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Original Research Article

EFFECT OF DIETARY INTERVENTION IN IMPROVEMENT & METABOLIC CONTROL WITH DIABETIC MELLITUS PATIENTS

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Abstract

Objectives: This study aimed to assess the effectiveness of dietary and lifestyle advice and determine the perception and attitudes of Omani adults with type 2 diabetes to diabetes management.

Methods: A cross-sectional epidemiological survey was conducted on 95 patients diagnosed with type 2 diabetes in Dubai. Metabolic parameters, dietary intake and exercise levels were evaluated in 2005 and re-evaluated in 2008.

Results: A total of 43% of the patients (male = 16, female = 27) had received no formal education. A significant reduction in fasting glucose and enhanced high density lipoprotein cholesterol were achieved in both male and female patients. However, in men, no changes were noted, other than in anthropometric and metabolic measurements and macronutrient intake. Conversely, women's macronutrient intakes reduced significantly leading to considerable improvement in body weight, body mass index, blood glucose and total cholesterol levels. Eleven patients (11.6%) admitted that they did not adhere at all to the diet advised by the dietician; 63.2% (n = 62) reported they followed their diet sometimes, and 25.2% (n = 25) stated they strictly followed the diet.

Conclusion: This minor improvement could be further enhanced by more health education.

Keywords: Diabetes Mellitus, Type 2; Compliance; Diet therapy; Dubai

Introduction

Type 2 diabetes has become one of the leading causes of disability and death in most developed countries as well as in developing countries undergoing rapid economic transition.[1,2] Oman is not an exception to this trend. It has progressed rapidly from an agrarian subsistence economy, emphasising animal husbandry and date production, to a diverse economy producing oil and oil-based products and with growing commerce and tourism sectors. This rapid change has had a huge impact on the lifestyle of the Omani population in the last three decades.

The first national diabetes survey, conducted by the Ministry of Health in collaboration with the

WHO in 1991, estimated that 10% of the Omani population aged 20 years or above had diabetes.[3] The latest study by Al-Moosa *et al*. in 2006 found that the prevalence of diabetes in the capital region of Muscat was 17.7%.[4] Type 2 diabetes presents as a complex spectrum of hypertension, hyperglycemia, insulin resistance, and dyslipidemia.[5,6] It is well known that obesity plays a central role in the development of insulin resistance and type 2 diabetes.[7,8] Diet and exercise modification are considered important components of the treatment strategy for adults with type 2 diabetes.6 Suitable use of diet and exercise can improve glycemic control and insulin sensitivity and reduce the need for insulin or oral medications.[5, 9] The Finnish Diabetes Prevention Study demonstrated that the risk of type 2 diabetes can be reduced significantly through a personalized intensive lifestyle intervention (i.e., individualized dietary advice and physical activity regime).[10,11, 12]

These studies showed that type 2 diabetes can be prevented through non-pharmacological means.

However, non-adherence to diet and exercise in the long-term was found to be the most frequently reported barrier in diabetes self management.[13,14]

Methods

A cross-sectional survey study was designed for Dubai citizens with type 2 diabetes living in north of dubai. In Dubai, every new case of diabetes is registered on the National Diabetes Register which is a part of "Diabetes Control Programme" initiated by the Ministry of Health in 2000. The registry, which is regularly updated, contains patients' demographic data, medical history, clinical assessment, laboratory investigation results, initial treatment plan, referrals, and follow-up plans. This registry was used to identify the patients for the study. There were a total of 198 cases of new type 2 diabetics in 2004 at the Diabetic Clinic at Al-Buraimi Hospital. Of these patients, 185 had complete diagnostic clinical and biochemical data which were obtained at the time of diagnosis. Out of these 185 patients, 65 cases were excluded from the study as they had not been attending the Diabetes Clinic for the last 6 months or the relevant data were missing. A further 3

patients were excluded as they did not receive any dietary advice during their treatment. Out of 121 patients who were invited to participate in the study, 23 declined. In the end, 98 patients were enrolled for the study. Thirty-three were treated with diet only and 65 patients were either on hypoglycemic agents and/or insulin to control blood glucose.

