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Therapy for Type-2 Diabetes

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Abstract

The prevalence of type 2 diabetes is very high in the United States and across the globe especially among adults aged above 45 years. Everyone is at risk of suffering type 2 diabetes regardless of their gender, race, religion, or any social, economic, or political affiliation. Type 2 diabetes is characterized by an increase in blood glucose either due to insufficient insulin, excess fat in the body, or reduced functions of the pancreas. This study aims to provide therapy procedures for type 2 diabetes. The treatment of type 2 diabetes involves medication and management of the condition. Management involves regular exercise, having a healthy nutrition plan, and weight loss among others. However, since other conditions such as high blood pressure, stroke, heart attack, and amputation are likely to occur as a result of diabetes or aggravate type 2 diabetes the intervention takes into consideration of such comorbid conditions. The patients should be examined by a team health care professional and put on a program that works better for their condition. Also, they should be educated to self-manage their conditions. It is recommended that once the patient knows the intervention that works well for them they should put it into routine practice to ensure effective management of type 2 diabetes.

Keywords Type 2 diabetes, Blood glucose, High blood pressure, Exercise, prevalence

Introduction

Diabetes is a condition that occurs when the blood sugars rise about normal due to insufficient insulin in the body or body resistance to insulin that prohibits the use of available insulin in the body (Sheehan & Ulchaker, 2010). Type 2 diabetes is the most prevalent among adults aged above 40 years, and it accounts for over 90% of all the cases in the United States (Whiteman, 2014). The condition is ranked position seven among the major causes of deaths claiming over 71,000 people annually in the U.S., and nearly half of the adult population have this condition. Also, it cost the economy 245 billion in 2012 (accounting for 20% of the total health care bills) due to lost productivity and provision of health care resources (Whiteman, 2014; AL-Samarraie et al., 2021). Type 2 diabetes is associated with lack of body exercise, poor nutrition, and obesity, therefore, with proper management, the condition can be reduced drastically. The recent statistics have shown that over 29 million Americans are either diabetes or pre-diabetes. Studies have also indicated that the prevalence of type2 diabetes is increasing rapidly, and the life expectancy of people with diabetes also continues to increase which implies

the cost of managing the condition will increase as well (CDC, 2014). This study is intended for all persons above the age of 18 years. This condition can result in severe health issues such as infections of the soft tissues, damages of blood vessels, kidneys, and eyes as well as retarded healing of the wounds (Shallenberger, 2009). This study aims at developing the treatment for type 2 diabetes. The high prevalence of persons diagnosed with type 2 diabetes in the United States necessitates the need for the development of effective treatment of the patients to improve the patients' health conditions and reduce the cost of health care.

Material and Methods

The treatment of type 2 diabetes begins after the patient has been diagnosed with diabetes or pre-diabetes condition. The most common and easiest test for diabetes is the oral glucose tolerance test (OGTT) whereby the patient consumes a huge amount of glucose and then monitors the speed at which it diminishes from the blood (Acton, 2011). For a normal person, the blood glucose comes back to normal (below 7.8%)

within two hours after consumption. Another test involves measuring haemoglobin A1C (HbA1c) by the doctor whereby the blood sample is taken and screened in the laboratory to determine the levels of the blood glucose. This test examines the amount of glucose that gets stuck or accumulates on the haemoglobin and the higher the glucose level the HbA1c (Codario, 2010). For the normal people, the HbA1c may be less than 6% (48mmol/mol) (Mustafa, & AL-Samarraie, 2020).

Also, self-monitoring of blood glucose using a blood glucose meter is sufficient to determine how the body regulates the glucose levels in the blood. The patient pricks their finger to obtain a drop of blood which they feed on a small plastic strip and place it on the testing machine/meter. The machine indicates the levels of glucose in the blood at various times of testing. Before the meal, the blood glucose is normal between 6 and 8 mmol/L while after the meal the blood glucose is between 6 and 10 mmol/L (Shallenberger, 2012; Mustafa et al., 2020). This is the most recommended method because it enables the patient to determine practically how the blood glucose levels are changing in response to various diets, physical exercises, medication, and changes in lifestyle such as weight loss. Furthermore, self-monitoring of blood glucose is crucial because it can help in controlling other conditions such as hypoglycaemia. The frequency of self-testing the blood glucose varies across individuals. The patient will require the assistance of the healthcare team to design the testing plan (Chowdhury, 2014). People in critical condition or beginners may require carrying out testing several times a day (every five minutes) while those in a stable condition can reduce the frequency of testing to as low as two times a day.

