Original Research Paper

Volume - 10 | Issue - 8 | August - 2020 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Home Science

EFFECT OF LOW GLYCAEMIC INDEX DIET ON GLYCAEMIA IN PATIENTS WITH TYPE 2 DIABETES

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ABSTRACT Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. Raised blood glucose, a common effect of uncontrolled diabetes may over time lead to serious damage to the heart, blood vessels, eyes, kidneys and nerves. Glycemic Index (GI) is a scale, which helps in ranking the carbohydrate rich foods, depending on how they affect blood glucose levels in a span of 2-3 hours after having food. The effect of glycaemic index diet has lot of impact on glycaemia patients with type 2 diabetes.

KEYWORDS : Low Glycaemic Index Diet, Type 2 Diabetes Mellitus, FBS, PPBS and HbA1C

INTRODUCTION

Diabetes mellitus or Type 2 Diabetes Mellitus is one of the major non-communicable and fastest growing public health problems in the world and is a condition difficult to treat and expensive to manage. Diet constitutes a crucial aspect of the overall management of diabetes that may involve diet alone, diet with oral hypoglycaemic drugs or diet with insulin). Low glycaemic index diet is used in this study for the management of the Type 2 Diabetes in order to promote overall nutritional well-being, glycaemic control, and prevent or ameliorate diabetes-related complications. Type 2 Diabetes Mellitus (T2DM) accounts for 90 per cent to 95 per cent previously it was known as Non-Insulin Dependent Diabetes or Adult Onset Diabetes, which affects individuals who have insulin resistance and usually have relative insulin deficiency initially, and often throughout their lifetime, these individuals do not need insulin treatment to survive. Its risk is determined by interplay of genetic and metabolic factors. Ethnicity, family history of diabetes, and previous gestational diabetes combine with older age, overweight and obesity, unhealthy diet, physical inactivity and smoking to increase risk. Excess body fat, several aspects of diet and physical activity, is the strongest risk factor for Type 2 Diabetes, both in terms of clearest evidence base and largest relative risk. Overweight and obesity, together with physical inactivity, are estimated to cause a large proportion of the global diabetes burden (Akram T. Kharroubi and Hisham M. Darwish, 2015).

REVIEW OF LITERATURE

Maffi, P. and Secchi A. (2017) appraised that the global prevalence of diabetes has increased substantially, reaching to 8.3 per cent in 2014 corresponding to 387 million patients. Most gloomy feature of the rapid increase of diabetes is the emergence of Type 2 Diabetes in children, adolescents and young adults. Diabetes immensely influences the patient's survival, quality of life and development of organ system degeneration.

Marsh, K. (2011) concludes that both the amount and type of carbohydrate are immensely important in predicting glycemic response to a meal. Diets based on low GI carbohydrate containing foods have been associated with a reduced risk of Type 2 DM and CVD, and intervention studies have also shown improvements in insulin sensitivity and A1C in those with diabetes. Low GI diets may also assist with weight management through effects on satiety as well as fuel partitioning.

David et al. (2012) carried out a study on the effect of Legumes as Part of a low Glycaemic Index diet on Glycaemic Control and Cardiovascular Risk Factors in Type 2 DM. The results revealed that low-GI legume diet reduced HbA_{1c} values by −0.5 per cent (95% CI, −0.6% to −0.4%) and the high wheat fibre diet reduced HbA_{1c} values by −0.3 per cent (95% CI, −0.4% to −0.2%). The relative reduction in HbA_{1c} values after the low-GI legume diet was greater than after the high wheat fibre diet by −0.2 per cent (95% CI, −0.3% to−0.1%; P < .001).The respective CHD risk reduction on the low-GI legume diet was −0.8 per cent (95% CI, −1.4% to −0.3%; P = .003), largely owing to a greater relative reduction in systolic blood pressure on the low-GI legume diet compared with the high wheat fibre diet (−4.5 mm Hg; 95% CI, −7.0 to −2.1 mm Hg; P < .001). Incorporation of legumes as part of a low-GI diet improved both glycemic control as well as reduced calculated CHD risk score in Type 2 DM.

Objectives

- To identify the Type 2 Diabetic clients
- To assess the blood sugar of Type 2 Diabetic clients by pre-test
- To develop and standardise the Low Glycaemic Index food to Type 2 Diabetic clients
- To study the effect of Low Glycaemic Index food on blood sugar of Type 2 Diabetic clients

METHODOLOGY

The Type 2 Diabetic clients were selected from the outpatient diabetic clinics at Tirupati, with the consent of the client and the treating physician. For basic study 120 diabetic patients were selected. The subjects were divided into 4 groups, i.e. experimental group I, experimental group II, experimental III and control group, each group comprises 30 subjects. The following 4 categories were used for giving interventions for the period of 12 weeks.

Experimental group I (30) - Low Glycemic Index diet supplementation.

