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Review Of Physiotherapy and Rehabilitation In Diabetes Mellitus Management

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Abstract

The goal of this review is to examine the impact of physical activity on diabetic-related issues such muscle strength, gait, balance, and overall well-being. Exercises have also been shown to have a positive impact on these aspects. Diabetes mellitus patients' quality of life (QOL) is increasing as a consequence of exercise therapies, but additional study is needed to further enhance both physical and mental QOL, as evidenced by the numerous studies presented in this publication. This publication includes a number of studies that claim that regular exercise can help reduce blood glucose levels. Exercises have also been shown to improve muscular strength, balance, gait, and fall-related difficulties, according to research.

KEYWORDS: Diabetes mellitus, Gait, Balance, Strength, Quality of life

Introduction:

Patients with diabetes mellitus, hypertension, and other musculoskeletal problems are on the rise because of changes in socioeconomic development, daily routines, and sedentary life styles that have resulted in a considerable increase in the number of patients (Zimmet, et al; 2001, Li M.Z, et al; 2013, Sena, et al; 2010). In emerging and developed nations alike, diabetes mellitus has become a major health issue (Li M.Z, et al; 2013, Qibin& Frank; 2012). As a result of diabetes's consequences, mortality and morbidity have increased worldwide. In order to correctly manage scarce resources, it is becoming increasingly important to estimate the prevalence of diabetes.

Epidemiology

Countless pieces of information have been gathered throughout the world to get an accurate count of patients (Wild, et al 2004, Soriguer, et al; 2012). Japanese diabetes rates reveal that every 9th person in 1000 has the disease, which is fast rising due to an increase in obesity, decreased

physical activity, and ageing. The prevalence of diabetes is expected to continue to rise (Goto, et al; 2013). Obesity, belly fat, high blood pressure, poor HDL cholesterol, high triglycerides and a family history of diabetes all contribute to the 13.8 percent incidence of diabetes in Spain (Soriguer, et al; 2012). Between 1944 and 2006, the prevalence of diabetes mellitus in Mexican men and women increased dramatically, rising from 0.7 percent in 1994 to 7.5 percent in 2000 and 14.4 percent in 2006 (Barquera, et al; 2013). In contrast, the prevalence of diabetes mellitus in Australia has increased three times since 1981, with AusDiab reporting an increase of 7.4 percent in year 2000. In Mexico (Shaw &Chisholm ; 2003).

In the year 2000, there were 171 million people in the United States who were diabetic (Wild, et al.; 2004). In 1998, researchers predicted that by 2025, the number of people with diabetes would rise to 300 million (King H, et al ; 1998). However, the number of people with diabetes has already risen to 387 million in 2014 (IDF 2014) (if viewed continent-wise, the 387 million included the North American and Caribbean (NAm&C), South and Central America (S&Cam), Europe, the Middle East and North Africa (ME&NAf), Africa, and South East Asia (SEAs). J.E.Shaw, R.A.Sicree et al. (2010) anticipate that by 2030, there would be an additional 439 million cases of diabetes mellitus. Sixty-nine percent of this population will live in developing countries, while only twenty percent will reside in industrialised nations (Shaw JE , et al; 2010). The number of people with diabetes is expected to climb to 592 million by the year 2035, according to a recent study by L. Guariguata and D.R. Whiting (2014).

Diabetic India has overtaken the United States to become the world's most populous country. The number of people with diabetes is rising at an alarming rate. Indians make for one-fifth of the world's diabetics (Joshi &Parik ; 2007). During 2000, 32 million individuals had diabetes, which grew to 40.9 million in 2007, and is anticipated to rise to 69.9 million and 80 million by 2025, according to the latest estimates (Mohan, et al ; 2007).

According to two separate studies conducted in India's north and south, urban residents had a higher rate of diabetes than rural residents (Misra et al, 2001 &Ramchandra, et al ; 1988). Only a few of studies have been completed in India's main cities, but a comprehensive national census is needed to provide an exact count of the country's population.

Types, Signs and Symptoms

One of the hallmarks of diabetes mellitus is hyperglycemia, which occurs when glucose is not properly used or produced (ADA;2006&WHO;1999). Polyuria, polydipsia, weight loss, and hazy eyesight are among the most prevalent symptoms (ADA;2006). Multiple subcategories are used to classify the condition. Diabetes mellitus type 1 (also known as insulin-dependent diabetes mellitus or idDM) and type 2 (non insulin dependent diabetes mellitus). According to WHO (1999), the categorization of DM should include both a clinical description and an etiological classification.