The intervention programs are conducted on patients with type 2 diabetes patients to determine how they respond to different intervention measures. The participants are grouped according to relevant intervention measures whereby some groups are engaged in physical exercises and healthy diet plans, another group is engaged in weight loss and healthy diet, and yet a different group is subjected to medication. For each group, the blood glucose levels are tested progressively for a given period, and the results are recorded and analyzed to determine the changes that have occurred during the period. The materials or resources required for effective implementation of therapy include the time for the health care staff and the patient, financial and monitoring tools such as blood glucose meter, the electronic records. The health care staff should guide clinical practices and determine when it is necessary to implement changes. However, the goals targeted for improvement should be specified and restricted to determine whether the treatment method is achieving the intended goals. Also, basing the intervention on limited goals will help in reducing the cost of treatment to the advantage of the patient. For instance, the management of glycemic, blood pressure, and lipid interventions aimed at reducing risks of stroke and heart attack can achieve up to 50% of these objectives.

Results

The intervention programmes are intended for monitoring the levels of blood glucose progressively. The grouping of the participants is based on the appropriate measures for each group (Asian-Pacific Type 2 Diabetes Policy Group, 2005; Mustafa et al., 2020). The intervention programmes are intended to reduce the level of glucose and lipids and increase metabolism activities. Increased physical exercises, low intake of carbohydrates, and medication have been proven to lower the blood glucose hence the risk of diabetes. A study in China by Da Qing involving 577 patients with type 2 diabetes established that regular exercise and healthy nutrition can reduce the prevalence of type 2 diabetes by up to 42% and 46% (Thomas, 2013). Similarly, physical exercises and weight loss intervention programs conducted in the U.S. involving 3234 IGT patients established that regular exercises and a healthy diet plan can reduce blood glucose by up to 58% (Goldstein & Mueller-Wieland, 2016). These effects were observed for about three years after the patients withdrew from intervention (Goldstein & Mueller-Wieland, 2016). According to Redmon et al., 2014, “a randomized controlled trial has shown a 50% reduction in major cardiovascular events through a multifactorial intervention targeting hyperglycemia, hypertension, dyslipidemia, microalbuminuria, aspirin and ACE inhibitor use in individuals with microalbuminuria.”

Discussion

Type 2 diabetes mellitus is not a very dangerous condition and should not cause alarm because with proper management and treatment people can continue living healthy lives (Editore, 2014). However, if the condition is not managed effectively, it can be fatal or cause other dangerous conditions such as unhealing wounds, heart attack, high blood pressure, stroke, etc. Since type 2 diabetes is caused by higher glucose levels in the blood the treatment and management techniques should focus on lowering the blood glucose and managing other conditions that cause blood sugars to rise (Sheehan & Ulchaker, 2011). The training and lifestyle intervention of pre-diabetes patients minimizes or delays the onset of diabetes by about 50%. Educating patients with type 2 diabetes on how to self-manage the condition is essential for persons with pre-diabetes. The intervention used depends on the patient's conditions (pre-diabetes or diabetes).

Pre-diabetes

The patients who are found to have pre-diabetes are referred to health care professionals for teaching and lifestyle intervention. The patients are required taught to make health plans to enhance involvement in physical activities, eating healthy diets, and reducing body weight. Other interventions include screening and treatment of cardiovascular diseases (CVD), metformin therapy as well as annual monitoring of the patient's condition.

Diabetes

The treatment of type 2 diabetes involves measures aimed at reducing the glucose levels in the blood. The absorption of glucose from the gut and glucose uptake from the muscles and adipose tissues (peripheral tissues) as well as the amount of insulin secretion in the pancreas will influence the level of blood glucose. The goal of treatment of type 2 diabetes is to bring the blood glucose, blood pressure, lipids, and glycemia back to normal levels. For normal blood glucose, the preprandial levels are 90-130 mg/dL and hemoglobin A1C (HbA1C) levels are less than 7%. The pharmacological treatment option varies with patients, and the health care providers have to take into consideration of various factors such as affordability, efficacy, comorbidities, patient preference, hypoglycaemia risk, effects on overweight, and possible side effects (Editore, 2014).

Type 2 diabetes is attributed to various premature mortality and morbidity due to CVD, amputations, renal failure, and loss of sight (CDC, 2014). To a greater extent type 2 diabetes is a component of a metabolic syndrome or insulin resistance syndrome. Therefore, management and treatment of type 2 diabetes involve more than controlling hyperglycaemia to include the control and treatment of various CVD. A multifactorial intervention is more effective for managing hyperglycemia, and cardiovascular conditions are efficient for patients with type 2 diabetes. Managing cardiovascular illnesses such as high blood pressure, use of tobacco and high lipid levels is crucial in the management and treatment of type 2 diabetes due to the high rate of comorbidity (LeRoith, 2012). Education and self-care exercises are also essential for the patients to enhance healthy living. The treatment and intervention measures applied to depend on whether the person has diabetes or pre-diabetes. The treatment and management of type 2 diabetes depend on the individual conditions.

