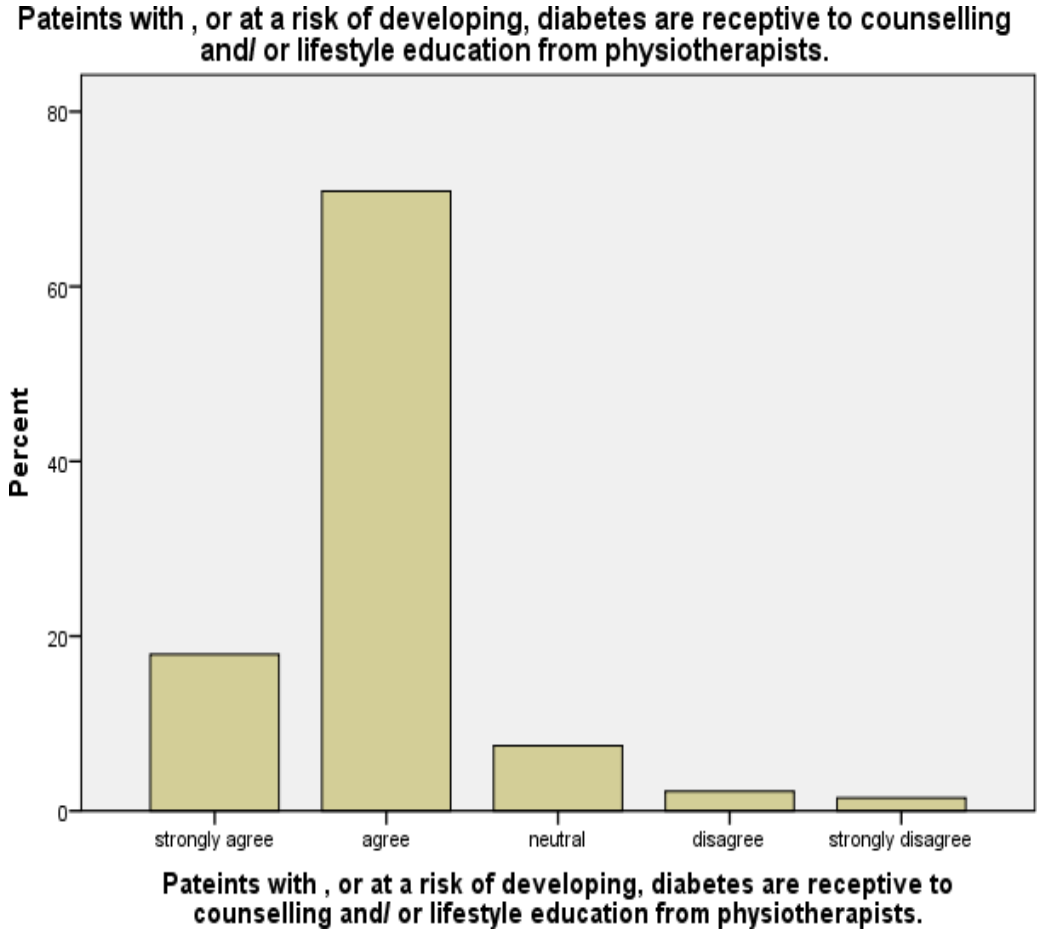


Figure IV 18Pateintswith , or at a risk of developing, diabetes are receptive to counselling and/ or lifestyle education from physiotherapists.

Table IV 19 PT have role in following areas for DM patients

	Responses		Percent of Cases
	N	Percent	
Exercise	105	34.9%	78.4%
Weight management	83	27.6%	61.9%
Diet and nutrition	52	17.3%	38.8%
Blood sugar control	19	6.3%	14.2%
Stress management	11	3.7%	8.2%
Secondary complications	31	10.3%	23.1%
Total	301	100.0%	224.6%

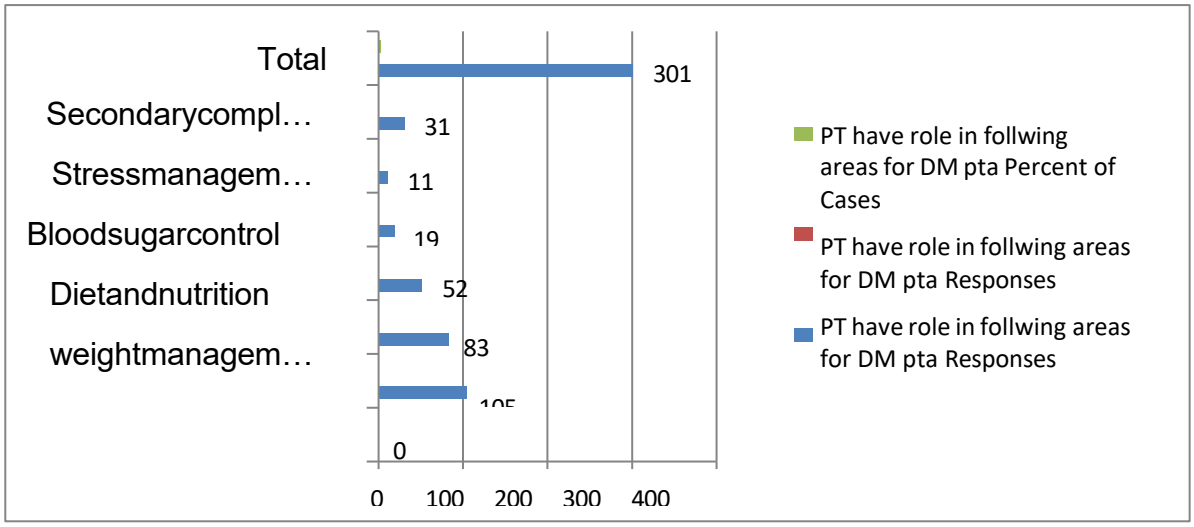


Figure IV 19PT have role in following areas for DM patients

Table IV 20 I am confident in my ability to educate people with diabetes with respect to

		Responses		Percent of Cases
		N	Percent	
Confidence in educating people with diabetes	Exercise	102	33.0%	76.1%
	Weight management	82	26.5%	61.2%
	Diet and nutrition	52	16.8%	38.8%
	Blood Sugar control	22	7.1%	16.4%
	Stress Management	12	3.9%	9.0%
	Secondary complications	39	12.6%	29.1%
Total		309	100.0%	230.6%
Table 2.9				

