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Original Research Article

Impact of Nutrition Health Education on Blood Sugar & Lipid Profile in Type-2 Diabetes Mellitus Subjects

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Abstract: The number of people with diabetes mellitus is increasing due to population growth, aging, urbanization, & increasing prevalence of obesity & physical inactivity. The aim of this work was to determine the impact of Nutrition health education (NHE) & Interpersonal counseling (IPC)on physiological indicators like blood glucose, glycated hemoglobin (HbA_{1c}) & Lipid profile (total cholesterol, triglyceride, high density lipoprotein, low density lipoprotein) of type 2 diabetes mellitus subjects. In this study T2DM subjects with or without complication, on treatment were taken from endocrine & medicine OPD of M.K.C.G. Medical College & Hospital. They were subjected to do blood tests in the RDC of the same hospital. Consent was taken from the apparently healthy T2DM subjects who were willing to participate in the study (n=200). They were divided into two groups: experimental group & control group. The subjects of experimental group were imparted nutrition health education through interpersonal counseling at Department of Physiology of the same college with the help of booklets. The control group did not receive any intervention. The NHE was given over a period of 1 year. The IPC was given at an interval of 3 months. Blood glucose [fasting plasma glucose (FPG) & 2hr post prandial blood glucose (2hrPPBG)], HbA1c, & lipid profile was done at the end of each 3rd month. Statistical analysis was done by using paired "t" test. There was significant reduction in FPG, HbA1c, total cholesterol, LDL-C, & non HDL-C in the experimental group than the control group. So advocacy measures are to be developed & adopted to sensitize theT2DM patients to build up their capacities.
Keywords: Nutrition health education (NHE), interpersonal counseling (IPC), Glycated hemoglobin (HbA1c), Lipid profile, Type 2 diabetes mellitus (T2DM)

INTRODUCTION

The number of people with diabetes mellitus is increasing due to population growth, aging, urbanization, & increasing prevalence of obesity & physical inactivity. Type 2 Diabetes Mellitus is the major cause of morbidity & mortality. It is also an important public health issue worldwide. The cost of diabetes care is very high throughout the world now a days. In India & other developing countries only 5% of gross domestic product (GDP) is spent on health care. Hence rising prevalence of T2DM poses a major clinical, economic & social burden in India. It has been noticed that lifestyle programs provide effective prevention strategies for reducing the risk of developing diabetes. Lifestyle programs also provide optimal management in patients already having T2DM. Diabetes education encourages the patients to take responsibility for their own health.

Diabetes is a chronic illness that requires a holistic approach in terms of care to prevent both acute and long-term complications. Nutritional management for diabetic patients has been evolving for 100 years as the pathophysiological basis of the complications incurred from diabetes becomes more explicit [1]. Medical nutrition therapy for diabetics can be divided into (1) dietary interventions and (2) physical activity. Lifestyle and dietary modifications form the cornerstone of therapy in type 2 diabetic patients (insulin resistance) [2]. In type 1 diabetic patients, who have an insulin deficiency, a balance between insulin and nutrition needs to be obtained for optimal glycemic control. This study was to determine the impact of nutrition health education (NHE) & interpersonal counseling on physiological indicators like blood sugar, glycated hemoglobin (HbA_{1c}), & lipid profile in T2DM patients.

MATERIALS AND METHODS:

200 apparently healthy T2DM subjects within the age group of 55 to 65 years were taken as the study population. Written consent was taken from all the subjects. 100 subjects were taken as the experimental group & rest 100 were taken as the control group. Cases were taken from endocrine & medicine OPD of M.K.C.G. Medical College & Hospital, Brahmapur, Odisha, during July 2015 to June 2016.