Upon enrolment, all patients received nutrition and lifestyle counselling based around four key themes: education about diabetes; diet and nutrition; weight management, and exercise.

Particular emphasis was given to education, i.e., what diabetes is, why it is important to control blood glucose, possible complications, why regular exercise is important etc. In Oman, although the dietary guidelines for diabetic patients are the same as for the general populations, individualised diet plans are prescribed to the patients.

The initial assessment of patients' diabetic management and their perception of the importance of diet and exercise took place in 2005.

Following the assessment, all patients received dietary and lifestyle advice and were re-invited in 2008 in order to assess: 1) if this advice had encouraged the patients to make any changes, and 2) if it did, how it affected diabetic control, taking into account each subject's primary method of diabetes management (diet control, hypoglycemic agents and insulin). Dietary assessment and anthropometric and biochemical measurements were carried out in 2005 and in 2008. The recommended targets for nutrition and lifestyle advice on metabolic control described were used to assess patients' compliance.[15]

Ethical approval was granted by the Ministry of Health, dubai. The nature and aim of study was

explained to all participants (in both verbal form and via a written information sheet) and written

consent was obtained from each participant. This investigation was conducted in accordance with the principles of the Declaration of Helsinki II. All patients were asked to complete (with or without assistance from the dietician) a food frequency questionnaire, which contains more than 60 questions covering five food sections: meat, milk, fruits and vegetables, breads, and other food and some Omani-style beverages. Food composition tables for Arab Gulf countries were used to analyse the nutrient composition.[16]

Height, weight and blood pressure were measured by one of the investigators according to WHO recommendations.[17] A digital scale was used to measure weight; subjects were weighed dressed in their own clothing hence a 1kg subtraction was set onto the device to account for the weight of the attire. Readings were recorded to the nearest kilogramme. The height of subjects was measured using a stadiometer and recorded to the nearest centimetre. Blood pressure was measured using an electronic measuring device. All subjects rested for ten minutes before recording their blood pressure. A digital sphygmomanometer made three consecutive blood pressure readings for each. Blood samples, after 12 hr. fasting, were obtained twice from the patients: on the same day on which they enrolled and had nutrition counselling, and then once during follow-up counselling.

The samples were used to determine glucose, glycosylated haemoglobin (HbA1c) and lipid profile (total cholesterol, low density lipoproteins (LDL), high density lipoproteins (HDL), and triglyceride). The paired-sample t-test was used to determine the changes in parameters between 2003 and 2004. The difference in macronutrient intake and the type of primary diabetes management was compared between the subjects by gender and was assessed with an independent t-test. The Statistical Package for the Social Sciences (SPSS), Version 16.0 for Windows, (SPSS Inc., Chicago, IL, USA) was used in data analysis. Results are given as mean values with corresponding standard deviations (SD). *P* values below 0.5% were considered significant.

Results

The demographic description of the patients is summarized and 96 patients, 90.8%were over 30 years old and 42.9% had received no formal education. The most common form of diabetes management used by the subjects was hypoglycemic agents. A total of 33 subjects followed a controlled diet only, 15 subjects used both insulin and hypoglycemic agents, and 9 subjects used insulin to control their blood sugar level. A total of 28 patients (28.6%) also used traditional herbal medicine. 75% of male (n = 37) and 51% of female (n = 25) patients also presented with hypertension and/or hyperlipidemia at the time of diagnosis in 2005.

As far as changes in body weight and metabolic measurements, a significant reduction in fasting glucose was achieved in both male and female patients. In men, no changes were noted in weight, body mass index (BMI), HbA1c, blood pressure, LDL-cholesterol and triglycerides over the three years of the study. In contrast, women made considerable improvement in terms of body weight, BMI, blood glucose, and total cholesterol levels. There was no significant difference in the metabolic measurements between different diabetes management groups, as it has no obvious effect on the rate of blood glucose level in the subjects. Examination of changes in macronutrient intakes revealed that in 2005 women had a greater total calorie intake ($P < 0.01$) compared to men. However, the macronutrient intake did not differ between the two sexes in 2005. In men, no changes were found in macronutrient intake between 2005 and 2008.. On the contrary, women had a significant reduction in the amount of macronutrients over the three years. In 2008, the average total energy intake (kcal/day) in women was reduced by 18% compared to that of 2005. Moreover, women less fat, carbohydrate

and protein (21%, 14% and 14% respectively) per day (g/day) in 2008 than they did in 2005.

