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EXERCISE AND DIABETES

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ABSTRACT

Virtually everybody needs some form and level of exercise to stay healthy and fit. Over the long term, diabetes is associated with dreaded health conditions, such as kidney failure, circulation problems, nerve damages, retinal damage and blindness, increased susceptibility to heart attack, stroke and hypertension. Exercise, however has the potential of controlling diabetes by non-medical means, reducing the severity of the disease, and significantly reducing the risk of long-term complications. Virtually all individuals who have diabetes can benefit from exercise. This review focused on diabetes and its types, the benefits of exercise to diabetic patients, and steps to take in programming exercise for diabetic patients.

INTRODUCTION

Virtually everyone needs some form of exercise to stay healthy and fit. Physical activity and exercise are widely promoted as effective means of enhancing the health and physical functioning of individuals. In a report of the surgeon-general on physical activity and health, according to the Centers for Disease Control and Prevention, CDC (1996), moderate physical activity can reduce substantially the risk of developing or dying from chronic diseases, such as diabetes. Other reports indicate that the rate of diabetes has increased steadily over the past 40 years, and it is currently the seventh leading cause of death in the United States. Approximately 16 million Americans - nearly six percent of the population - suffer from diabetes (Fahey, Insel and Roth, 2001).

Over the long term, diabetes is associated with dreaded health conditions, such as kidney failure, circulation problems, nerve damage, retinal damage and blindness, increased rate of heart attack, stroke and hypertension. However, a major clinical research has found out that it is possible to prevent diabetes with moderate

diet and exercise (Chamberlain and Demouy, 2002). Exercise has the potential for controlling diabetes by non-medical means, reducing the severity of the disease, and significantly reducing the risk of long-term complications (Mullen, 2000).

The government of Nigeria has over time made policy statements that committed them and all the people to intensive actions for attaining the goal of good health for all citizens (Uchegbu, Ibeabuchi and Uzoho, 2002), that is, the level of health that will permit them to lead socially and economically productive lives. According to Uchegbu, Ibeabuchi and Uzoho (2002), the government is convinced that the health of the people not only contributes to better quality of lives but is also essential for sustained economic and social development of the country as a whole. Major among the health services to be rendered to the public is education concerning prevailing health .problems and the methods of preventing and controlling them. The focus of this paper therefore was to discuss diabetes and how exercise can help in the prevention and control of the disease; the risk factors of exercise in diabetic patient; the kinds of exercises that are good for diabetic patients and the programming of such exercises for the condition.

WHAT IS DIABETES?

Diabetes mellitus is a condition where the body has difficulty in absolving glucose from the blood and delivering it to the rest of the body for its energy needs (Mullen, 2000). This is because of the lack of, or the inability to use insulin, the hormone required to 'escort' glucose from the blood to the cells of the body. Getchell, Pippin and Varnes (1987) described diabetes mellitus as a condition in which the body does not produce or properly use insulin. This hormone (insulin) is needed for the body to convert starch and sugar into energy.

According to Getchell, Pippi and Varnes (1987), when untreated, diabetes can lead .to very serious problems, such as high levels of sugar in the blood, which can cause poor circulation and nerve damage. These conditions may lead to severe pain in the limbs, blindness, kidney failure and even death. Small injuries may cause tissue death, which may require the amputation of a limb. Diabetes also increases the risk of developing atherosclerosis.

Two major types of diabetes have been identified (Getchell. Pippin and Varnes. 1987: Di Nubile, 1999; Mercola, 2000: Mullen. 2000 and Chamberlain and Demouy. 2002). These are:

i. Insulin-dependent diabetes mellitus; and

ii. non-insulin-dependent diabetes mellitus

The insulin-dependent diabetes mellitus is also known as Type 1. This type is more serious, but a less common form of diabetes mellitus and it is probably hereditary. More often than not, it begins in childhood and manifests when the pancreas cannot make enough insulin; it is sometimes called juvenile-onset diabetes (Getchell, Pippin and Varnes, 1987). It should be noted that without enough insulin, glucose builds up in the blood and body cells do not get the glucose they need. Some of the symptoms of insulin-dependent diabetes include frequent urination, accompanied by a very high level of thirst, fatigue, and rapid weight loss. Patients receive insulin via injections, which is usually self-administered.