Baseline data were collected by general examination, history taking, and anthropometry &24-hour dietary recall. Blood tests: fasting blood sugar, 2-hour PPBG, Lipid profile & HbA_{1c} at RDC, M.K.C.G. Medical College & Hospital, Berhampur. All the parameters were monitored at baseline, 3 months, 6 months, 9months & at the end of 1 year. From dietary profile of the subjects' calorie, fat, protein, carbohydrates, fiber intake were calculated by using the nutritive value of Indian foods.

Nutrition Assessment was done by: Type of diabetes, any complications; Blood sugar control; Past medical history; Anthropometrics- height, weight, BMI, body composition; Medications, including supplements; Dietary 24 hour recall (meals, snacks, and beverages); Favorite foods; Food allergies; Eating patterns and habits; Physical activity; Readiness to change; Attitude

The control group did not receive any counseling. The experimental group received one-to-one counseling initially, and then at an interval of three months for a period of one year. The counseling was done in the Department of Physiology, M.K.C.G. Medical College, and Berhampur. The subjects were given the first counseling in two groups by the same person in two different periods i.e. one batch in the morning from 10am to 12 noon & the other batch in the afternoon from 2pm to 4 pm.

Nutrition Counseling was done by: Patient's lifestyle; Work schedule; Family life; Support system; Education level; Knowledge about diabetes and nutrition; Record keeping abilities; Attitude ; Ability to adapt to change; Reaction to advice; Goal setting. The NHE was given over a period of 1 year. The IPC was given at an interval of 3 months. Blood glucose, HbA_{1c}, & lipid profile was done at the end of each 3rd month. Statistical analysis was done by using paired "t" test.

RESULTS:

Table 1: Anthropometric parameters of experimental group (n=100)

Parameters	Male	Female
Number	74	36
Age (years)	57.4±6.3	55.6±12.3
Height (m)	1.62±5.45	1.52±4.2
Weight (kg)	73.9±10.3	64.4±9.5
BMI (kg/m^2)	27.8±4.5	25.7±5.7
Waist circ (cm)	101.4±15.7	87.2±19.6

Table 2: Anthropometric parameters of control group (n=100)

Parameters	Male	Female
Numbers	74	36
Age (years)	58.4±9.0	54.9±9.0
Height (m)	1.67±7.9	1.53±2.5
Weight (kg)	67.5±6.3	61.2±8.7
BMI (kg/m^2)	25.6±3.5	25.8±3.6
Waist circ. (cm)	89.1±9.4	85.2±12.5

Table-3: Mean nutrient intake of experimental subjects

Diet composition	Baseline	3months	6months	9m0nths	1 year
Calories (kcal)	1896±421	1546±554	1436±449	1238±324	1256±213
Protein (g)	46.4±12.4	50.4±12.6	56.8±8.5	57.2±4.2	58.2±5.6
Carbohydrate (g)	227.6±63.2	210.2±42.6	204.2±24.3	184.3±26.4	180.2±26.4
Fat (g)	64.2±24.2	56.2±20.4	46.4±12.4	40.2±12.6	40.2±10.2
Fiber (g)	6.8±2.4	7.6±2.6	8.3±2.3	8.6±2.4	8.4±2.1
Fiber/1000 kcal	3.9±2.1	3.6±2.4	3.2±2.3	3.1±2.4	3.1±1.8

Table-4: Mean nutrient intake of control subjects

Diet composition	Baseline	3months	6months	9m0nths	1 year
Calories (kcal)	1896±446	1946±354	1838±349	1948±224	1856±323
Protein (g)	45.4±12.4	42.4±10.6	42.8±07.5	47.2±9.2	44.2±8.6
Carbohydrate g)	227.6±33.2	231.2±32.6	244.2±34.5	265.3±36.2	245.2±36.4
Fat (g)	67.2±14.2	76.2±23.4	64.4±14.4	80.2±10.5	72.2±09.4
Fiber (g)	5.8±1.4	5.6±3.6	6.3±1.3	4.6±0.4	6.4±3.1
Fiber/1000 kcal	3.1±1.6	3.2±2.0	3.6±2.1	3.8±2.6	2.1±0.8