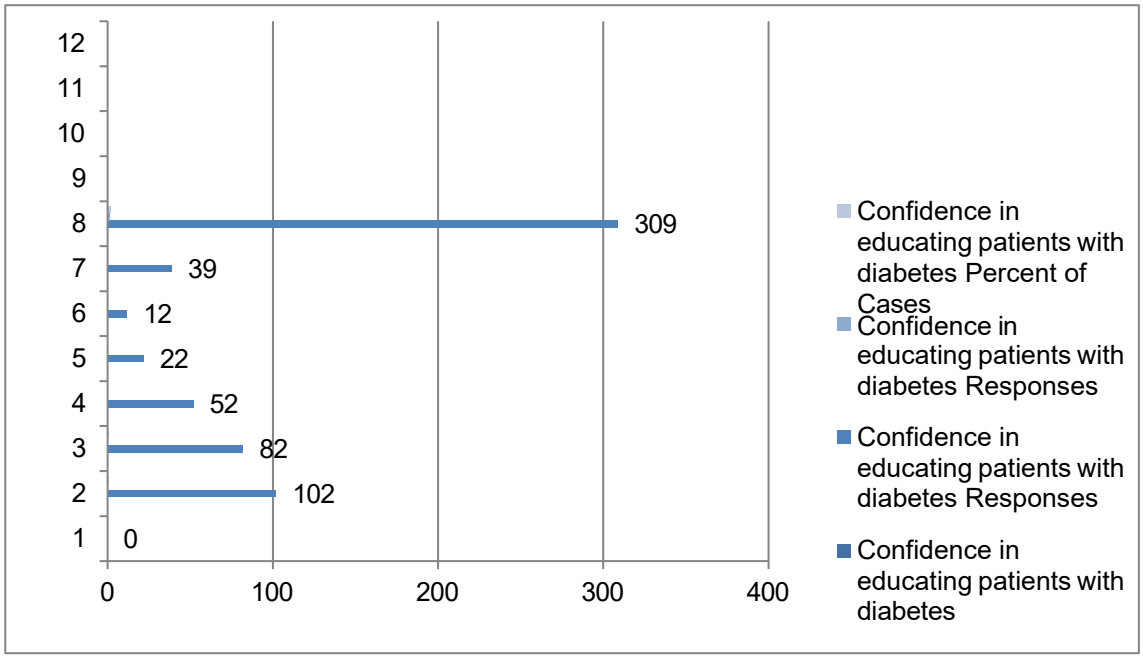


Figure IV 20I am confident in my ability to educate people with diabetes with respect to

Table IV 21 I beleive physiotherapists can play a role in prevention of diabetes

		Frequency	Percent	Valid Percent	umulative Percent
Valid	1	48	35.8	35.8	35.8
	2	72	53.7	53.7	89.6
	3	13	9.7	9.7	99.3
	4	1	.7	.7	100.0
	Total	134	100.0	100.0	

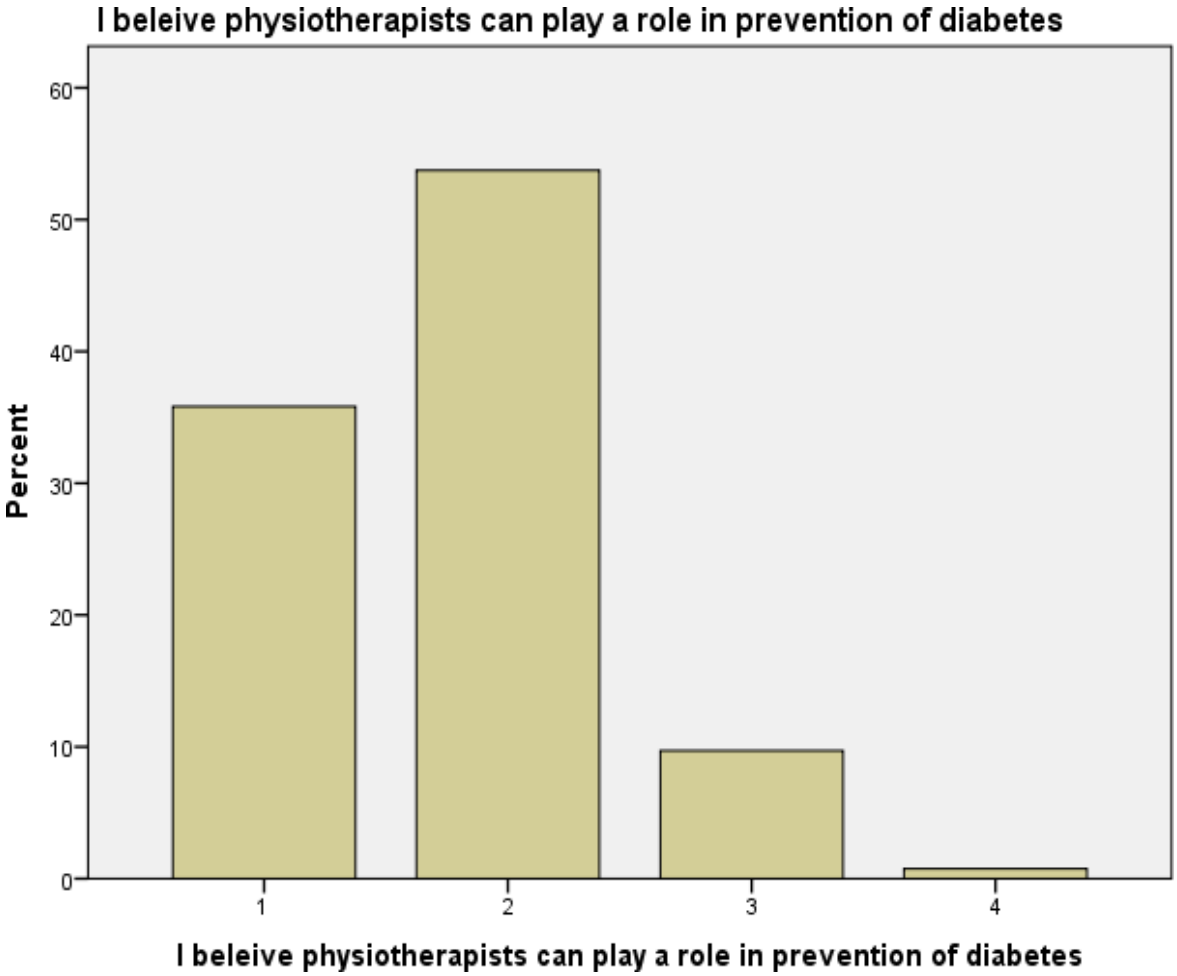


Figure IV 21I beleive physiotherapists can play a role in prevention of diabetes

Table IV 22 I specifically screen for diabetes during my initial assesments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	34	25.4	25.4	25.4
	Most of the time	66	49.3	49.3	74.6
	Sometimes	20	14.9	14.9	89.6
	Infrequently	10	7.5	7.5	97.0
	Never	4	3.0	3.0	100.0
	Total	134	100.0	100.0	