Insulin-dependent diabetics often experience difficulty in balancing the levels of sugar and insulin in their bodies, and this situation poses to them two problems: insulin shock, and diabetic coma. In some cases, illness, physical activity, or even excitement may cause the body to use too much blood sugar unnecessarily. This situation leaves the patient with low blood sugar and too much insulin. Of course, a very low level of blood sugar and a high level of insulin can cause insulin shock. This condition can be observed in the presence of the following symptoms: dizziness, rapid pulse, excessive sweating, and paleness. Eating or drinking high sugar foods, such as orange juice, can quickly arrest this condition. Mullen (2000) suggested that exercise for the Type 1 diabetic should be medically supervised; this is because of necessary medical concern and complications.

The opposite condition of insulin shock, which is diabetic coma, occurs in insulin-dependent diabetes, when there is too much sugar in the blood. Diabetic coma is a state of partial or complete unconsciousness, brought about when the blood sugar level is very high and insulin

level is low. In this situation. the person's pulse is weak and rapid, the skin is very dry and a large amount of sugar is excreted into urine. In this case. quick medical attention is required, otherwise it could be fatal.

People suffering from non-insulin-dependent diabetes mellitus or Type 2 diabetes are 'insulin-resistant', meaning that they produce insulin, though the insulin is not effective in escorting glucose into the cells (Mullen, 2000). The Type 2 diabetes is also known as mature-onset diabetes, because it is usually observed in adults. In this condition. as earlier mentioned. the pancreas produces enough insulin, but the cells cannot take in glucose. Getchell. Pippin andVarnes (1987) observed that this form of diabetes is most common among those who are obese. Obesity affects the cells, so they do not take glucose.

People can inherit a tendency to develop non-insulin-dependent diabetes. Symptoms that are noticed in people suffering from Type 2 diabetes include blurred vision, fatigue, frequent infections, frequent urination and increased thirst. Studies however have shown that this type of diabetes can be controlled by diet, exercise and medicine (Getchell, Pippin and Varnes, 1987; Mercola, 2000 and Mullen, 2000). If not treated, the condition can cause the glucose level to build up and cause a diabetic coma (Getchell, Pippin and Varnes, 1987). Mullen (2000) recommended that physicians should prescribe oral hypoglycemic agents if blood glucose levels cannot be controlled. As a last resort however, a Type 2 diabetic will be put on insulin, which is most likely if the patient continues with a poor lifestyle, such as sedentary living, poor eating habit and weight gain. It is also reported that eighty to ninety percent of the diabetic population are Type 2.

Fahey, Insel and Roth (2001) reported a third type of diabetes, which is found among pregnant women. According to them. this type of diabetes occurs in about two to three percent of pregnant women. The so-called gestational diabetes usually disappears after pregnancy, but more than half of women who experience it eventually develop Type 2 diabetes.

BENEFITS OF EXERCISE TO DIABETICS

The benefits of exercise for people who suffer from diabetes are many. In diabetic patients, exercise can mean the difference between 'medical management' and 'lifestyle management'. Some of these benefits are discussed below.

1. Decreased cardiac risk: According to Di Nubile (1999), one widely recognized benefit of exercise is as important to diabetic individuals as it is to the population as a whole; this is the reduction of risk factors related to cardiovascular diseases. Patients of Type 2 diabetes have been reported to have a twofold to fourfold increase in such risks. Blood pressure in patients decrease with exercise (Horton, 1988). High insulin levels cause hypertrophy of the tunica media - the middle muscular layer of the vascular wall. This hypertrophy is associated with the sustained hypertension so common in Type 2 diabetes. Exercise increases insulin sensitivity, causing insulin level to decrease.The hypertrophic effects are then lessened, potentially decreasing blood pressure values.

2. Weight loss: This is desirable for many patients of Type 2 diabetes because weight loss improves metabolic parameters. Exercise has been shown to be a useful adjunct to diet for the diabetic (Wing, Epstein and Paternostro-Bayles, 1988). In addition, the psychological benefits of exercise-improvements in mood, self-esteem, and the quality of life - are particularly important for people who have a chronic disease, such as diabetes (Rodin, 1989). Exercise for diabetic patients. as part of their treatment regimen. allows them to take active, positive role in the management of their disease.

