

FACTORS AFFECTING PARTICIPATION IN PHYSICAL ACTIVITY AND ADHERENCE TO EXERCISE PROGRAMMES BY PERSONS LIVING WITH DIABETES MELLITUS.

Wachira L J Muthoni and Onywera O V Kenyatta University, Nairobi Kenya

Abstract

This study investigated exercise patterns in the management of diabetes by adult diabetics at Kenyatta National Hospital in Nairobi, Kenya. Diabetics' predisposition to exercise, actual and perceived barriers to engagement in active physical activity was investigated as well as influences of age, gender, type of diabetes, duration of having diabetes and knowledge of exercise for diabetes on physical activity participation. Subjects comprised 140 diabetic patients who had been diagnosed to have diabetes mellitus. The results indicated that the main barriers to participation in physical activity and adherence to exercise programmes included;

experience of pain, hyperglycemia and hypoglycemia as a results of exercise (36.0%), physical disability resulting from complications of the disease (18.0%), lack of knowledge on exercise i.e. what to do, how hard and for how long (38.1%), perception of exercise being unnecessary if one can successfully manage with other forms of treatment (12.9), feeling of sufficiency of daily work and home activities thus need not engage in exercise (40.3), lack of motivation to exercise (22.3%) and fear of the outcomes of exercise on the condition (24.5%). The study recommends follow-up intervention and further research in the area.

Key words: Exercise, Physical Activity, Diabetes Mellitus, Adherence

Introduction

Diabetes mellitus is a disease associated with problems of frequent and rapid swings of blood sugar levels between hyperglycaemia and hypoglycaemia but resulting primarily in hyperglycaemia (ACSM, 1995; Edgren, 2004). It is a condition where the pancreas ceases to produce enough insulin or when the cells stop responding to insulin produced such that the glucose in the blood cannot be absorbed into the cells of the body (Edgren, 2004). Although diabetes cannot be cured, it can be controlled and managed to normal limits successfully (Williams, 2004). This is achieved through insulin therapy, oral

medication, diet and exercise therapies and patients' education on diabetes (Sherrill, 1993). Exercise and diet are considered first choice in treatment especially for Type 2 diabetes due to obesity which is usually present (Andreoli et al., 1997). Exercise therapy aims at managing blood sugar levels, weight control and increasing a sense of well being. Soon after the discovery of insulin, exercise was found to enhance insulin sensitivity in the body (Katzen & Mahler, 1978). Exercise is also known to have insulin-like effects.

Health Benefits of Exercise to the Diabetic

Exercise, an important cornerstone of diabetes therapy, has significant psychological and physiological benefits for people with diabetes

(Allen, 2004). Exercise may also present several contraindications if not properly designed, prescribed and executed. However, the benefits outweigh the

contraindications. Exercise is excellent in weight management especially using regular moderate-intensity physical activity for long term effects (ADA, 2006). It helps burn excess body fat, decreasing and controlling weight and fat profile. Regular physical activity improves insulin sensitivity and glycaemic control. In fact a frequently overlooked benefit of exercise training is its ability to significantly decrease haemoglobin A1c in glycaemic control (Allen, 2004). Exercise also helps to improve blood circulation and protects against heart disease by lowering "bad" Low Density Lipoprotein (LDL)

cholesterol and increasing "good" High Density Lipoprotein (HDL) cholesterol. With exercise there is increased energy levels, enhanced work capacity, improved muscle strength, increased bone density and strength. There is also reduced stress, relaxation and release of tension and anxiety thus improving the wellbeing of the diabetics (ADA, 2006; IDF and WDF, 2003; Web MD, 2006). Exercise also lowers blood pressure and blood glucose thus eliminating the need for diabetes medication (Howley and Franks, 1992).

Exercise Non-Adherence

Despite the potential benefits of exercise, many diabetics still do not adhere to long-term programs. Unfortunately, patients are often unsuccessful in Exercise regime Programme, as soon hyperglycaemia persists leading to introduction of oral medication as part of further management intervention (Andreoli et al., 1997). Reasons for this could be failure to participate in exercise due to patients' attitudes, social/cultural and environmental factors (Sallis et al., 1989; Levene, 2003). Inadequacy of patients' knowledge on exercise could also deter the use of exercise as a form of management resulting to limited exposure and wrongful approach to physical activity (Shillitoe, 1988).