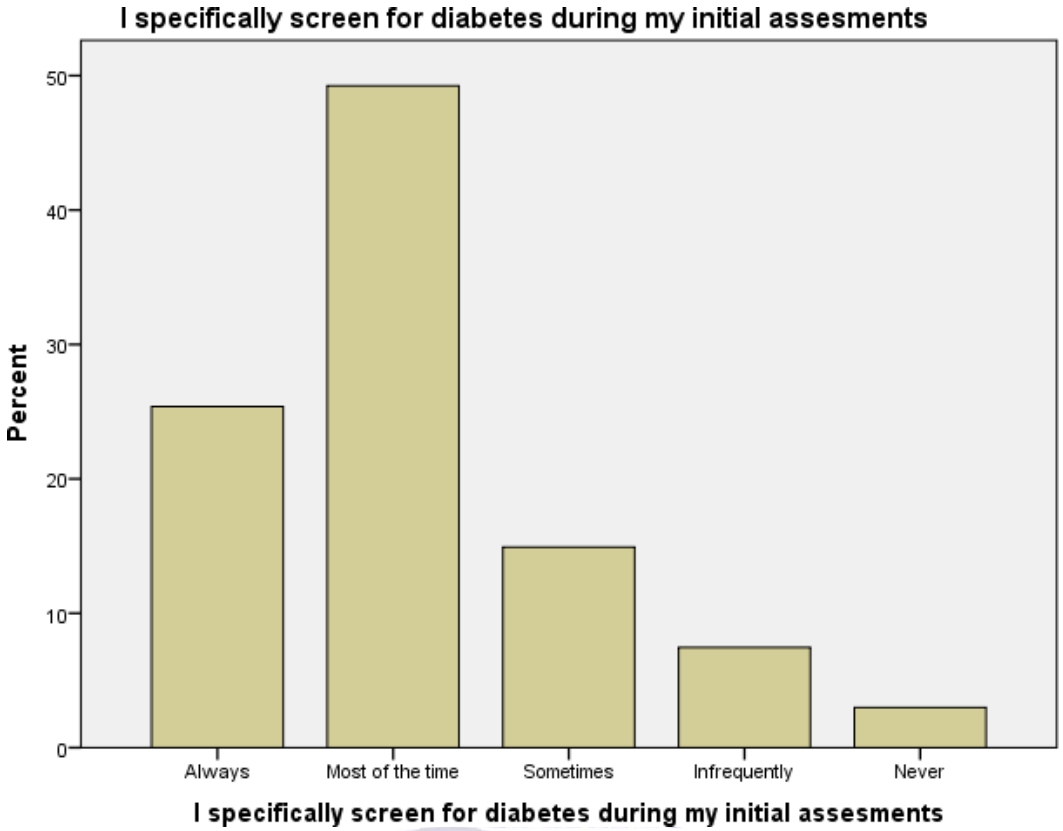


Figure IV 22I specifically screen for diabetes during my initial assesments

Table IV 23 In patients with diabetes , I specifically ask patients to test blood sugar levels

.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	52	38.8	38.8	38.8
	Most of the time	49	36.6	36.6	75.4
	Sometimes	21	15.7	15.7	91.0
	Infrequently	10	7.5	7.5	98.5
	Never	2	1.5	1.5	100.0
	Total	134	100.0	100.0	

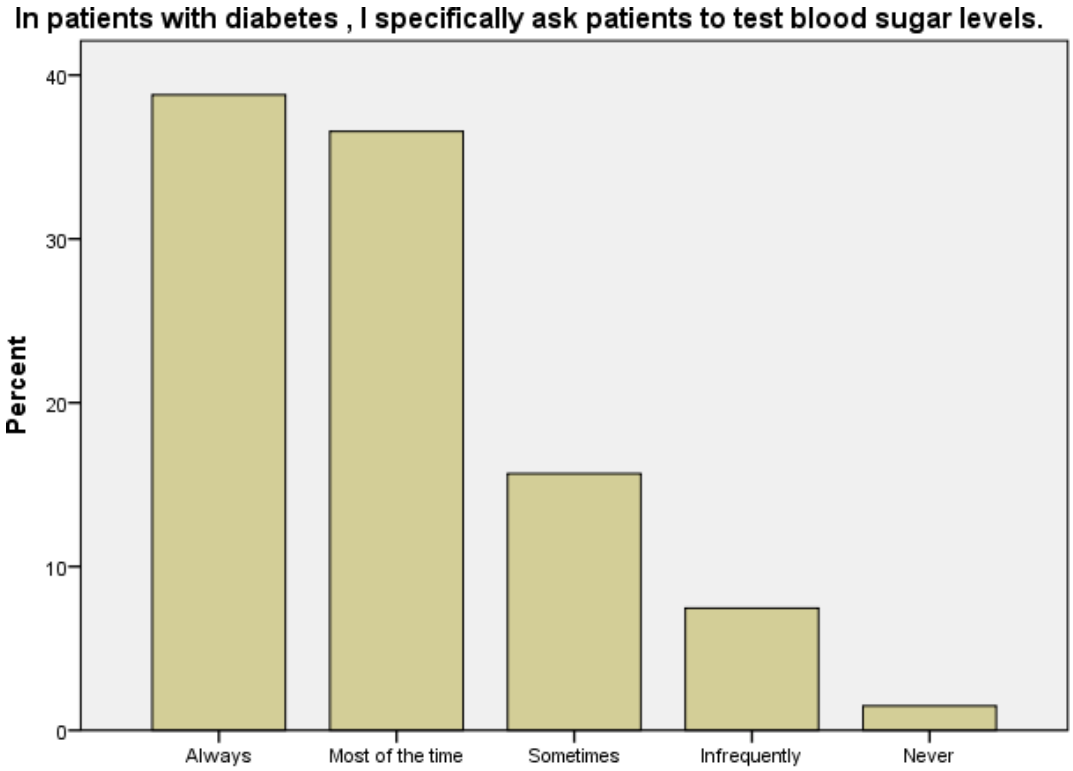


Figure IV 23In patients with diabetes , I specifically ask patients to test blood sugar levels

Table IV 24 I treat patients specifically for diabetes related complications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	37.3	37.3	37.3
	No	84	62.7	62.7	100.0
	Total	134	100.0	100.0	