Impaired glucose regulation (IGT & IFG) is the stage between normal glucose levels and DM. IGT is categorized as a stage rather than classification is natural history of disordered carbohydrate metabolism. Similarly, IFG is categorised as a stage it refers to fasting glucose concentration which are lower than those required to diagnose diabetes mellitus but higher than

the normal. IGT and IFG are not clinical entities n their own right, but rather risk categories for future diabetes. Further normoglycemia classified as another stage in which persons who have evidence of pathological process which may lead to DM or in whom a reversal of hyperglycemia has occurred (WHO;1999).

Type 1 and Type 2 Diabetes Mellitus are the most widely recognised forms of the disease. Type 1 diabetes, also known as juvenile/Insulin Dependent Diabetes Mellitus (IDDM), and Type 2 diabetes, also known as non-insulin-dependent diabetes mellitus (NIDDM), are caused by a variety of factors, including genetic and environmental ones, as well as ones that interfere with insulin absorption or secretion. The pancreas' beta cells, which produce insulin, are damaged in type 1 diabetes, resulting in a shortage of insulin. The immune system assaults and kills beta cells since it is an autoimmune illness. Type 1 diabetes mellitus susceptibility is largely inherited polygenetically, with genetics playing a role in around two-thirds of cases. Diabetes mellitus (NIDDM) is caused by insulin resistance in the fat, muscle and liver cells of the body because they are unable to utilise insulin properly. Middle-aged and older overweight/obese adults are more likely to develop it. Though this has grown more widespread among children and teenagers in recent years (Sena et al ; 2010). In addition, environmental variables have a role of the rise in diabetes cases. Type 1 diabetes can be caused by a variety of viral illnesses, including mumps,

coxasackie B4, Retrovirus, rubella, and others. Type 2 diabetes is linked to a sedentary lifestyle and obesity. In addition, it has been discovered that maternal malnutrition, which results in low birth weight, is a risk factor for DM in later life (Sena et al.; 2010).

Diagnosis of Diabetes Mellitus

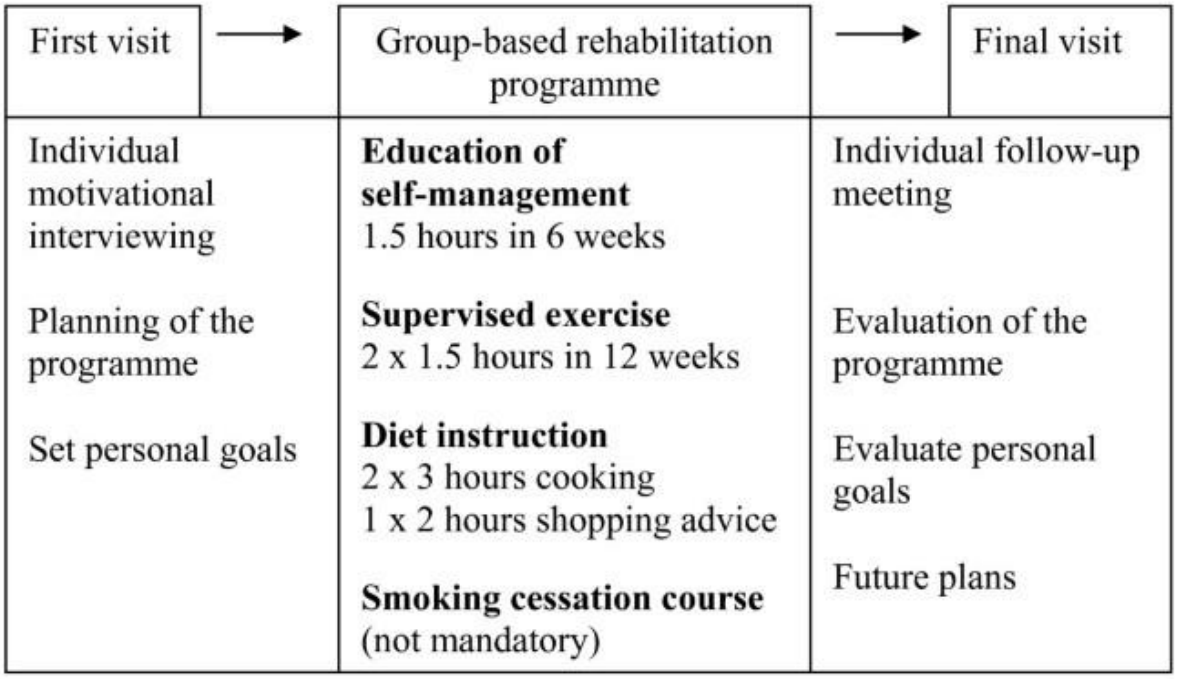
A urine test for glucose and ketones is usually recommended when a patient complains of symptoms that indicate diabetes. The most often used tests to diagnose diabetes are blood glucose, urine glucose, ketone testing, HbA1c, and the Oral Glucose Tolerance Test (OGTT) (WHO ; 1999, Seino et al 2010).