3. Improved glucose utilization: It has been recognized since ancient times that exercise may have direct therapeutic effect on diabetes (Di Nubile, 1999). Its ability to lower blood sugar was noted in the pre-insulin era and was used to reduce the need for insulin in the mid-1920s. Mullen (2000) opined that the main benefit of exercise is, however, the increased intake of glucose by the muscles and enhanced ability to store glucose.

EXERCISE RISKS IN DIABETIC PATIENTS

Though exercise is necessary and advisable, it has, on a few occasions, posed some risks to the diabetic patient. Some of these risks are discussed below.

1. Hypoglycemia: The major risk of exercise among diabetic patients is hypoglycemia - a condition of low blood sugar. This condition is of greater concern for patients who have Type 1 diabetes than for those who have Type 2 (Di Nubile, 1999). In non-diabetic individuals, increased glucose utilization during exercise triggers an array of homeostatic responses. Insulin declines and concentrations of counter-regulatory hormones (i.e. glucagons, growth hormone, catecholamine and cortisol) rise, increasing hepatic gluconeogenesis. But in a Type 1 diabetic, there is no such endogenous source of insulin to modulate insulin, and the counter-regulatory mechanisms are likely to be impaired, particularly after 5 years or more of diabetes (Rogers, Yamamoto and King, 1988: Spelsberg and Manson, 1995; and DiNubile, 1999).

2. Delayed hypoglycemia: Delayed hypoglycemia is a more insidious danger. Di Nubile (1999) reported that it often occurs at night. 6 to 15 hours after exercise, but may develop as long as 28 hours after exercise. One prospective study (Sane, Helve andPelkonen, 1988) found out that 48 of approximately 300 young patients with Type 1 diabetes had at least one such episode in a 2-year period; and it often occurred in individuals who increased their exercise regimen.

3. Hyperglycemia: The opposite crisis, hyperglycemia, is a risk for patients who have poor metabolic control (DiNubile, 1999). Without adequate insulin, muscle cells cannot utilize glucose during exercise, glucagons-induced production of glucose from the liver is unopposed, and fatty acids are mobilized to supply fuel. This results in increasing hyperglycemia (Delvin, Hirshman and Horton, 1987 and DiNubile, 1999). This accounts for the reason blood glucose monitoring before exercise is necessary.

TYPES OF EXERCISE FOR DIABETICS

Virtually all individuals who have diabetes can benefit from exercise. The potential gains are such that patients should make necessary efforts to increase their physical activity, moving from sedentary living to a life of maximum capacity. Most studies documenting the benefits of exercise among diabetic patients recommended aerobic activities (Di Nubile, 1999: Mercola, 2000; Mullen, 2000 and Chamberlain and Demouy, 2002).

According to Chamberlain and Demouy (2002), the activities most likely to control diabetic are aerobic exercises. Anything that gets the heart beating and makes use of a larger portion of the muscles in the legs and arms should be indulged in by diabetic patients. Such activities could include walking, aerobic activities or step class, jogging, swimming, water aerobics, bicycling or dancing. Nicholas (1999) recommended that for the purpose of control and prevention of this disease, individuals should be made to choose sports or activities that they enjoy doing regularly. These can also include recreational and domestic activities such as sweeping, dusting, washing. gardening and fetching of water. Some weight training exercises and those that can increase the strength can also be chosen.

PROGRAMMING EXERCISE FOR DIABETICS

Before commencing any exercise programme, it is important that the client or patient consults a physician who will conduct a thorough physical examination, because of some of the risks of diseases/conditions (Awopetu, 2000 and Okuneye, 2002).

EXERCISE INTENSITY

Nicolas (1999) suggested the need for a stress test to evaluate the heart and determine the best level of exercise for individuals. According to Di Nubile (1999), the workable goal for many patients is aerobic exercise at 50% to 70% of Vol max. This paper recommends 60% to 70% of

Vol max for preventive and control measures of diabetes; but this could be modified based on physicians' recommendations.