The first therapy for type 2 diabetes focuses on changing lifestyle to maintain or achieve glycemic goals. In case the lifestyle fails to achieve these goals the metformin should be added (Ali, 2015). The patient should learn the symptoms are characterizing high blood glucose in their body and how to bring it down. With the assistance of health professionals, the patient should set their goals and define the physical exercises or plans of their meals for every day that will help to meet their target (Krentz, 2013). Then, the patient should monitor the blood glucose regularly using a blood glucose monitor. However, the newly diagnosed individuals with high glucose levels/A1C should be insulin administration with or without other agents should be made.

The methods for managing type 2 diabetes mellitus are personalized. The methods that are applied include administration of insulin, glucose, physical body activities, weight loss, and implementing a plan for eating healthy meals and medication. The normal glucose levels should range between 90-130 mg/dL while the hemoglobin A1C should not exceed 6.5% for a normal person (Burant, 2012). Therefore, when the blood pressure or hemoglobin exceeds these levels,

it implies the presence of excess glucose in the body which must be brought back to the normal levels.

Type 2 diabetes has co-morbidity with various conditions. One of the most common conditions is hypoglycaemia (characteristic reduction of glucose in the blood) due to the use of diabetes drugs (Redmon et al., 2014). This is a severe condition if not treated because it can make the patient unconscious. However, the condition can be easily managed with an administration of glucagon through injection or eat foods rich in carbohydrates. Other conditions co-morbidity with type 2 diabetes include dyslipidemia (high cholesterol levels in the blood, hypertension/high blood pressure, increased risk of heart attack, cardiovascular diseases, blindness, stroke, amputations and kidney problems/kidney failure.

Management of cardiovascular diseases is of great significance in the management of patients with type 2 diabetes because the condition aggravates the risks hence the risk declines with proper management (O'Keefe Bell & Wyne, 2009). The reduction of cardiovascular condition focuses on controlling blood pressure, use of aspirin, cessation of tobacco, and reduction of low-density lipoprotein. Type 2 diabetes is responsible for causing several other illnesses in various parts of the body (Ashfield Healthcare Communication, 2016). Implementation of interventions such as lifestyle changes and education of the patients require the collaboration of patients, relatives, and health care providers.

The risk of developing type 2 diabetes increases due to various factors. For instance, the over-working of the beta-cells of the pancreas reduces the secretion of insulin and when insulin is deficient in the blood most of the glucose is stored in the blood resulting in high blood glucose (Ganz, 2005). Also, deposits of too many fats in the wrong body parts and susceptibility of the individuals due to gene inheritance or other factors reduce the ability of the body to process glucose normally hence resulting in excess glucose in the blood.

The type of fibers and sugars present in the food an individual eats will affect the functioning of the pancreas to produce sufficient insulin which results in the accumulation of glucose in the body. Eating healthy foods with low carbohydrates reduces glucose levels in the blood (Lien et al., 2010). Having low glucose in the body is beneficial to the lungs because it reduces the demand for the pancreas to generate more insulin which in turn minimizes the risk of failure of the pancreas. The patients should ensure fruits and vegetables constitute the largest portion of their meals as a means of reducing carbohydrates in the meals (Chowdhury, 2014). Also, the meals should have sufficient fibers to ease digestion.

Excess fats in the body limit the metabolism activities and cause blockage of the blood vessels which results in high blood pressure. However, increasing physical exercise and taking proper diets can get rid of excess fat and enhance metabolism thus reducing the blood glucose in the blood (Group Health, 2015). The medication improves the functionality of the pancreas to produce sufficient insulin

which in turn improves the management of blood glucose to the normal levels. Gastric bypass surgery can also be used as a cure for type 2 diabetes in the initial stages by reducing food intake and minimize the levels of ectopic fat in the body (Barnett, 2012). However, the surgical operations involved are risky and complicated thus, they do not work well for all patients (Khardori, 2021).

Conclusion

Management and treatment of type 2 diabetes depend on the individual because the condition is caused by different factors among the patients and individuals respond differently to different therapeutic and control strategies. However, education on lifestyle management is an effective therapeutic and management approach for this condition. The lifestyle changes include engaging in regular physical exercises, use of medications, and having healthy nutrition. However, type 2 diabetes management will also involve reducing the number of lipids and blood pressure in the body as well as stoppage of tobacco use to manage cardiovascular conditions. Patients should be educated on how to take care of themselves to live

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healthy lives. Also, medications are necessary for managing blood glucose levels hence reducing the risk of developing other complications such as kidney, nerves, and eye problems. However, the patients with type 2 diabetes should be under observation in case of development of other complications such as Hypoglycemia (low blood glucose levels) as a result of medication.

Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication.

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