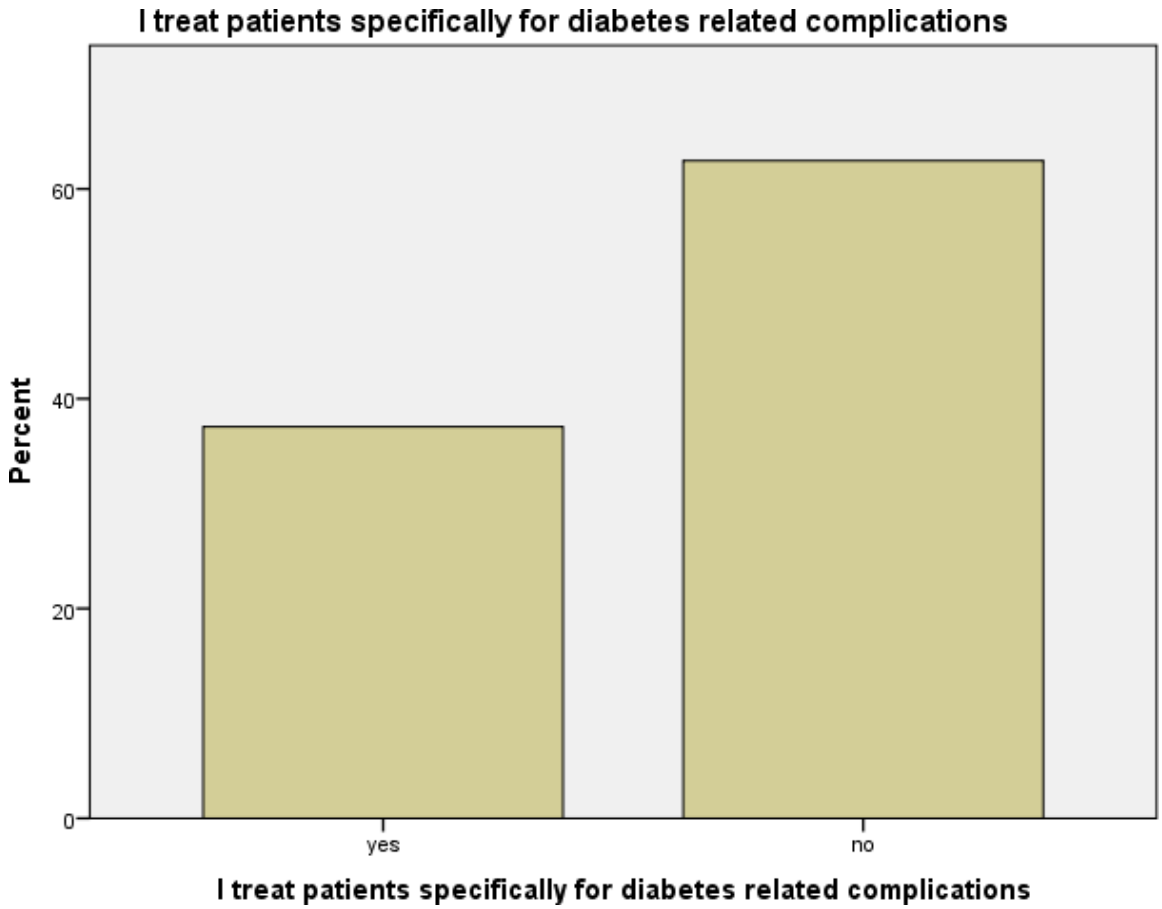


Figure IV 24I treat patients specifically for diabetes related complications

Table IV 25 I encourage patients to bring equipment to check their blood sugar levels during their treatment

.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	18	13.4	13.4	13.4
	Most of the time	30	22.4	22.4	35.8
	Sometimes	43	32.1	32.1	67.9
	Infrequently	30	22.4	22.4	90.3
	Never	13	9.7	9.7	100.0
	Total	134	100.0	100.0	

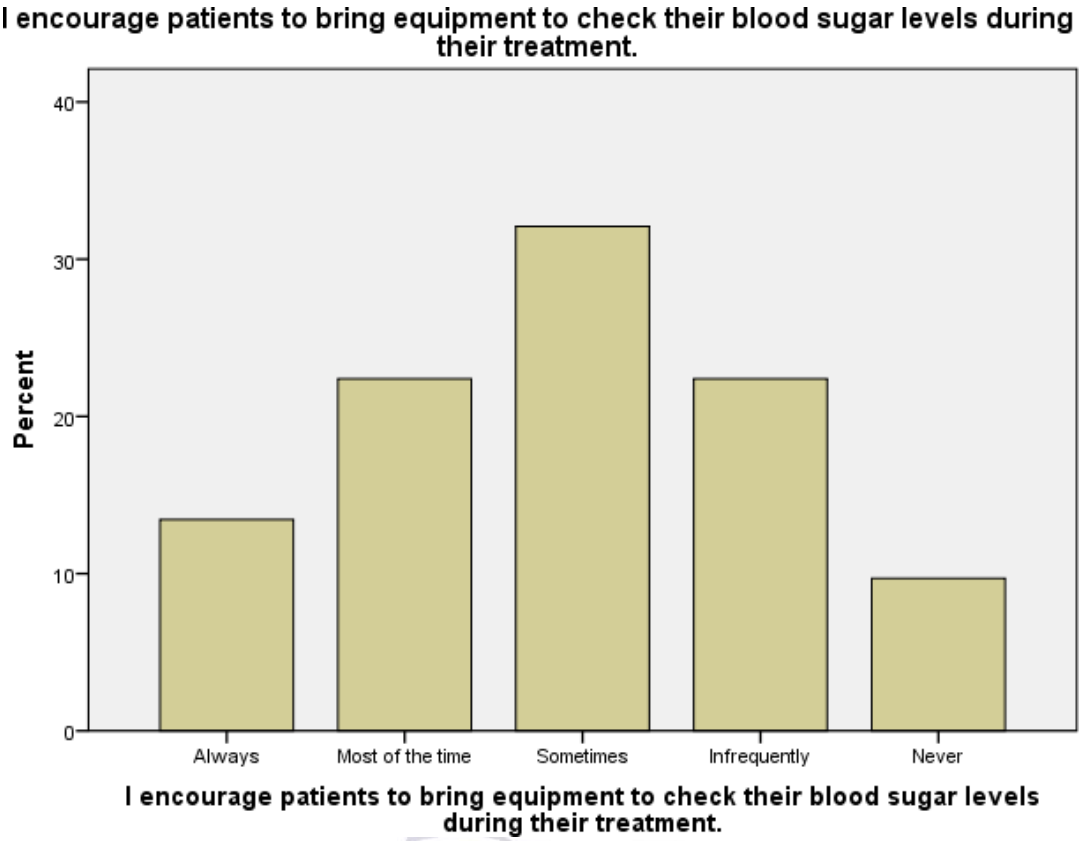


Figure IV 25I encourage patients to bring equipment to check their blood sugar levels during their treatment

Table IV 26 I monitor patients with diabetes for low blood sugar warning signs during treatment/exercise.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	62	46.3	46.3	46.3
	Most of the time	35	26.1	26.1	72.4
	Sometimes	22	16.4	16.4	88.8
	Infrequently	4	3.0	3.0	91.8
	Never	11	8.2	8.2	100.0
	Total	134	100.0	100.0	