Table-5: Impact of NHE on Glycemic &lipemic status of experimental subjects

Parameters	Baseline	3months	6months	9months	1 year
FPG	145±43	140±53*	134±42	122±35	112±45**
2hrPPG	184±56	165±43*	153±52	148±41	142±12**
HbA_{1c}	7.3±0.6	7.1±0.8*	6.8±0.5	6.4±0.4	6.2±0.6**
TC	236±42	192±41*	184±35	174±24	156±12**
TG	153±21	150±24	143±15	132±05	132±02**
HDL	40±12	46±08	45±15	54±06	60±02**
LDL	152±54	132±23*	126±20	110±12	112±08**

(*) significantly different from baseline at P<0.01, (**) significantly different from baseline at P<0.001

Table-6: impact of NHE on Glycemic &lipemic status of control subjects

Parameters	Baseline	3months	6months	9months	1 year
FPG	144±38	144±42	142±23	140±14	140±18
2hrPPG	180±43	185±32	180±52	182±32	186±15
HbA_{1c}	7.6±0.2	7.5±0.5	7.8±0.4	7.6±0.3	7.8±0.6
TC	236±42	240±46	232±32	234±14	246±9
TG	153±21	156±14	155±28	152±15	156±12
HDL	46±10	44±12	42±10	38±02	42±06
LDL	142±54	152±32	156±10	150±12	140±08

From the above tables, it has been seen that there is marked reduction of FPG, 2hr PPG, HbA_{1c}, TG, and LDL in the experimental group having nutritional health education by counselling than the control group without any dietary counselling. There is marked increased in HDL in experimental group than in control group.

DISCUSSION

Many factors affect how well diabetes is controlled. Many of these factors are controlled by the person with diabetes, including how much and what is eaten, how frequently the blood sugar is monitored, physical activity levels, and accuracy and consistency of medication dosing. Even small changes can affect blood sugar control. Eating a consistent amount of food every day and taking medications as directed can greatly improve blood sugar control and decrease the risk of diabetes-related complications, such as coronary artery disease, kidney disease, and nerve damage. In addition, these measures impact weight control. A dietician can help to create a food plan that is tailored to a person's medical needs, lifestyle, and personal preferences. The weight is a direct reflection of how much is eaten and how much is the activity level. Eating a consistent number of calories every day can help to control blood glucose levels and maintain body weight. In overweight or obese persons, losing weight by eating fewer calories or increasing activity levels can improve blood sugar control, and lower blood pressure and cholesterol levels.

MNT Goals for Diabetes:

- Carbohydrate intake should be monitored for glycemic control.
- A variety of carbohydrates from fruit, vegetables, whole grains, legumes, and fat-free/low-fat dairy products should be included in the diet.
- The glycemic index guidelines may provide a modest benefit.
- Excess energy intake should be avoided.
- Lifestyle modifications are to be encouraged to improve glycemia, dyslipidemia, and blood pressure.
- Caloric intake, saturated and trans fats, cholesterol, and sodium intake should be reduced.
- Intake of fiber, nutrient-rich foods should be increased.
- Energy expenditure should be increased

Eating a healthy diet can:

a. Prevent complications from high blood sugars like nerve problems, kidney problems, and vision problems
b. Prevent other complications like heart disease and circulatory problems
c. Help you control your blood sugars and blood lipids
d. Help you maintain a healthy weight or lose weight if you are overweight
e. Allow you to take less medication or avoid taking medication for your diabetes
f. Lose weight if you are overweight
g. Exercise to promote or maintain weight loss
h. Monitor carbohydrate intake to maintain blood sugar control
i. Obtain carbohydrates mainly from fruits, vegetables, whole grains, legumes, and low-fat or skim milk
j. Consume at least 130 grams carbohydrate per day (do not use low-carbohydrate diets to treat diabetes)
k. Use sugar substitutes if desired
l. Limit saturated fat, trans fat, and dietary cholesterol.