Experimental group II (30) - Low Glycemic Index diet supplementation and counseling

Experimental group III (30) - only counseling

Control group (30) - No intervention

Biochemical Parameters

Multiple factors are involved in the development as well as prognosis of type 2 diabetes mellitus to cardiovascular complications. To identify some of these factors in this study the changes in FBS, PPBS and HbA1c in the Type 2 DM clients were investigated. Fasting blood sugar samples were taken from the type 2 DM clients to measure the blood sugar by using standards procedures. The standard techniques / methods used for the assessment of Biochemical parameters in Type 2 Diabetic client are presented below.

Sl. No.	Parameters	Method
1	FBS	GOD/POD method
2	PPBS	GOD/POD method
3	HbA1C	HPLC method

RESULTS AND DISCUSSION

The results of the analysis of FBS, PPBS and HbA1c in the Type 2 DM clients are discussed below.

Fasting blood sugar (FBS)

Fasting blood sugar levels give vital clues about how a person's body is managing blood sugar. Blood sugar tends to peak about an hour after eating and declines after that. High fasting blood sugar levels point to insulin resistance or diabetes, while abnormally low fasting blood sugar could be due to diabetes medications. Knowing when to test and what to look for can help keep people stay healthy, especially if they have diabetes or are at risk of developing the condition. The table 1 shows the results of FBS and also presented in the Fig.1.

Table 1 Distribution of sample according to FBS

FBS	Pre- test				Total	Post- test				Total
	Exp Group I	Exp Group II	Exp Group III	Control group		Exp Group I	Exp Group II	Exp Group III	Control group	
Good	3 (10)	3 (10)	3 (10)	3 (10)	12 (10)	6 (20)	20 (66.7)	6 (20)	8 (26.7)	40 (33.3)
Fair	17 (56.7)	15 (50)	19 (63.3)	22 (73.3)	73 (60.8)	21 (70)	9 (30)	21 (70)	17 (56.7)	68 (56.7)
Poor	10 (33.3)	12 (40)	8 (26.7)	5 (16.7)	35 (29.2)	3 (10)	1 (3.3)	3 (10)	5 (16.7)	12 (10)
Total	30 (100)	30 (100)	30 (100)	30 (100)	120 (100)	30 (100)	30 (100)	30 (100)	30 (100)	120 (100)

The table 1 portrays that in pre- test, experimental group I, majority of the respondents (56%) are under fair control, followed by one third of the respondents (33.3%) are under poor control and remaining (10%) are under good control while in experimental group II, fifty per cent are under fair control, followed one third (33.3%) are under poor control and remaining (10%) are under good control. In experimental group III, majority of the respondents (63.3%) are under fair control, followed by around 27 per cent are under poor control and remaining (10%) under good control. In post- test, in experimental group I, majority of the respondents (70%) are under fair control, followed by 20 per cent are under good control and remaining (10%) are under poor control while in experimental group II, majority of the respondents (66.7%) are under good control, followed by 30 per cent are under fair control and remaining (3.3%) under poor control while in experimental group III, majority of the respondents (70%) are under fair control, followed by 20 per cent are under good control and remaining (10%) under poor control. In case of control group, majority of the respondents (56.7%) under the fair control, followed by 26.7 per cent are under good and remaining (16.7%) are under poor control. It is concluded that post test has lot of impact on the improvement of FBS from 10 per cent to 33.3 per cent.

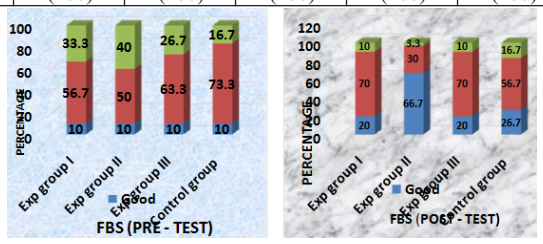


Figure 1 Distribution of sample according to FBS

2. Postprandial Blood Sugar (PPBS)

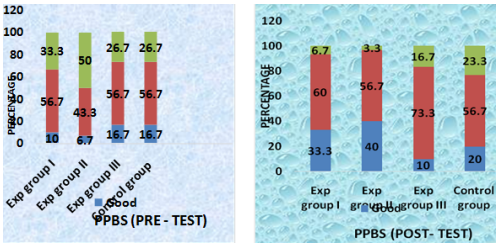
Blood sugar after a meal is called postprandial blood sugar. Majority of patients with diabetes fail to achieve their glycemic goals. Elevated postprandial glucose (PPG) concentrations may contribute to suboptimal glycemic control. Postprandial hyperglycemia is also one of the earliest abnormalities of glucose homeostasis associated with type 2 diabetes and is markedly exaggerated in diabetic patients with fasting hyperglycemia. The table 2 and Fig.2 4 show the results of PPBS.

