Importance of accurate food measurement and physical exercise on BMI and glycaemic control in obese type 2 diabetic patients

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Abstract

A prospective 3-month study was conducted among 36 obese type 2 diabetic patients in Ibadan, Nigeria to determine the effects of demonstrating accurate measurement of food quantity and training in moderate physical exercise on the body weight, body mass index (BMI), and fasting plasma glucose (FPG). Patients were randomly divided into two groups (experimental and control) of 18 patients each. The experimental group had demonstrations on accurate food quantity measurement and training in physical exercise, while the control group continued with the dietitian's verbal instructions. An interviewer-administered questionnaire was used to assess the socio-demographic characteristics of the patients. A 24-hour dietary recall and food diary were used to assess the patient's compliance with diet therapy. The frequency of performing the exercise was recorded in the diary by the patients. Compliance to diet therapy and exercise were scored good, fair, or poor. The mean age of the patients was 48±8 years. There was no significant difference in the age, sex, ethnicity, income, and adherence to dietitian's appointments by the two groups ($p>0.05$). However, compliance with diet therapy and exercise was significantly better – while body weight, BMI, and FPG levels were significantly reduced – in the experimental group compared with the control group ($p<0.05$). Though the study was short-term (3 months), it indicated that a combined, structured approach to diet and exercise can have beneficial effects in obese type 2 diabetic patients.

Introduction

The management of diabetes includes an adjustment of diet, engaging in regular moderate amounts of exercise, and blood glucose monitoring.[1]

A carefully planned hypocaloric diet combined with regular exercise is ideally obligatory as a means of lifelong behavioural change for obese type 2 diabetic patients. This is because excessive adipose mass largely contributes to insulin resistance which characterises the disease,[2] and appropriate diet and exercise can improve glycaemic control.[3] Exercise is an adjunct to diet therapy in the treatment of type 2 diabetes. If possible, 30 minutes of moderate physical activity on most days of the week is recommended.[2,4] Brisk walking is the preferred mode of exercise for type 2 diabetic individuals. Brisk walking means walking as fast as one could walk if one were late for an appointment (or walking at about 3 miles per hour.[5] Brisk walking is ideal because it does not require any special equipment, can be done anytime and at any place, and is generally safe.[5,6]

This study determines the effects of demonstrating accurate food quantity measurement, and trained moderate exercise (brisk walking for 30 minutes), on the body weight, body mass index (BMI), and glycaemic control in obese type 2 diabetic patients.

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Patients and methods

A prospective study was conducted over a period of 3 months among 36 obese (BMI ≥30) type 2 diabetic patients attending the Dietetic Clinic of the University College Hospital (UCH), Ibadan, Oyo State, Nigeria. All the 36 patients who consented to the study were on hypoglycaemic drugs and had been given standard verbal instruction by the dietitians on diet (1000–1500 Kcal/day) as well as the need for moderate physical exercise, at least 6 months beforehand. Obese patients with complications such as cardiovascular disease, uncontrolled hypertension, infection, or not willing to participate, were excluded from the study.

The patients were randomly divided into two groups (experimental and control) of 18 patients each. The experimental group was given practical demonstrations on how to prepare and quantify their cooked foods according to the prescribed calories, using household measures. The group was also trained in brisk walking for 30 minutes by a physiotherapist, and were asked to perform the physical exercise in the morning and evening every day, or for at least 3 days a week. The control group was instructed to continue with the dietitian's verbal instructions on diet and exercise. Interviewer-administered questionnaires were used to collect information. The baseline data were weight, height, BMI, and fasting plasma glucose (FPG).

The patients were asked to visit the dietitian every 2 weeks for follow-up. A 24-hour dietary recall and food diary kept by the patients was used to assess compliance with their diet. The frequency of performing the exercise was also recorded by each patient and submitted to the dietitian at every visit. Compliance of the patients with their diet and exercise were rated as good, fair, or poor if they scored >70%; 50–70%, and <50%, respectively.

The mean weight, BMI, and the FPG of the two groups of patients were also recorded at the end of the study. The data obtained from each group of patients were analysed as means with standard deviations (SD), or percentages, using the Statistical Package for Social Sciences (SPSS) statistical computer software (version 11.0). The changes in the initial and the final mean body weight, BMI, and FPG levels of the experimental and the control groups were compared. Student 's t-test was used to determine the significance of the difference between the two groups. Statistical significance was accepted at $p<0.05$.