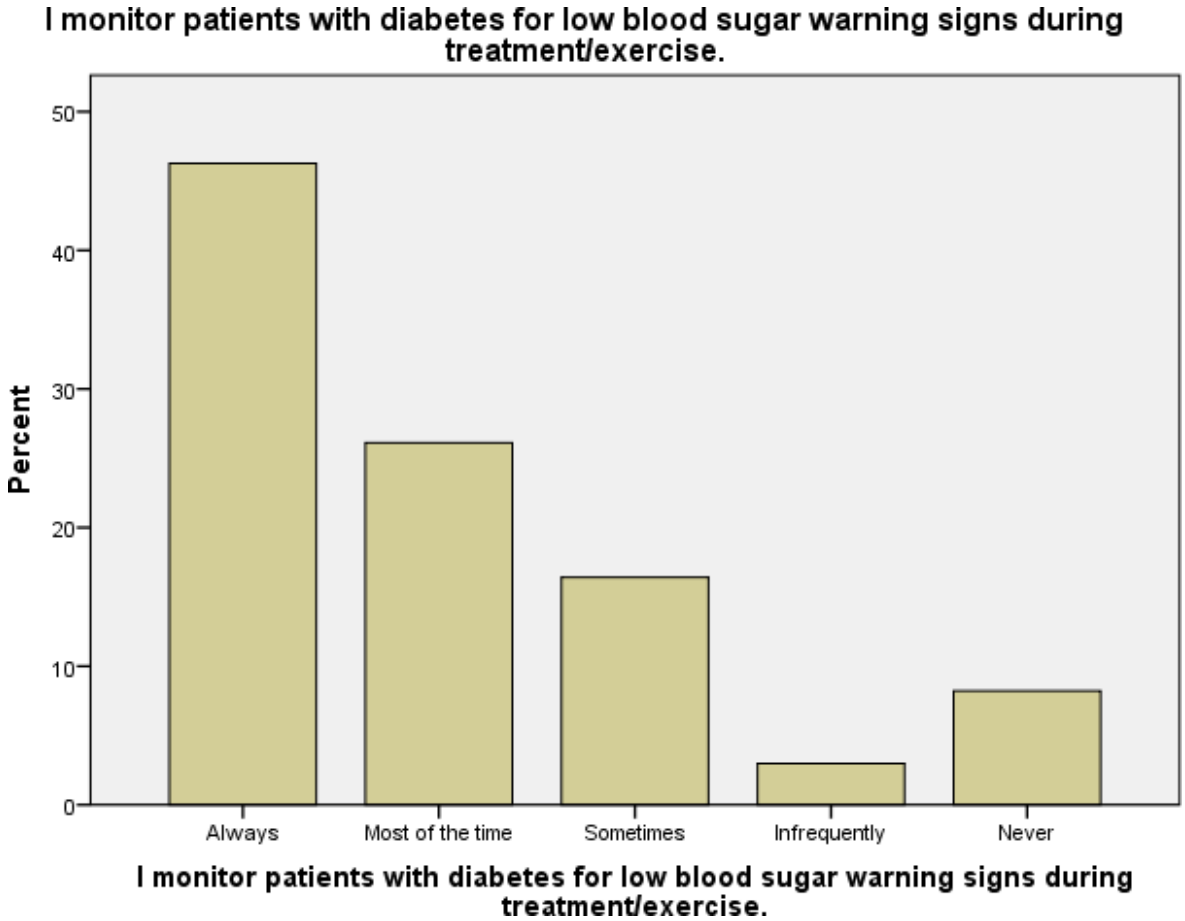


Figure IV 26I monitor patients with diabetes for low blood sugar warning signs during treatment/exercise.

Table IV 27 I have a treatment plan/policy in place in case a patient with diabetes experiences low blood sugar levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	113	84.3	84.3	84.3
	No	21	15.7	15.7	100.0
	Total	134	100.0	100.0	

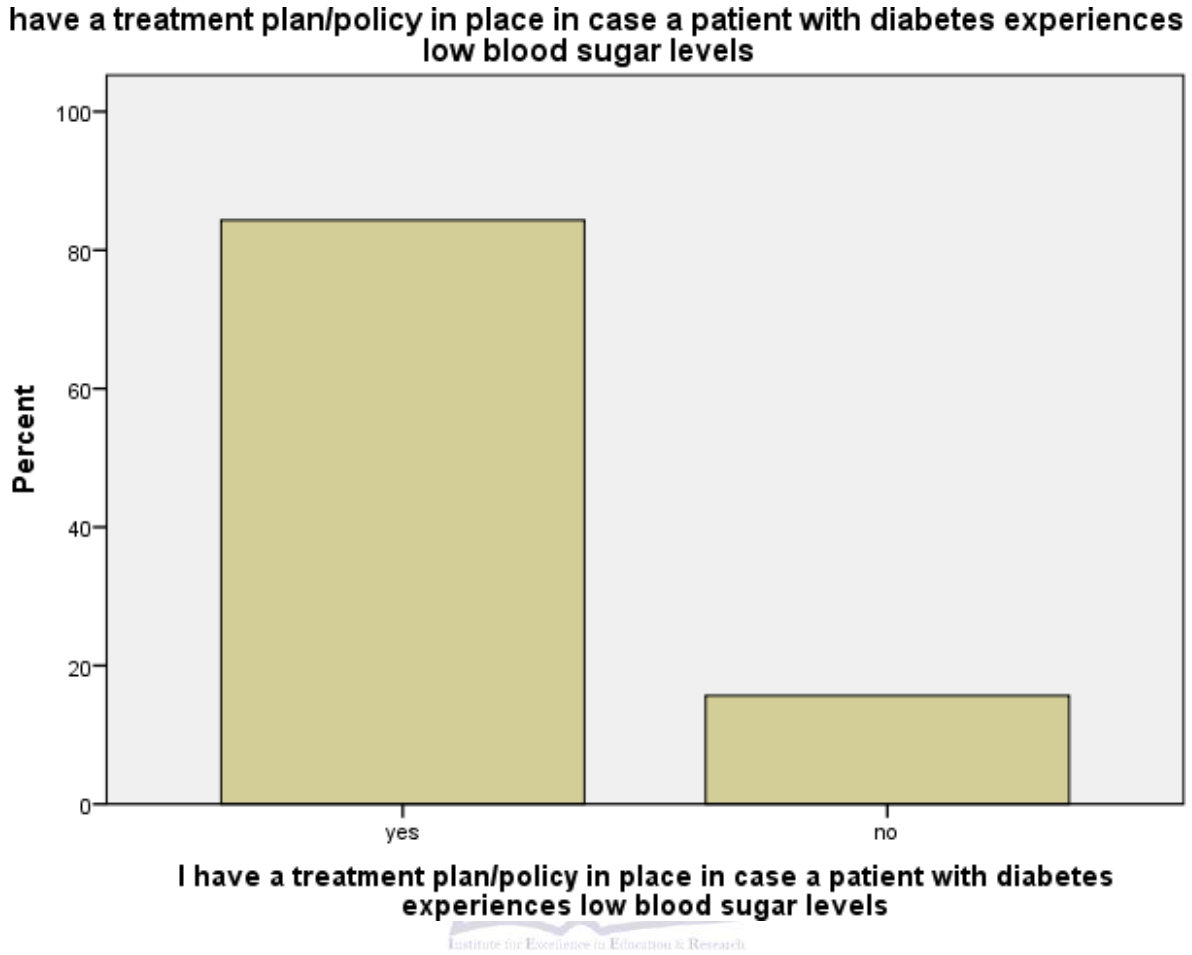


Figure IV 27I have a treatment plan/policy in place in case a patient with diabetes experiences low blood sugar levels