Dietary compliance was divided into three categories: always, sometimes and none. Only 11 patients (11.6%) admitted that they never adhered to the diet advised by the dietician, while 63.2% (n = 62) reported they followed their diet sometimes and 25.2% (n = 25) stated they strictly followed diet.

Patients were grouped into three clusters according to physical activity: sedentary, moderate and active. A total of 47% of the patients (n = 46) reported they were “active”, 24% “moderate” and 28% “sedentary”. The most common form of physical activity reported was walking.

Finally, patients were asked about their perceptions and beliefs and attitudes toward diet and exercise and their effect on metabolic control. A total of 21.2% of the patients reported that they strongly believed “drinking 0.5 cup fruit juice improves hypoglycemia” and 9.6% strongly believed that “diet only is sufficient for improving blood sugar”. Regarding exercise, 55.8% of the patients strongly believed that “exercise improves blood sugar”.

Moreover, 15.4% of the patients also strongly believed that “taking traditional herbs improves blood sugar levels”. Furthermore, more than 10% of the patients did not follow the advice, as they did not believe diabetes or diabetes related complications would affect their quality of life.

Discussion

This epidemiological survey was designed to assess the impact of nutritional and lifestyle advice given to patients by dietitians and to determine the perception of and attitudes to diabetes management of type 2 diabetic patients attending the Diabetic Clinic at Hospital.

In this study, nutrition and lifestyle counseling made a small improvement in metabolic control in diabetic patients. At the time of this study, there were no specific dietary recommendations for people with diabetes in dubai. The guidelines used for diabetic patients at the Hospital were similar to the ones recommended for the general population, i.e. total calorie intake should constitute 50–55% carbohydrates, ≤30% fat (<10% saturated, 10% polyunsaturated, 10% monounsaturated) and 10– 15% protein with 300 mg/day or less cholesterol. In addition, diabetic patients were advised to eat frequent small meals in order to maintain a steady blood sugar level.[18] The subjects’ fasting blood glucose level showed a very slight change among the subjects in the study, while the fasting blood glucose and HDL-cholesterol levels showed a marked improvement, though this did not reach the target value in all subjects in the study. This could be due to the decrease in nutritional intake, especially from fat and carbohydrate among the subjects in the study. On the other hand, HbA1c did not change, which is an important result. Unexpectedly, despite a higher illiteracy rate in women, the compliance for dietary advice was better in female patients; overweight and obese women achieved an average of 3.0 kg and 7.1 kg weight loss respectively over three years. This could be explained by the substantial reduction of total energy and nutritional intake in women which was associated with a decrease in blood pressure and lipids profile. On the contrary, there was no enhancement noted in HbA1c, blood pressure or lipids profile levels in men and, in addition to this, 16.4 % of men whose BMI was within ideal body weight in 2005 became overweight (30< BMI ≥25) by year 2008. This could be explained by the substantial reduction of total energy and nutritional intake in women in 2008 (when compared with 2005) and the lack of change in the nutritional intake levels in men from the collection of baseline figures until the end of the study.

Conclusion

The nutritional and lifestyle advice for the type 2 diabetic patients in the study brought about a slight improvement in fasting glucose level in both male and female patients. Female patients made a significant improvement in body mass index, total cholesterol levels and macronutrients intake over three years. This minor improvement in the overall metabolic control could be further enhanced by increasing health education. More than 70% of the subjects in the study were active which is considered to be an important factor in managing obesity (BMI) and lowering the glycemic index in diabetic patients;18 however, obesity in these type 2 diabetic patients was also more likely due to poor dietary habits rather than to lack of exercise.[24]

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