Exercise adherence is a multifaceted concept, and non-adherence should be identified early on in the behavioral change process (Martinus et al., 2006). There are many hindrances to exercise that need to be identified and addressed. Barriers may be real e.g. lack of motivation, presence of debilitating illness, physical disability, and blindness, lack of time, available space and security (IDF & WDF, 2003).

Most real barriers often relate to foot problems, arthrosis or neuropathy. All other barriers are normally perceived barriers such as expenses for going to the gym, for buying exercise equipment, waste of time, being tired or not liking it (IDF & WDF, 2003). Emotional factors, "fourth variable" (along with insulin, diet and exercise) and reactions to stress have an important effect on diabetic control (Mngola, 2006). Diabetics may even require psychological help (IDF and WDF, 2003). The presence of psychosocial problems is often superimposed in such a way as to make management extremely difficult. A defence mechanism frequently seen is denial of the reality and may manifest as dietary and exercise non-adherence, failure to perform urine or blood testing, or even failure to attend clinic (Mngola, 2006).

People with all these barriers can be helped through counselling, encouragement to exercise, giving demonstrations on how to exercise and education on exercise targets, scopes and methods. This should address the different groups of patients such as the

elderly, children, those with depressive symptoms, those with chronic diseases and complications, and functional limitations (Martinus et al., 2006; IDF and WDF, 2003). Studies show that by educating subjects, increasing self-efficacy, and improving

Purpose of Study

The purpose of this study was to investigate the factors affecting participation in physical activity and

Research Questions

Two questions were addressed: (1) what were the factors associated with the diabetic patients' participation in physical activity? (2) What are the

Methods

Participants

The subjects comprised 140 diabetic patients attending the diabetes clinic at the Kenyatta National Hospital Medical Out-Patients Clinics. This study incorporated only diabetic outpatients of Type 1 diabetes, Type 2 diabetes or Impaired Glucose Tolerance (IGT) of 18 years and above. Just as in previous studies by Paul and Heerden (2004), children were excluded as they are not capable of providing reliable data especially where self reporting of usual behaviour need to be recorded. It

Instrument

A self-administered closed ended questionnaire was considered appropriate due to its ability to investigate an individual's perception/awareness, motivation and attitude. It was also found to be convenient due to the large sample size and short period of time patients had for the exercise considering the length of the questionnaire. The questionnaire comprised of

motivation, it is possible to maintain exercise compliance, which in turn can result in many physiological and psychological benefits (Martinus et al., 2006).

adherence to exercise programmes by persons living with diabetes mellitus in Kenya.

perceived factors that prevent diabetics from engaging in physical activity?

was also observed that those under 18 years are mainly students who are in school where most of their activities are dictated and controlled, hence difficult to assess their predisposition to using exercise as therapy. There was no restriction on gender, race or mobility status. The subjects were randomly sampled based on voluntary availability. This was an efficient system to capture the variations and heterogeneity that exist in the target population with the quest to obtain a representative sample.

questions for the diabetic patient's evaluation on the exercise regime and predisposition to exercise. The questionnaire was validated for content, adequacy, consistency and clarity by experts in the area of physical activity in the Department of Exercise, Recreation and Sports Science at Kenyatta University as well as the Kenyatta National Hospital Ethical and

Research Committee (KNH-ERC). The adapted questionnaire was only in English and this was not seen as a flaw in the study since the comprehensibility of the questionnaire was pilot-tested and improved before hand.

Procedure

The subjects were randomly sampled as they attended their annual check ups and quarterly treatment at the clinic as per their scheduled appointment, which made it highly unlikely to encounter a single patient more than once. The consent of the subjects was first sought and obtained before questionnaires were issued. Each patient required approximately 25 to 30 minutes to complete the questionnaire. Due to the nature and length of the clinic only eight patients were contacted in a day (5.7% of the sample size) for a period of 5 weeks.