OGTT and glucose

The most common side effect of measuring blood glucose, and in particular plasma glucose, is hyperglycemia. This was widely recognised as a primary diagnostic tool for many years (Sacks et al 2011). Later, in 2006, ADA updated the values (table-2) and specified that confirmation should be done by repeating the test on a future day if any one of these FPG requirements is satisfied. As there are differences in FPG, with the mean FPG being greater in the morning than the afternoon, when obtaining a sample from a person, it should only be drawn when the subject has fasted overnight for at least 8 hours (ADA; 1997, Troisi et al ; 2011). Because growth hormone and cortisol are secreted at night and early in the morning (Troisi et al ; 2011). Only when the patient is either unable or unwilling to do self-monitoring of blood glucose is urinalysis performed (SMBG). It is also used in situations where blood glucose testing is unavailable or too expensive (Sacks et al 2011, Goldstein et al ; 2004, IDF ; 2005). Other reasons for avoiding using SMBG include its inability to discriminate between hypoglycemia, euglycaemia, and hyperglycemia, as well as its inaccuracy (Goldstein et al ; 2004).

Ketone Testing

Diagnosis of diabetes is based on the level of ketone bodies in the blood and urine. I'm used to using test tubes and tablets. Both blood and urine ketones can be measured using dipsticks and tablets. Diabetic ketoacidosis (DKA) is possible if ketones are found in the urine. As part of the diagnosis and continuing monitoring of DKA, the blood!-hydrobutyric acid (!HBA) level is specially analysed (Sacks et al 2011).



HbA1c

HbA1c was created as a diagnostic marker for diabetes by an international committee in 2009. It is the most convenient test since it does not need fasting or scheduled samples, and there is no influence on diet or exercise modifications (Malkani&Mordes ; 2011). Additionally, it has been referred to be a biomarker for diabetes. Biomarker is a biological molecule discovered in blood, other bodily fluids, or tissue as an indication of normal or aberrant process or of a condition or illness. To identify the persons and to implement different preventative actions at a subclinical stage, these biomarkers are useful (Lyons &Basu (2012) Because of its precision and ease, it has become a standard part of medical examinations (Sacks et al 2011,Malkani&Mordes ; 2011). HbA1c levels should be maintained at or below 7 percent for patients with diabetes, and the test should be repeated at least twice a year for individuals whose treatment is either modified or does not fulfil treatment goals (Sacks et al 2011).

Diet, hypoglycemic medications, and insulin are the mainstays of diabetic care. Patients with diabetes should adhere to a well-balanced diet that includes an adequate amount of carbs, fats, and proteins, with fat making up the majority of the diet. Oral hypoglycaemic medicines such as sulphonylureas, alpha-glucosidase inhibitors, and thiazolidinediones are often used to treat type 2 diabetes. Islet cell transplantation is a new treatment that is continuously being studied, although at this time only total organ transplantation (pancreas transplantation) can be relied upon. stem cell transplantation of!-cells, which have the potential to multiply and develop into specialised cells, is another option. Another approach of replacing!-cells in diabetes treatment includes further trans-differentiation (Sacks et al 2011).

Improves the quality of life for diabetic patients by using an alternative method.