Table 2 Distribution of sample according to PPBS

PBS	Pre- test				Total	Post- test				Total
	Exp. Group I	Exp. Group II	Exp. Group III	Control group		Exp. Group I	Exp. Group II	Exp. Group III	Control group	
Good	3 (10)	2 (6.7)	5 (16.7)	5 (16.7)	15 (12.5)	10 (33.3)	12 (40)	3 (10)	6 20)	31 (25.8)
Fair	17 (56.7)	13 (43.3)	17 (56.7)	17 (56.7)	64 (53.3)	18 (60)	17 (56.7)	22 (73.3)	17 (56.7)	74 (61.7)
Poor	10 (33.3)	15 (50)	8 (26.7)	8 (26.7)	41 (34.2)	2 (6.7)	1 (3.3)	5 (16.7)	7 (23.3)	15 (12.5)
Total	30 (100)	30 (100)	30 (100)	120 (100)	30 (100)	30 (100)	30 (100)	30 (100)	30 (100)	120 (100)

The table explicitly shows that in pre- test experimental group I, majority of the respondents (56.7%) are under fair control, followed by 33.3 per cent are under poor control and remaining (10%) are under good control whereas in experimental group II, fifty per cent of the respondents are under poor control, followed by 43.3 per cent are under fair control and remaining (6.7%) are under good control. In experimental group III, majority of the respondents (56.7%) are under fair control, followed by 26.7 per cent are under poor control, and remaining (16.7%) are under good control while in control group, majority of the respondents (56.7%) are under fair control followed by 26.7 per cent of the respondents are under poor control and remaining (16.7%) are under good control. In post test, in experimental group I, majority of the respondents (60%) are under fair control, 33.3 per cent under are good control and remaining (6.7%) are under poor control, in experimental group II, majority of the respondents (56.7%) are under fair control, 40 per cent are under good control and remaining (3.3%) under poor control whereas in experimental group III, majority of the respondents (73.3%) are under fair control, 16.7 per cent are under poor control and remaining (10%) are under good control. In case of control group, majority of the respondents (56.7%) are under fair control, 20 per cent are under good control and remaining (23.3%) are under poor control. It is concluded that post test has lot of impact on the improvement of FBS as the percentage increased from poor towards fair and good in PPBS

Figure 2 Distribution of sample according to PPBS



3. Glycated Hemoglobin (HbA1c)

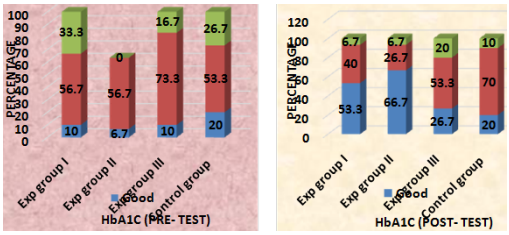
The HbA1c test measures how the body is managing blood sugar over time, usually the last 2–3 months. The person will undertake this test at the doctor's office or in a lab. If levels are very high, the individual may need a second test. HbA1c is the main test that doctors use to manage diabetes. The table 3 and Fig.3 show the results of HbA1c.

Table 3 Frequency and percentage distribution of sample according to HbA1C

HbA1C	Pre- test				Total	Post- test				Total
	Exp. Group I	Exp. GroupII	Exp. Group III	Control group		Exp. Group I	Exp. Group II	Exp. Group III	Control group	
Good	3(10)	2(6.7)	3(10)	6(20)	14(11.7)	16(53.3)	20(66.7)	8(26.7)	6(20)	50(41.7)
Fair	17(56.7)	17(56.7)	22(73.3)	16(53.3)	72(60)	12(40)	8(26.7)	16(53.3)	21(70)	57(47.5)
Poor	10(33.3)	11(36.7)	5(16.7)	8(26.7)	34(28.3)	2(6.7)	2(6.7)	6(20)	3(10)	13(10.8)
Total	30(100)	30(100)	30(100)	30(100)	120(100)	30(100)	30(100)	30(100)	30(100)	120(100)

The table limpidly presents that in pre- test, experimental group I, majority of the respondents (56.7%) are under fair control, 33.3 per cent are under poor and remaining (10%) are under good control. In experimental group II, majority of the respondents (56.7%)are under fair control, 36.7 per cent are under poor and remaining (6.7%) are under good control while in experimental group III, majority of the respondents (73.3%) are under fair control, (16.7%) are under poor and remaining (10%) are under good control. In case of control group, majority of the respondents (53.3%) are under fair control, 26.7 per cent are under poor as well as remaining (20%) are under

Figure 3 Frequency and percentage distribution of sample according to HbA1C



CONCLUSION

The risk of Type 2 Diabetes is determined by interplay of genetic and metabolic factors. Several dietary practices are linked to unhealthy body weight and/or Type 2 Diabetes risk, including high intake of saturated fatty acids, high total fat intake and inadequate consumption of dietary fibre. The post test has lot of impact on the improvement of FBS in related to good control from 10 per cent to 33.3 per cent good in PPBS and improvement of HbA1c from 11.7 per cent to 41.7 per cent.

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