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Implementing Glycemic Index in the Management of Weight, BMI and Glycosylated Hemoglobin Levels in Type-II Diabetics

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Abstract: ***This study determines the benefits of consuming low glycemic index (GI) diets in the management and control of Type –II Diabetes Mellitus. 200 diabetics who volunteered for the study had been divided randomly into 2 groups. Group 1 (n=100) consumed low GI diet for 2 months while Group 2 (n=100) served as controls. The reverse scheme was followed in the next 2 months when Group 1 served as control and Group 2 was fed with the low GI diet. The results demonstrated that when the subjects consumed low-GI diets, they showed clinically significant benefits in both BMI and HbA1c% levels.***

Keywords: Glycemic Index, Diabetes, Obesity, Nutrition.

Key Messages: It has been proved that inducing low GI foods in everyday diets resulted in a clinically significant effect on glycemic controls assessed by Glycosylated Hemoglobin levels(HbA1c%).

1. Introduction

Consumption of high calorie diets containing large amounts of refined carbohydrates has become a common practice in our society and is an important factor in the etiology of obesity and increasing tendency of developing Type-II Diabetes Mellitus (DM).

Various methods of energy restriction, techniques to lose weight and strategies to control glycemic response have been put into practice but none of them has proved successful at the population level. School children are becoming overweight, despite a decrease in total fat consumption. This has sparked an interest in the carbohydrate composition of diets, including the glycemic index (GI).

Scientifically controlled nutrition is an essential strategy in the management of Type-II Diabetes Mellitus. It has been reported that low GI diets have increased satiety which leads to decreased food intake[1] and a slow rise in blood glucose.

Starchy foods with high fiber content that yield relatively flat glycemic responses have been identified, including legumes, pasta, barley, parboiled rice and whole grain breads. Incorporating such diets has been associated with reduced blood glucose, insulin, and lipid levels[2].

The prevalence of obesity has increased dramatically in recent years. In a crossover study conducted on twelve obese teenage boys it has been proved that the rapid absorption of glucose after consumption of high-GI meals induces a sequence of hormonal and metabolic changes that promote excessive food intake in obese subjects[3].

In contrast, low-GI foods may enhance weight control because they promote prolonged satiety leading to reduced calorie intake thereby minimizing postprandial insulin secretion, and maintain insulin sensitivity[4,5,6,7,8].

Additional studies are needed to examine the relationship between dietary GI and long-term body weight regulation.

Diabetes Mellitus and Cardiovascular Disease (CVD) are some of the leading causes of mortality and morbidity. 80 – 90 % of the total diabetics suffer from the so called non–insulin dependent Diabetes Mellitus. The lifetime risk of developing type-2 Diabetes for adult population is estimated at 5 % to 7 % [9].

One study conducted on 36,787 men and women, aged 40 – 69 years, examined associations between Type-2 Diabetes and fiber, glycemic load (GL), GI and fiber – rich foods. The study concluded that reducing dietary GI while maintaining a high carbohydrate intake may reduce the risk of type 2 diabetes. One way to achieve this would be to substitute white bread with low – GI breads[10].

The inclusion of low GI foods in the diet of diabetic patients favorably influences carbohydrate and lipid metabolism, requires only small changes in nutritional habits and has no known deleterious effects[11].

The aim of the present study was to determine whether any benefit might occur from lowering the GI of diet in the weight management and in controlling Type –II Diabetic Mellitus.

2. Methodology

200 subjects (all literate – graduation level or more) between the age group of 45 – 60 years with established Type – II Diabetes Mellitus volunteered in the study. Before beginning the study, all the subjects were instructed to

maintain their usual lifestyle during the experimental period. The purpose, nature, and potential risks of the study were explained and a written informed consent was obtained from each subject. Then these subjects were divided randomly using lottery method into two groups (Group –1 and Group – 2) having 100 subjects in each group.

All 200 subjects of both groups were subjected to general examinations: **(i)** personal details (Name, Age, Sex, Address, etc.), **(ii)** life style (smoker / non – smoker), dietary habits, family status, education level, work pattern / job, etc. and **(iii)** anthropometric measurements { Height [m], weight [kg] and Body Mass Index [kg/m^2] [12]}.

The above referred subjects were also subjected to the estimation of Glycosylated Hemoglobin [HbA1c%][13] levels and their weights taken at the start of the experiment.

All the Group–1 subjects were provided with the diet charts and imparted proper education / awareness regarding the concept and benefits of consuming low glycemic index diets. They consumed the low GI diets for 2 months while the Group– 2 served as the control group by consuming diets according to their previous daily routine. The same investigations were repeated in both the groups at the end of 2 month period.

In the next two months the reverse scheme is followed by the two groups (Group – 1 served as the control group while Group – 2 consumed the low GI diets) and the same tests were conducted.

Design: Randomized, controlled, crossover and open trial study design.

Student's t test applied and results were considered significant when $P < 0.05$. Data are expressed as mean $\pm$ SE.

The subjects included in the study group were neither compelled to participate in the study nor were they subjected to any kind of risk.

3. Results

In this study the effects of consuming low Glycemic Index diets in controlling Blood Glycosylated Hemoglobin (HbA1c %) levels in Type-II DM patients has been proved. As well, the effects of diet intervention on the weight and Body Mass Index (BMI) have been studied.

The mean values for Glycosylated Hemoglobin (HbA1c %), weight and BMI at the start of the study and after 2 & 4 month period for both groups are given in Tables – 1, 2 & 3 respectively along with the statistical significance. Figure – 4 compares the HbA1c%, weight and BMI for both groups throughout the study period.