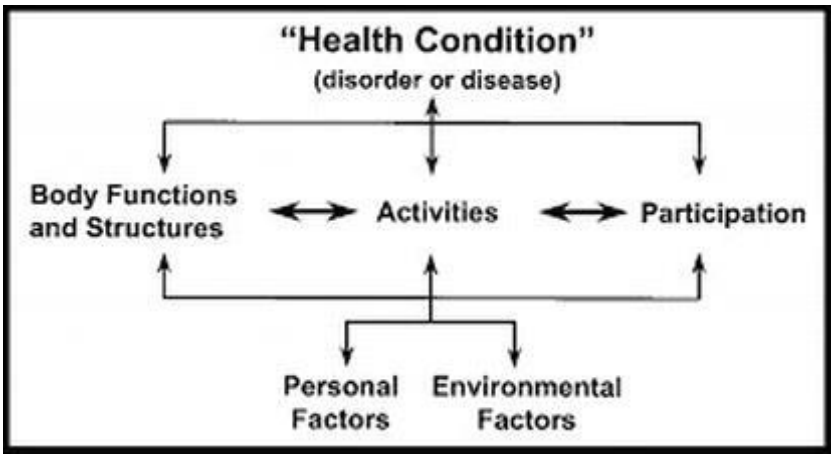
Strengthening Diabetes Mellitus Patients by Exercising Activities of daily living (ADL) and exercise are recommended as part of the above-mentioned therapy procedures for people with diabetes (Lamonte et al ; 2012). Due to long-term effects, social and financial load, inadequate glycaemia control, and daily measures to manage the condition, patients with diabetes have a poor quality of life (Polonsky ; 2002). As a result, individuals with DM must hunt for treatment procedures that assist them enhance their quality of life and relieve their own burdens. In those with type 2 diabetes, regular physical activity improves quality of life. 2011; Nicolucci and coauthors). Exercise's impact on quality of life has been the subject of several studies, with varying degrees of success. Researchers Valerie H. Myers et al. (2013) evaluated the effects of aerobic, resistance, and a combination of the three on patients' quality of life and found that all three regimens increased physical quality of life, but mental health quality of life did not improve significantly. Additionally, Myers et al (2013) discovered that people with type 2 DM benefit from an exercise schedule rather than a specific exercise modality, since Teiser et al employed treadmills for 12 weeks and found no significant difference in quality of life (Tessier et al ; 2000). Apart from other parameters, the quality of life did not significantly change between the intervention and control groups in terms of exercise training, according to D.Robb Holton 2003 and Ajediran I Bello 2011. (Holton et al ; 2003, Bello et al ; 2011). As a result, we believe that more research on this parameter is necessary.

Exercises Helps in Increasing Strength in Diabetes Mellitus

Patients with diabetes have been shown to have lower muscle strength than those who do not have type 2 diabetes (Hatef et al 2014), resulting in decreased physical activity. According to Sayer et al. 2005, older men with diabetes have significantly lower muscle strength and more impaired physical functions than those without diabetes. According to this, weaker muscles tend to be smaller and hence have the potential for lower glucose absorption and hyperglycemia in the bloodstream (Sayyer et al ; 2005). However, those who engaged in aerobic/resistance training or a mix of the two saw an increase in their strength. It was shown that progressive resistance training with five exercises at 65 percent of 1RM for four weeks resulted in an increase in muscular strength and a decrease in body fat (Hameed et al.; 2012). This finding was backed by a 2005 research by Javier Ibanez, Mickel Izquierdo, et al. Progressive resistance training 50 percent to 80 percent of one RM was examined twice a week for four weeks. Muscle strength improved significantly as a result of the study (Ibanez et al ; 2005). The American Diabetes Association (2000) and the American College of Sports Medicine (2000) said that rehabilitation should include both strength and aerobic workouts. A study by Savvas P. Tokmakidis et al (2004) examined the effect of combining strength and aerobic exercise, which included 75-minute walks on a treadmill and a warm-up and cool-down programme, as well as six resisance exercises performed in three sets with 12 repetitions at 60% of 1 RM for each exercise. As a result of implementing the exercise routine, participants saw improvements in their glucose management, exercise tolerance, and muscle strength (Tokmakidis et al ; 2004).