Table IV 28 I provide education around diabetes management and control when a patient with diabetes comes to see me with a different primary issue.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	63	47.0	47.0	47.0
	Most of the time	46	34.3	34.3	81.3
	Sometimes	18	13.4	13.4	94.8
	Infrequently	6	4.5	4.5	99.3
	Never	1	.7	.7	100.0
	Total	134	100.0	100.0	

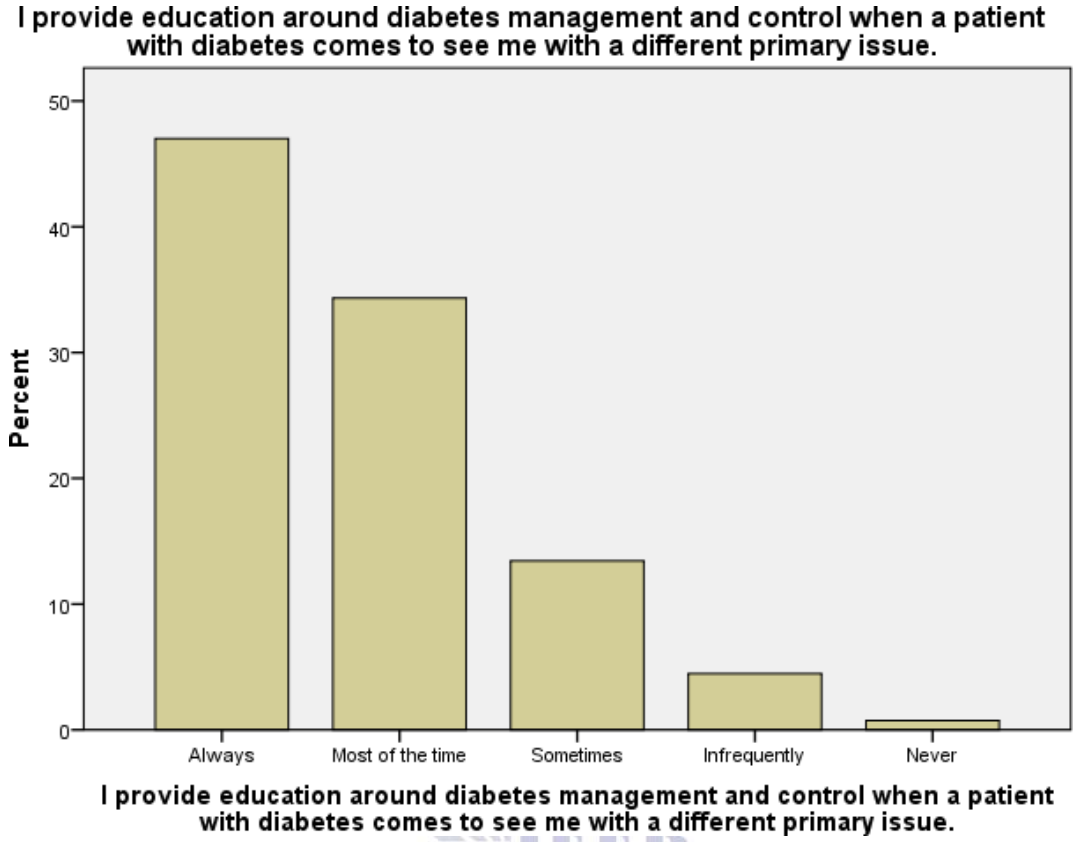


Figure IV 28I provide education around diabetes management and control when a patient with diabetes comes to see me with a different primary issue.

Table IV 29 I refer patients to the following to augment/help in the care of their diabetes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Physician	87	64.9	64.9	64.9
	Dietitian	24	17.9	17.9	82.8
	Occupational therapist	5	3.7	3.7	86.6
	Multidisciplinary clinics	4	3.0	3.0	89.6
	Others	14	10.4	10.4	100.0
	Total	134	100.0	100.0	

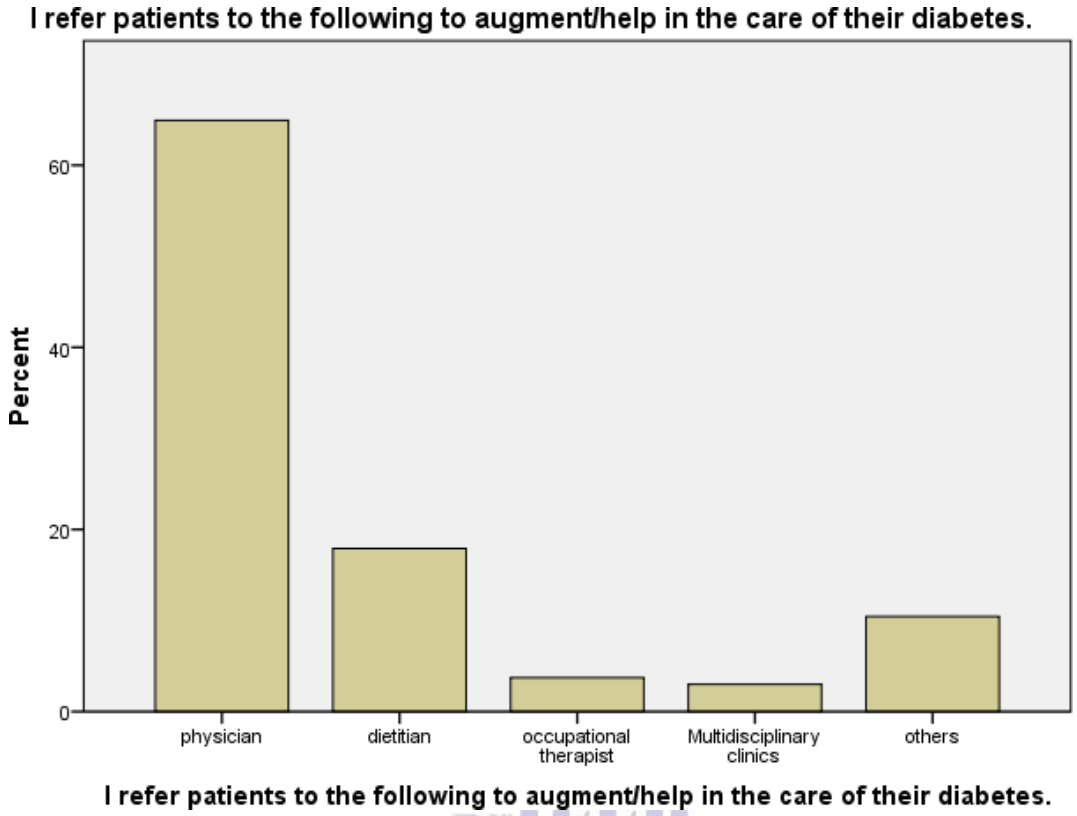


Figure IV 29I refer patients to the following to augment/help in the care of their diabetes.