Results

Among the 36 patients, 17 (47%) were male and 19 (53%) female. The mean age of the patients was 48±8 years, with a range of 36–57 years. Most (88%) were Yoruba. Also, a high percentage (91%) had no formal, primary, or secondary education. Most, 34 (94%) earned less than N40 000 (US$261) a month.

There were no significant differences in the mean age, sex, ethnicity, educational status, income, and adherence to the dietitian's appointment between experimental and control groups. However, compliance with diet therapy and exercise were significantly better in the experimental than in the control group ($p<0.05$) (see Table 1).

Table 2 shows the mean differences between the initial and the final body weight, BMI, and FPG of the experimental and the control groups. Significant reductions in the body weight, BMI, and FPG were observed in the experimental group compared with the control group ($p<0.05$).

Discussion

Although the duration of this study was relatively short (3 months), the information obtained from the experimental and the control obese patients who participated has shown that the demonstration of accurate food measurement and training in moderate levels of physical exercise contributed significantly to the reduction of body weight ($p=0.037$), BMI ($p=0.042$), and glyceamic control ($p=0.031$) of the obese type 2 diabetic patients, compared with when only verbal instructions were given to them. This also indicates that in developing countries where education of patients is generally low, there may be a need to carefully spell out the healthcare information given to patients.

Table 1 Age, gender, and compliance data for the experimental and control groups (means±SD)

Characteristics	Experimental group (n=18)	Control (n=18)	Total (n=36)	Significance
Age (years)	48±7	49±3	48±8	NS
Males n (%)	9 (50)	8 (44)	17 (47.2)	NS
Females n (%)	9 (50)	10 (56)	19 (52.8)	NS
Compliance to dietitian's appointment n (%)				
Good	16 (89)	15 (83)	31 (88)	NS
Fair	2 (11)	2 (11)	4 (11)	NS
Poor	0 (0.0)	1 (5.6)	1 (0.8)	NS
Compliance with diet therapy n (%)				
Good	16 (89)	4 (22)	20 (56)	p<0.001
Fair	2 (11)	9 (50)	11 (31	p<0.001
Poor	0 (0)	5 (28)	5 (14)	p<0.001
Compliance with exercise n (%)				
Good	16 (89)	2 (11)	18 (50)	p<0.001
Fair	2 (11)	10 (56)	12 (33)	p<0.001
Poor	0 (0)	6 (33)	6 (17)	p<0.001

Table 2 Mean body weight, body mass index, and fasting blood glucose before and after intervention (means ±SD)

	Experimental group (n=18)	Control group (n=18)	Significance
Body weight (kg)			
Initial	82.3±4.6	81.7±2.7	
Final	76.2±2.7	78.1±2.1	
Difference	–6.1±0.4	–3.6±1.9	p<0.05
Body mass index (kg/m^2)			
Initial	31.7±0.6	30.9±0.4	
Final	28.5±0.5	29.1±0.3	
Difference	–3.2±0.4	–0.8±0.2	p<0.05
Fasting blood glucose (mmol/L)			
Initial	12.9±1.4	12.1±1.2	
Final	8.6±0.8	10.9±1.7	
Difference	–4.8±0.7	–1.3±1.8	p<0.05

For example, in Nigeria, practical demonstrations given to patients as a group, on how to prepare and quantify different food items, should be given as an additional instruction which should follow the verbal individual dietary counselling usually given to diabetic patients. Also, the training in moderate physical exercise helped the patients to quantify the intensity or magnitude, duration, and type of the exercise rpescribed for them.

The guidelines of care should also encourage an organised care programme which should cover all aspects of healthcare management of diabetic patients. This should ideally involve a collaborative team approach with inputs from a range of health professionals who could contribute to a more effective delivery, and optimal care for diabetic patients[-7] Type 2 diabetic patients are encouraged to perform exercise regularly as a means of maintaining weight and glycaemic control.[8] Physiotherapists are trained to plan, design, and provide physical therapy services to individuals requiring them. These physiotherapists are available in many hospitals in Nigeria, but are not actively being involved in the management of obese diabetic patients.

Our study is short-term, and the beneficial effects on BMI and FPG required good levels of compliance from the experimental group of patients. Nevertheless, the results do suggest that a structured, multidisciplinary, educational approach can have significant beneficial effects on body weight and glycaemic control in obese type 2 diabetic patients.

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