Data Analysis and Presentation

Tests were first done to determine the power of the sample size as a representative of the population. The G Power 3.0.3 power analysis protocol was used with Post hoc engaging a large effect size of 0.40 because the subjects were of a special group who are likely to cluster in different aspects. It was established that the lowest power possible of this study was at 96.5% and highest power at 99.6% confidence levels.

Data collected were coded and entered for analysis using the Statistical Package for Social Sciences

Results and Discussions

The researchers assisted respondents who could not complete the questionnaire on their own (about 25.9%) due to eye problems or inability to read due to illiteracy. For this group of patients the researchers assisted by asking the questions and filling the questionnaire with them. Another group of patients that were offered assistance by the researchers were the prisoners attending the clinic who could not write since they were handcuffed.

There was 100% response rate since all the 140 questionnaires issued were handed back. However one questionnaire was excluded from the data analysis after it was discovered that the respondent's answers were overly exaggerated according to the data sorting regulations. Therefore overall useful data collected was 99.3% of the intended cases.

(SPSS) version 12. The data was cleaned and sorted to identify any entry that did not meet the analysis protocol requirements. Descriptive analyses were done to obtain the frequencies, percentages and means of the responses which are presented in tables and charts. Chi-square (χ^2) was also used to analyse the relationship between the independent variables (age, gender, Type of diabetes, duration of diabetes and knowledge level) and the dependent variable, PA level and participation. The level of significance was set at p. 05

Demographic information: The final sample comprised 139 persons with diabetes. The males were 68 (48.9%) and females 71 (51.1%). The mean age of the respondents was 49.61 years with ages ranging from 18 to 75 years. The results indicated that the dominant age groups of the respondents were those between 41-50years who were 41 (29.5%) and 51-60years who were 39 (28.1%). This is consistent with literature on the types of diabetes that indicates most of diabetics in this age bracket are of Type 2 diabetes. The results presented 96 (69.1%) respondents of Type 2 diabetes and 42 (30.2%) of Type 1 diabetes and only one (1) with pre-diabetes IGT (Impaired Glucose Tolerance). The duration of time from when the diabetics were first diagnosed with diabetes was assessed. Majority (47, 33.8%) of the respondents had had diabetes for a period between one to five (1-5) years.

Factors Associated with Diabetics' Participation in Physical Activity

In assessing the diabetics' predisposition to exercise, perceived barriers and factors associated with engagement in activity were investigated.

General factors

a) Age

There were more of aged patients in the low activity level. It was evident that age was significantly associated with activity level where activity level falls with age. However, this could also be due to encroachment on other complications of diabetes with age. This also supports findings on duration of diabetes where most of those with more than 20 years of diabetes were of less than recommended (low) activity levels thus advancement in duration (which goes with increase in age) is associated with inactivity.

b) Gender

The males and females diabetics' activities seem not to differ in performance compared to what is seen to be prevalent among the non-diabetics of different gender. The study concludes that both genders have similar tendencies in participation in physical activity and any differences observed are not out of the societal gender roles and responsibility, but out of chance. Therefore, once the patients are diagnosed to have diabetes, they tend to follow a similar activity inclination probably due to prescription of activity or precaution given.

c) Knowledge level

It is evident that knowledge level is significantly associated with activity level where there was a significant association of high knowledge with better performance. The knowledge on exercise procedures and importance to diabetics was sufficient; however comparing overall knowledge and performance there is a gap between the sufficient knowledge and the evidently low practice level. Given that 121 diabetics (87.1%) felt they should be given more education and information on exercise for diabetics, there is still more room for improvement.

d) Types of diabetes

It was observed that type of diabetes was highly associated with activity level where there was a significant association of more of Type 2 diabetes with higher activity levels. The Type 2 diabetics are predominantly the ones who are most involved in exercise and physical activity. This is due to the large population size of the Type 2 diabetics, and the fact that most are put on an exercise therapy due to obesity which is usually present.

e) Duration of having diabetes

The duration of time from when the diabetics were first diagnosed with diabetes was assessed and its relationship with the activity levels tested. The results of significant association show that many diabetics are initially low in activity levels after diagnosis. The activity level is seen to increase in many diabetics at 1 to 10 years of diabetes. However, the trend goes down with less diabetics being active with time. Advancement in duration of having diabetes, just as with advancement in age, is highly associated with inactivity as it is evident that most of those with more than 20 years of diabetes (who are mostly elderly) have less than recommended (low) activity levels.