EXERCISE DURATION

Nicholas (1999) opined that exercise duration that is as short as 10 minutes is good, but one should endeavor to exercise up to 20-30 minutes per day; and every exercise section, especially programmed activities and sports, should begin with warm-up and end with warm-down exercises, which should include some stretching activities for the limbs, trunk and major segments of the body. Di Nubile (1999) recommended 20 to 60 minutes of exercise per day. This paper, however, agrees with Nicholas' position of 20-30 minutes duration per day for easy participation, frequency and convenience, and 10-20 minutes, at a low intensity as a start for those who have never exercised.

FREQUENCY OF EXERCISE

Nicholas (1999) recommended that daily exercise is best and should be adopted if possible; otherwise, it must not be less than three tunes per week. Some other studies recommended three to four times per week (Di Nubile, 1999; Mercola, 2000: Mullen, 2000; Awopetu, 2000; Chamberlain and Demouy, 2002 and Okuneye, 2002).

CONCLUSION

It is important to bear in mind that each individual has his metabolic response to exercise, which is very important when involving the diabetic patient in exercises. No general guidelines can take the place of intelligent self-observation and regular glucose monitoring in developing an individualized plan to facilitate safe and enjoyable exercise.

REFERENCES

Awopetu. A.R. (2000). Exercise prescription for preventive and rehabilitative care. Nigeria Journal of Physical Health Education and Recreation 1:24-28.

Centers for Disease Control and Prevention (1996). Physical activity and health: A report of the surgeon-general. National Centre for Chronic Disease Prevention and Health Promotion. www.cdc.gov/nccdphp/dash.

Chamberlain, J. and Demouy, J. (2002). Diet and exercise delay diabetes and normalize blood glucose. National Institutes of Diabetes and Digestive and Kidney Disease, http://www.niddk.nih.gov.

Delvin, J.T., Hirshman, M. and Horton, E.D. (1987). Enhanced peripheral and spanchnic insulin sensitivity in NIDDM men after single bout of exercise. Diabetes 36(4); 434-439.

Di Nubile, N.A. (1999). Exercising with diabetes: Tips, strategies and preventions. The Physician and Sports Medicine 4(27); 1827-1834.

Fahey. T.D., Insel, P.M. and Roth, W.T. (2001). Fit and well: Core concepts and labs in physical fitness and wellness (4U1 ed). California: Mayfield Publishing Company.

Getchell, L.H, Pippin, G.D. and Varnes, J.W. (1987). Houghton Mifflin Health. Boston: Houghton Mifflin Co.

Horton, E.S. (1988). Role and management of exercise in diabetes mellitus. Diabetes Care 11(2); 201-211.

Mercola, J. (2000). Exercise reduces diabetes by reducing insulin resistance. Archives of Internal Medicine 160: 2108-2116.

Mullen, D.L. (2000). Exercise and diabetes: Simple fitness solutions. www.simplefitnessolutions.com.

Nicholas, A.D. (1999). Exercise in diabetes management. The Physician and Sports Medicine 4(27); 1800-1810.

Okuneye. R.O. (2002). Regular exercise and individual health. Nigeria Journal of Physical Health Education and Recreation 2: 5-10.

Rodin, J. (1989). Psychological effects of exercise. In: R.S. Williams and A.G. Wallace (eds) Biological Effects of Physical Activity. Champaign: Human Kinetics.

Rogers, M.A., Yamamoto, C. and King, D.S. (1988). Improvement in glucose tolerance after one week of exercise in patients with mild NIDDM. Diabetes Care 11(8); 613-618.

Sane, T., Helve, E. and Pelkonen, R. (1988). The adjustment of diet and insulin dose during long-term endurance exercise in Type 1 diabetic men. Diabetologia 31(1); 35-40.

Spelsberg, A. and Manson. J.E. (1995). Physical activity in the treatment and prevention of diabetes. Comprither 21(10); 559-562.

Uchegbu, J.N., Ibeabuchi, W.C. and Uzoho, C. (2002). School and Community Health. Owerri: Onii Publishing House.

Wing. R.R., Epstein, L.H, Paternostro-Bayles, M. (1988). Exercise in behavioural weight control programme for obese patients with Type 2 diabetes. Dicihetologia 31(12): 902-909.