Breakdown of Macronutrients should be:

Total carbohydrate: 45-65% of total calories; Protein: 10-35% of total calories; fat: 20-35% of total calories. Food groups include macronutrients and micronutrients. There is no optimal diet mix of macronutrients that can be prescribed to the entire diabetic population. Dietary needs are to be individualized. Reduction in fat (saturated fats, trans - fats, cholesterol) intake in diabetic patients is aimed at decreasing cardiovascular disease risk by reducing plasma cholesterol and low-density lipoprotein (LDL) cholesterol levels [3-5]. Low-carbohydrate and low-fat diets used to achieve initial weight loss are effective for 1 year and need monitoring with a lipid profile and renal function tests. Low-carbohydrate diets (20-120 g/d) carry the additional benefit of a favorable lipid profile as compared with low-fat diets. Low-carbohydrate diets have also been noted to decrease fasting plasma glucose values by about 21-28 mg/dL [6-7].

For patients who are on insulin therapy or oral hypoglycemics, being on a restrictive diet requires adjustment of dosage to prevent hypoglycemia. Carbohydrate choices in diabetes are as follows:[8-9]: Carbohydrates necessary for energy, some vitamins, fiber, and dietary palatability and as a major regulator of postprandial glucose levels. Recommended daily allowance for carbohydrates is 130 g/day. Type of carbohydrates (ie, starch, amylose, amylopectin) consumed reflects on postprandial glucose values. Low–glycemic index foods are recommended. Nonnutritive sweeteners have fewer calories compared with regular sucrose used in table sugar but have not been shown to reduce glycemia [10].

Dietary fat recommendations in diabetes are as follows: [11-12] Total dietary cholesterol consumption of less than 200 mg/day. Saturated fat intake consumption of a maximum of only 7% of one's daily intake. Servings of no fried fish recommended weekly as a form of omega-3 fatty acids, which have been postulated to reduce adverse cardiovascular disease outcome. Plant sterols intake to block intestinal absorption of cholesterol and lower total plasma LDL cholesterol percentage, if intake is around 2 g/d. Protein recommendations in diabetes are that a good quality, high-protein diet is recommended. This measure can aid in achieving weight loss and blood glucose level control [5]. In addition to the macronutrients, micronutrients are an important component of a balanced diet. Uncontrolled diabetic patients are usually micronutrient deficient because of poor dietary choices. Physicians should encourage meeting daily needs from a healthy, balanced diet rather than from supplementation with multivitamins [13].

If this cannot be achieved, then a daily multivitamin is acceptable. Zinc, copper, and chromium have been studied but do not play any role in achieving tight glycemic control [14]. Much interest has been sparked in the role of antioxidants and diabetes, as diabetes has been noted to be a state of oxidative stress. Flaxseed has been shown in experiments to decrease inflammatory markers in type 2 diabetic patients, but there are no specific and reliable recommendations [15].

CONCLUSION

Managing diabetes requires a multidisciplinary approach, and nutrition and physical exercise are 2 significant facets to help reduce the global burden of the diabetes epidemic. To ensure successful outcomes, physicians, patients, and dietitians need to work together. Studies have shown one-on-one consultations with a qualified registered dietician improve patient adherence to prescribed diabetic diets. Diet plays an important role in many diseases, including the most common health problems: heart disease, certain cancers, obesity, stroke, hypertension and type 2 diabetes mellitus. There was significant reduction in FPG, HbA1c, total cholesterol, LDL-C, & non HDL-C in the experimental group than the control group. So advocacy measures are to be developed & adopted to sensitize theT2DM patients to build up their capacities. The cornerstones of therapy for type 2 diabetic patients are diet and lifestyle modifications. For type 1 diabetic patients, the goal of optimal glycemic control can be

achieved with a balance between insulin and nutrition needs.

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