Perceived barriers and Reasons for lack of participation in physical activity

Table 1 summarizes the various factors limiting involvement in exercise/physical activity. The factors

that were found to be greatly associated with participation in physical activity were: the perception that daily chores at home and at work contributed sufficient activity, lack of information on the kinds of exercise to perform, presence of discomfort due to the disease and presence of problems arising from participating in exercise. Factors that were least associated with participation in physical activity and exercise were physical restriction such as imprisonment and prioritizing other therapies above exercise. In a similar study by Thomas et al., (2004) the most significant factors influencing physical activity included a perceived difficulty in taking part in exercise, exhaustion, enticing television programmes, lack of local facilities, and lack of spare time. This suggests that perception and social factors may be more significant in discouraging physical activity than health related concerns.

Table 1: Reasons for lack of participation in physical activity

	Factor	YES		NO		Total	
		No	%	No	%	No	%
1	Lack time to exercise	38	27.3	101	72.7	139	100
2	Find exercise difficult and tiresome	25	18.0	114	82.0	139	100
3	Do not know the kinds of exercise to do	53	38.1	86	61.9	139	100
4	Have discomfort, tiredness thus cannot exercise	52	37.4	87	62.6	139	100
5	Cannot exercise due to complications of diabetes such as hypertension, neuropathy, retinopathy, CVD etc	40	28.8	99	71.2	139	100
6	Have disabilities and impairment that hinder participation in PA such as amputation, on wheelchair, blindness	25	18.0	114	82.0	139	100
7	Have foot problems such as wounds, blisters, pain, swelling and numbness	49	35.3	90	64.7	139	100
8	Experience problems due exercise such as episodes of hypoglycemia and hyperglycemia	50	36.0	89	64.0	139	100
9	Fear of the outcomes of exercise	34	24.5	105	75.5	139	100
10	Lack company and motivation to exercise	31	22.3	108	77.7	139	100
11	Under restriction such as imprisonment thus cannot exercise as required	4	2.9	135	97.1	139	100
12	Cannot afford or access local fitness facility and Programmes	32	23.0	107	77.0	139	100
13	Find the amount of activity they do at work and home sufficient thus do not need more exercise	56	40.3	83	59.7	139	100

14	Do not think exercise is necessary if one can successfully attain glycemic and weight control with other therapies	18	12.9	121	87.1	139	100
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The study observed that about 38 (27.3%) of the respondents had a problem of getting time to exercise. This could be due to the nature of occupation and prioritizing other things above exercise. A similar observation has been reported in studies by Kamiya et al. (1995), Paul and Van Heerden (2004), Murphy, et al. (1999) and Thomas et al. (2004). Lack of time is a perception of many who operate in tight schedules at work or home with a belief that one has to set aside lengthy hours for exercise besides their normal daily activities. Diabetics can incorporate exercise in their daily activity schedule. This can be done by taking advantage of opportunities to exercise such as: using the stair case instead of lift, alighting from the bus some distance away to walk, playing with the children and basically get actively involved. Katrina *et al.* (2006) observed that persons with diabetes who place PA high on their priority list, make time for physical activity, and have fewer concerns about injury from PA, end up being more active and manage it better.

On the factor of finding exercise difficult and tiring, 25 (18.0%) respondents indicated this as a barrier. It is a perception of many that exercise is accompanied by pain, is difficult and requires a lot of effort. Diabetics who reported discomfort, tiredness and weakness as a result of the ailment were 52 (37.4%). In diabetes, there is already an existing state of tiredness and discomfort thus exercises or any physical activities can be found to be an additional burden. In their study, Thomas et al. (2004) propose that patients be encouraged to take some form of physical activity despite feeling tired. Ironically

fatigue can be improved by undertaking exercise. Diabetics therefore need to be sensitized that exercise need not be difficult. Besides, the benefits gained in overall health, leave alone managing diabetes, are worth every effort. There are many ways to exercise that are simple, enjoyable and add to overall wellbeing.