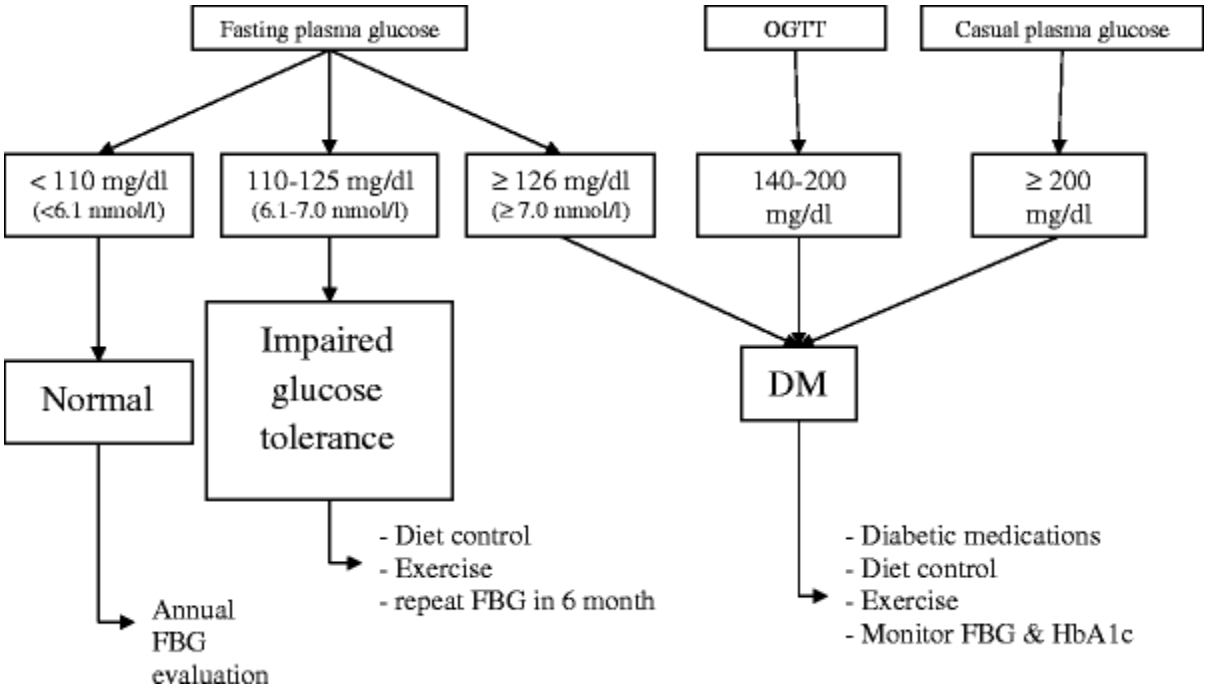
Exercises, Muscle Quality and Glucose

Exercising helps to increase muscle quality (Brooks et al ; 2007, Ivey et al ; 2000). "Maximal force generation per unit of muscle mass of specific compartment may be a better predictor of muscular function than strength alone," states the definition of muscle quality. There is no correlation between muscle mass and muscle quality, and as a result, changes in either one can be caused by a variety of factors. In both men and women, muscle quality declines as we become older, but studies show that women have worse muscle quality than males (Metter et al ; 1999). Diabetic patients living in the community were studied by Seok Won Park (2006), who assessed the strength and quality of their hands and knees. Although diabetics had larger muscle mass in the upper and lower limbs than non-diabetic patients, the quality of their muscles was shown to be poorer than that of non-diabetic individuals (Park et al; 2006). The quality of one's muscles is a good indicator of one's health and prognosis for death. Using pneumatic machines, Naomi Brooks et al., 2007 found that strength training, which included upper back, chest press, leg press, knee extension and flexion, improved muscle quality and associated functional capacity as a result of exercise interventions, leading to improved quality of life and a better disease outcome in people with diabetes (Brooks et al.; 2007).



The ability to regulate blood glucose levels is a critical function of regular exercise. Patients with diabetes have found it to be one of the best ways to rehabilitate. Controlling disease-related complications is made easier by increasing the number of activities of daily living (ADLs) (Boule et al.; 2001). Walking, for example, is a low-impact activity that has been shown to help control blood glucose levels. During a pilot investigation, Tomas Fritz and urban Rosenqvist were able to evaluate the immediate impact of walking on blood glucose levels in type 2 diabetic patients. Low-intensity exercise is sufficient for decreasing blood glucose levels in senior diabetics, according to the findings of this study (Fritz & Rosenqvist; 2001). There is a correlation between the amount of time spent exercising and how intense it is. Increases in both of these factors lead to an increase in muscle glucose uptake and a reduction in hepatic glucose. Even if you perform moderate aerobic activity just once or twice a week, you can lower your risk of post-exercise hypoglycemia by decreasing your plasma insulin levels (Colberg et al ; 2012). (Baynardet al ; 2005). On the stability ball for 12 weeks, three sets of 10 exercises, each with five repetitions per set, were shown to reduce Body Mass Index and Glyclated haemoglobin levels. (Subramanian S and Venkatesan P