Table IV 30 Do you offer counselling to patients regarding diabetes management or prevention

.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	83	61.9	61.9	61.9
	No	51	38.1	38.1	100.0
	Total	134	100.0	100.0	

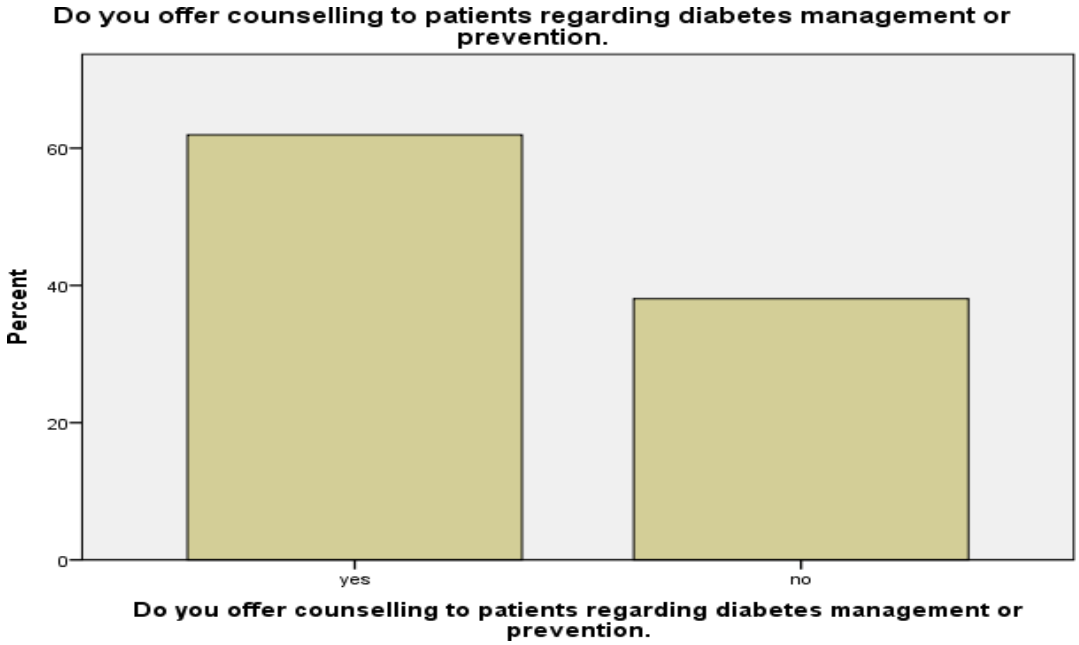


Figure IV 30Do you offer counselling to patients regarding diabetes management or prevention

Table IV 31

Knowledge question	Treating glow sugar	Minimum Capillary blood sugar	Recommen d weekly year bioactivity	Exercise best type	Aware of guidelines	We blearing
Incorrect%	64.9	59	50	59	46.3	46.3
correct%	35.1	41	50	41	53.7	53.7
frequency of correct	47	55	67	55	72	120
frequency of Incorrect	87	79	67	79	62	14

Figure IV 31

Table IV 32

	Total Score		
valid		Frequency	Ranges/ percentage
1	Low	45	33.6
2	Moderate	75	56.0
3	High	14	10.4
	Total	134	100.0