Fifty three respondents (38.1%) did not know the kinds of exercise to do. In diabetes education fora, diabetics are encouraged to walk and be actively involved. Walking may seem sufficient but there is need to have a variety to break the monotony. This can be done by incorporating a wider variety of activities in an appropriate and clear exercise prescription dosage. Besides, those with foot problems, amputations or are on wheelchair need to be inducted to a greater variety of exercises. Despite 91.3% of diabetics having shown to have good knowledge of exercise for diabetics, it is discouraging that many of them do not know the kinds of exercises they can do. The knowledge given in education programmes could be mainly on benefits of exercise and how to monitor ones self before, during and after exercise but not giving a variety of such kinds of exercises, dosage and/or demonstration of the same. Diabetics know the importance of exercising but they do not do so simply because they are not confident enough with the information given amidst fear of the unknown. Similar observations on such a barrier of not knowing the kinds of exercises to do and how to perform them, have been recorded in studies done by Paul and Van Heerden (2004), Katrina *et al.* (2006), Kamiya et al. (1995) and Thomas et al. (2004). For instance, Thomas et al.

(2004) reported that lack of confidence in the ability to perform exercise was the main barrier to performing exercise in their study, and this had been a consistent finding in previous US studies.

Barriers of presence of complications of diabetes such as high blood pressure, neuropathy, nephropathy and retinopathy affected 40 (28.8%) of the respondents. Presence of disabilities and impairments leading to amputations or confinement to wheel chairs affected 25 (18.0%) of the respondents. Feet problems such as wounds, pain, swelling, blisters and numbness which are common problems to diabetics affected 49 (35.3%) of the respondents. These three factors deter participation in PA as the diabetics may not perform as required or perform at all, if not given individualized special exercise prescription to suit the condition. For instance, there is a danger of contraindication in some kinds of exercise for diabetics with complications. This discourages the

Fifty (36.0%) of the respondents had experienced problems such as pain, hyperglycemia and hypoglycemia as a result of exercise, while 34 (24.5%) had fear of the outcomes of exercise on their conditions. In their study, Paul and Van Heerden (2004) observed that the changes in the trend of activity could be attributed to the misconception that exercise either worsens diabetes management or always induces hypoglycemia. This reflects on the same issue of exercise precaution and counseling. If diabetics are not well guided on the dosage of exercise especially intensity, duration, carbohydrate intake and blood sugar monitoring before and after exercise, they may encounter problems with exercise. This may discourage such diabetics from ever exercising again instigating the fear factor.

diabetics from participating in general activity as taught in the education fora.

Diabetics with feet problems and those with peripheral neuropathy could get contraindications from some kinds of exercise such as repetitive and impact activities if precaution is not observed. Instead of such problems being sub-lined, patients can be encouraged to get into non weight bearing activities such as swimming instead of the over-emphasized walking activity. Diabetics with leg amputations and on wheel chairs or crutches can be given aerobic exercises for arms and body. Katrina et al. (2006) also observed that more than half of their participants had to reduce their physical activity because of health problems. It is therefore a conclusion of this study that education targeted at reducing concerns about injury and including ways to reduce injuries and complications may be particularly important for diabetics in order to deal with these barriers.

Thirty one (22.3%) of the respondents lacked company and motivation to exercise. Diabetics are encouraged to get exercise partners or company who also act as accountability partners. Exercise for the diabetics is supposed to be a life-long venture for management of diabetes. For a diabetic to engage in such lifestyle modification and strictly adhere to the therapy, it calls for discipline and motivation. In their study, Murphy, et al., (1999) observed that being part of a group of people with similar health problems was beneficial as it gave the diabetics accountability, an opportunity to learn from each other as well as from the health professionals. Those who were unable to make it to the group exercise sessions reported finding it difficult to keep up their motivation in the other activities. Motivation as a

psychological factor, if addressed adequately, can go a long way to keep diabetics exercising and reaping the benefits.

Only four (4) of the respondents (2.9%) were under restriction in prison thus could not exercise as required. In studies done on diabetes management in prison by Farlane et al., (1992), it is evident that control is great with diet due to the highly restrictive diet but control of diabetes can be lost with prisoners on intense (highly demanding) PA in form of hard labour. Intense activity leads to hypoglycemia which is a worse complication.