2012) (Subramaniam&Venkatesan; 2012). Studies on the impact of aerobic, resistance, or a mix of the two types of exercise on blood glucose levels have been conducted by a number of authors. Glucose absorption by muscles and a decrease in blood glucose have been documented (Subramaniam & Venkatesan; 2012, Yardley et al.; 2013, Church et al ; 2010). Walking on a treadmill for 50 minutes with 5 minutes of warm-up and cool-down sessions has a favourable effect on blood glucose levels, according to Shivanandnayak and his co-workers (2005). (Nayak et al ; 2005). In addition to insulin resistance, hyperinsulinemia, hyperglycemia and hypertension are all linked to obesity (Boule et al ; 2001). Because of this, it is essential to lower glucose levels as well as body fat. Several studies have recently shown that people with type 2 DM need to do intensive resistance training in order to reduce their belly fat or overall body weight even with only a minor increase in physical activity (Jackcic et al ; 2012, Jeffery et al ; 2003). In addition, the patient must follow strict dietary restrictions and exercise regimens (Sigal et al ; 2006). Repetitive resistance training utilising elastic bands of 40 to 50# of one repetition maximal strength for three days a week for 12 weeks was shown to be effective in reducing blood glucose and body fat in two randomised controlled studies by Hwi Ryun Kwon and Kyung Ah Han (Kwonet al ; 2010).



Exercises Gait and Balance

A number of studies have been done on managing glucose and reducing body weight via exercising. However very little study has been done on efficacy of workouts on rehabilitation of patient with diabetes experiencing difficulties like gait dysfunction, falls, balance problems. elderly or diabetic individuals are at risk for falling because of their deteriorating health (Sartor e al ; 2012, Kruse et al ; 2010, Fulk et al 2010). Falls are caused by changes in balance, which is essential to a person's movement and stability (Najafi et al ; 2010). Peripheral neuropathy, a major consequence of type 2 diabetes, causes sensory and motor abnormalities that affect gait and balance (Allet et al., 2012), postural instability, falls, depression and anxiety, all of which have a

negative impact on quality of life and daily activities (Najafi et al ; 2010). The gait of diabetics differs from that of non-diabetic individuals. In diabetes mellitus patients without peripheral neuropathy, a study by G. Yavuzer in 2006 found substantial gait abnormalities. Patients with diabetes walk more slowly, have shorter steps, a longer stance phase, a broader BOS, and more variable step times on uneven ground (Brach et al ; 2008, Yavuzer et al ; 2006, Petrofsky et al ; 2005). Poor balance, neuropathies, and muscular weakness can all be contributing issues (Petrofsky et al ; 2005). Exercises can help diabetics and diabetic peripheral neuropathy sufferers improve their balance and gait. Diabetic patients completed training in gait and balance exercises, balance and endurance activities, and functional strength and endurance exercises as part of a randomised controlled experiment done by Allet et al in 2010. The findings indicated that a focused intervention may simultaneously enhance gait and balance (Allet et al ; 2012). As a result, people with DPN should engage in frequent physical activity to reduce their risk of falling and losing their balance. Exercise regimens used to treat other degenerative diseases, such as Alzheimer's and Parkinson's, can also be utilised to treat diabetic peripheral neuropathy (DPN). Although research showing the impact of exercise on balance may be found, to our knowledge there is a huge demand for varied protocols and the most recent exercise instruments and trends to be investigated for the same purpose. Therefore, it is important to consider the impact of exercise on these parameters.

CONCLUSION

Exercise programmes for diabetes have been analysed in this study. An exercise regimen can be used in conjunction with other treatments, such as food restriction or medication. Exercises have been shown to have a positive effect on blood glucose levels. It is possible to reduce blood glucose levels by engaging in any sort of physical activity that demands more muscular exertion than the activities of daily living (ADLs). Rather of prescribing one exercise modality, it would be better if the patient was prescribed an exercise programme and these activities were gradually increased in difficulty. Patients with diabetes can engage in aerobic, resistant, or a mix of the two, although several writers have shown that the combination of aerobic and resistive activities is more effective than either alone.

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