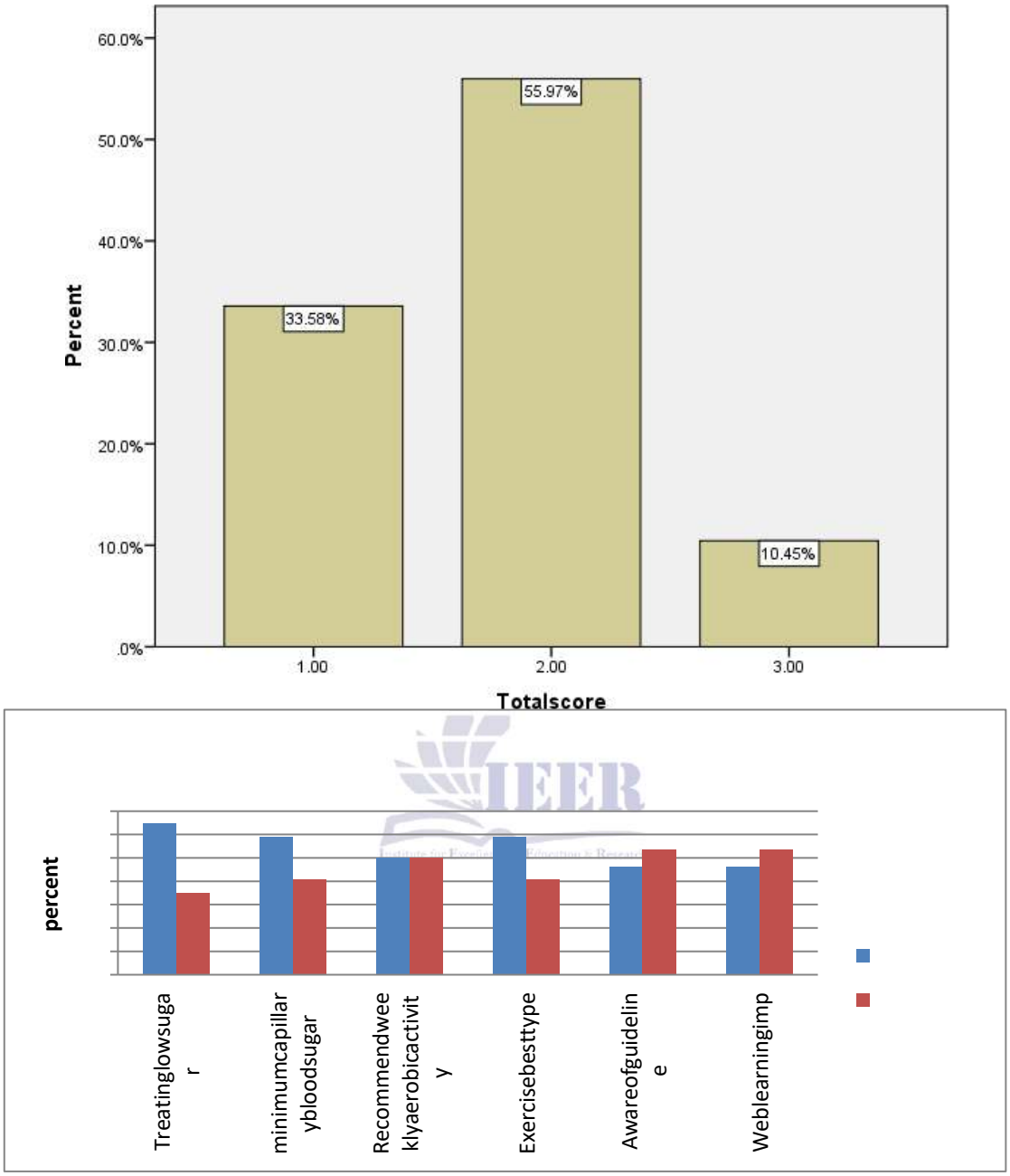


Figure IV 32

DISCUSSION

The present study aimed to assess the knowledge, attitudes, beliefs, and current practices of physiotherapists regarding diabetes prevention and management. Diabetes mellitus is one of the leading causes of morbidity and disability worldwide, contributing significantly to the healthcare burden in both developed and developing countries ,DeFranzo et al., 2015 (9). Physiotherapists, as movement and rehabilitation specialists, have a vital role in promoting physical activity, preventing complications, and supporting lifestyle modification among diabetic patients Doehring et al .2016 (21) The findings of this study provide insight into the current state of physiotherapists' readiness to participate effectively in diabetes care and how these results align with previous global research.

The findings revealed that physiotherapists

demonstrated positive attitudes and beliefs regarding their role in diabetes management. More than 80% agreed that diabetes prevention and management fall within their professional scope, and the majority expressed willingness to counsel or refer patients to other healthcare professionals. These findings are consistent with Doehring et al. 2016 (21) in Canada and Alotaibi et al. 2022(33) in Saudi Arabia, both reporting that physiotherapists perceive diabetes care as part of their clinical responsibility. However, the current study, like previous ones, found moderate confidence levels in applying evidence-based knowledge, indicating a gap between awareness and practical proficiency. The majority of participants also supported the need for specialized diabetes-related education, a finding echoed by Morris et al. 2016(22) and Mohd et al. 2021(32), who identified lack of professional training and limited access to continuing education as major barriers to effective diabetes management.

In terms of current practices, a large proportion of respondents routinely integrated diabetes-related care into their sessions. Over 70% reported screening for diabetes during initial assessments and monitoring blood sugar levels during therapy sessions. Nearly half always provided diabetes-related education, while 84.3% had emergency plans for hypoglycemia, reflecting strong clinical preparedness. These results are comparable to Shaw and Singh 2017 (23) and Tobin et al.2019 (27), who found that physiotherapists actively encourage exercise and safety precautions but often lack standardized screening systems. In the present study, only 13.4% of participants consistently asked patients to bring glucose-monitoring devices, and less than 40% treated diabetes-related complications directly. This suggests that while physiotherapists demonstrate awareness and willingness, certain clinical practices remain underdeveloped. Similar gaps were reported by Okafor et al. 2021 (30) and Alhowimel et al. 2023 (36), who cited limited interprofessional collaboration and unclear role boundaries as barriers to effective implementation.

Regarding knowledge, only 10.4% of physiotherapists scored in the high knowledge category, while 56% demonstrated moderate understanding. Correct responses for questions on hypoglycemia management, aerobic activity guidelines, and capillary blood sugar levels ranged between 35% and 53%. This finding closely mirrors Doehring et al. 2016 (21), Lim et al. 2019 (26), and Kaur et al. 2020 (28), all of whom reported that physiotherapists generally possess moderate awareness but limited guideline familiarity. The consistency of these results across multiple regions suggests that insufficient diabetes-specific education is a widespread issue in the profession. Nevertheless, the strong positive attitudes observed indicate that physiotherapists recognize their potential role and are willing to expand their scope through continuous learning. Collectively, the findings of this study emphasize that physiotherapists possess favorable attitudes but moderate knowledge regarding diabetes management. The positive correlation between awareness and perceived responsibility reflects a progressive mindset among clinicians. However, the limited implementation of standardized diabetes management practices indicates need for structured clinical guidelines, interprofessional collaboration, and enhanced continuing education. Studies such as Zheng et al. 2018 (5) and Yang et al. 2021 (31) have shown that physiotherapist-led exercise interventions significantly improve glycemic control, reinforcing the importance of empowering physiotherapists with the necessary tools and knowledge. In line with Blais et al. 2024 (37), strengthening education, referral pathways, and competency frameworks can enable physiotherapists to take a more active and evidence-based role in diabetes prevention and rehabilitation.

Limitations

Although this study provides meaningful insights into therapists perception , practices and knowledge , several limitations mut be acknowledge As a cross-sectional design it captures data from a single point in time and therefore limits the ability to establish cause-and-

effect relationships between knowledge, attitudes, and practices. Secondly, the use of self-administered questionnaires may have introduced response bias or social desirability bias, as participants might have over reported positive behaviors. Thirdly, the study employed a judgmental (non-probability) sampling method, which may have introduced selection bias and reduced the generalizability of findings to all physiotherapists in Pakistan. Additionally, the sample size (n = 134), though adequate for descriptive purposes, represents a relatively small portion of the professional population. Another important limitation is that this study did not differentiate between specific types of diabetes (Type 1 or Type 2); therefore, responses reflected general understanding and practices rather than targeted management of distinct diabetic populations. The knowledge assessment included only a limited number of questions focused mainly on exercise and screening, which may not fully reflect the broader scope of diabetes-related competencies. Finally, the study did not include qualitative interviews, which could have provided richer insights into individual perceptions, institutional challenges, and contextual barriers affecting physiotherapists' role in diabetes management.

CONCLUSION

The present study demonstrates that physiotherapists hold positive attitudes and a strong sense of professional responsibility toward diabetes prevention and management; however, their knowledge and clinical application remain moderate. Strengthening diabetes-related education, developing clear clinical guidelines, and promoting multidisciplinary collaboration are essential to translate positive attitudes into consistent, evidence-based practice

RECOMMENDATIONS

As this study was conducted in a single city with a sample of 134 physiotherapists, it is recommended that future research expand the sample size and include participants from multiple regions of Pakistan to improve generalizability. Since the findings showed that most physiotherapists hold positive attitudes but demonstrate moderate knowledge and inconsistent practices, professional organizations, universities, and healthcare authorities should collaborate to conduct continuing education workshops and integrate diabetes management modules into physiotherapy curricula. National physiotherapy bodies should also establish standardized guidelines and referral systems to strengthen physiotherapists' roles in multidisciplinary diabetes care and help bridge the existing knowledge–practice gap.

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