Thirty two (23.0%) respondents reported inability to afford or access local fitness facilities and programmes. A similar observation has been made in the study by Paul and Van Heerden (2004) where 22% reported lack of sporting facilities. Thomas et al.

(2004) also accounted that 26% of inactive patients of less than 60 years reported lack of local facilities as a reason for inactivity. Diabetics who cannot gain access to fitness facilities or afford them can be encouraged and taught how to exercise in their own locality.

Majority of the respondents (56, 40.3%) reported to have found the amount of physical activity they engage in at work and home sufficient thus need not engage in more. This is a perception of diabetics, just as non-diabetics, that being physically active is a sufficient measure. Similar findings were reported in the study by Paul and Van Heerden (2004) where 22% of the non-exercisers were contented with non-participation in physical activity. Comparisons of those who perceived their activity level to be sufficient and the actual sufficient PA level were done and shown in Figure 1.

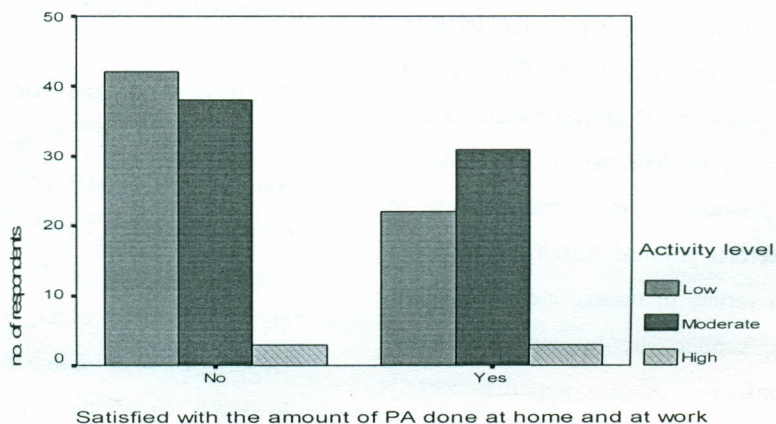


Figure 1: Distribution of self-perceived satisfaction with activity level in relation to actual PA level

As shown in Figure 1, majority of those who perceived themselves as not to have sufficient activity level were actually of low and moderate PA levels. However, a good number of those who perceived themselves to have sufficient PA levels

were of moderate activity level while the rest were of low activity levels.

Eighteen (12.9%) of the respondents did not perceive exercise to be necessary if one can successfully manage diabetes with other therapies. This factor

shows that there is a preference of other therapies over exercise by some diabetics despite its many benefits other than just managing diabetes. A similar observation was observed by Paul and Van Heerden (2004) in which 7% of respondents indicated that they did not believe exercise was necessary or beneficial.

Conclusions

The percentage of patients with diabetes who participate in significant physical activity is not satisfactory as physical activity is almost a mandatory form of management of diabetes. According to set standards, this is required for there to be health-related benefit. There are many hindrances to exercise which have been identified and need to be addressed. Many diabetics would like to exercise more, which is advisable, given the actual high rates of low level of activity but are hindered by these factors which can be addressed, their effects minimized and eliminated. Diabetics should be able to exercise according to their capabilities, physical limitations and personal interests and increase in compliance to exercise/physical activity therapy can be achieved by a variety of means, including public health programs, support groups and community-based interventions.

Recommendations

This study recommends that the medical institutions and exercise science professionals in Kenya should:

- 1) Strengthen the existing exercise therapy regime through in-depth patient and medical staff education on exercise.

- 2) Incorporate individualized patient exercise supervision, regulation of diabetics daily PA as well as offer encouragement through support groups and seminars.
- 3) Design exercise prescription manuals to be used in this region and programs for each group of diabetics to ensure adherence to exercise protocols and procedure.
- 4) Include a variety of exercises in diabetes education materials and ways which diabetics can incorporate exercise in their daily activity.
- 5) Sensitize the fitness industry on how to safely and effectively handle diabetes cases in their exercise and fitness programs through in-depth instructors and staff education on exercise and diabetes.

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