Since at the start of the study, the diabetic patients were unaware of the concept of GI, (though some of the subjects have heard about it through newspapers or internet but have not applied it because of some misconceptions) so nobody bothered about managing the diet scientifically. When monitored for Glycosylated Hemoglobin (HbA1c %), weight and BMI this study found no significant difference between the two groups considered for the study (Table – 1).

Now in the next 2 months, Group – 1 consumed the low GI diets according to the diet charts provided to them during the counseling sessions. Therefore, at the end of 2 month period, Group – 1 subjects reduced weight, BMI and had a good control over Glycosylated Hemoglobin levels (Table – 2).

On the other hand, Group – 2 continued to have their diets as before for 2 months, according to their previous dietary habits / schedules and were not benefited. This is an important finding in a population with a high prevalence of diabetes and adult obesity.

In the last 2 months of the 4 month study period, Group – 1 consumed the diets as they were having before the start of the study whereas Group – 2 consumed the restricted diet according to the GI concept. Therefore after 4 months, when these diabetic patients (both groups) were assessed for their glycemic response towards weight, BMI and Glycosylated Hemoglobin levels, it was found that Group – 2 subjects were benefited whereas Group – 1 subjects experienced poor controls over glycemic response and gained weight (Table – 3).

These findings and results are very close to the studies conducted by Brand et al[14] and Rendell M[15]. Buyken et al[16] showed that low-GI food consumption was associated with low levels of HbA1c %, independent of its fiber content.

This study proved that inducing low GI foods in everyday diets resulted in a clinically significant effect on glycemic controls assessed by Glycosylated Hemoglobin levels (HbA1c %).

4. Discussion:

The published literature supports the presence of an association between low-GI diets, weight loss and associated management of glycemic response in Type-II DM patients.

This study demonstrated that when the subjects consumed low-GI diets, they showed clinically significant benefits in both BMI and HbA1c% levels.

Though the beneficial effects of consuming of low GI diets remained controversial at the global level[17,18], this study provides evidence that emphasis on the use of low-GI foods, decreased BMI and improved the metabolic control in individuals with Type-II DM.

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Table 1: Mean Values for Glycosylated Hemoglobin, Weight & BMI at Zero Period

Groups Studied	*Glycosylated Hemoglobin (HbA1c %) (Mean ± SD)*	*Weight (kg) (Mean ± SD)*	*Body Mass Index (BMI) (Mean ± SD)*
GROUP – 1 n = 100	8.02 ± 1.02	80.29 ± 14.67	28.07 ± 6.12
GROUP – 2 n = 100	7.96 ± 0.74	76.67 ± 11.25	27.25 ± 8.24
Statistical Significance GROUP – 1 v/s GROUP - 2	t = 0.48 p = 0.63 [NS]	t = 1.96 p = 0.05 [NS]	t = 0.79 p = 0.43 [NS]

Table 2: Mean Values For Glycosylated Hemoglobin, Weight & BMI After 2 Month Period

Groups Studied	*Glycosylated Hemoglobin (HbA1c %) (Mean ± SD)*	*Weight (kg) (Mean ± SD)*	*Body Mass Index (BMI) (Mean ± SD)*
GROUP – 1 n = 100	6.32 ± 0.97	71.99 ± 16.26	25.51 ± 7.13
GROUP – 2 n = 100	9.06 ± 1.16	79.27 ± 14.04	29.98 ± 8.61
Statistical Significance GROUP – 1 v/s GROUP - 2	t = 18.12 p < 0.0001 [HS]	t = 3.39 p = 0.0009 [HS]	t = 4.5 p < 0.0001 [HS]

Table 3: Mean Values For Glycosylated Hemoglobin, Weight & **BMI** After 4 Month Period

Groups Studied	*Glycosylated Hemoglobin (HbA1c %) (Mean ± SD)*	*Weight (kg) (Mean ± SD)*	*Body Mass Index (BMI) (Mean ± SD)*
GROUP – 1 n = 100	**9.03 ± 1.03**	**76.86 ± 10.52**	**26.9 ± 7.65**
GROUP – 2 n = 100	**6.31 ± 0.89**	**72.39 ± 16.11**	**24.79 ± 6.67**
Statistical Significance GROUP – 1 v/s GROUP - 2	**t = 19.98 p < 0.0001 [HS]**	**t = 2.32 p = 0.02 [S]**	**t = 2.08 p = 0.04 [S]**

Table 4: Statistical Analysis Of Glycosylated Hemoglobin (HbA1c %), Weight and BMI in Group – 1 and 2 (Comparison Between Zero Period and After 2 & 4 Months of Study)

Parameter	*GROUPS COMPARED*					
	Group - I			*Group - II*		
	*A**	*B***	*C****	*A**	*B***	***C****
Glycosylated Hemoglobin (HbA1c %)	t = 12.08 p < 0.0001 [HS]	t = 6.97 p < 0.0001 [HS]	t = 19.15 p < 0.0001 [HS]	t = 7.99 p < 0.0001 [HS]	t = 14.26 p < 0.0001 [HS]	t = 18.81 p < 0.0001 [HS]
Weight	t = 3.79 p = 0.0002 [HS]	t = 1.9 p = 0.06 [NS]	t = 2.52 p = 0.01 [S]	t = 1.45 p = 0.15 [NS]	t = 2.18 p = 0.03 [S]	t = 3.22 p = 0.002 [VS]
Body Mass Index	t = 2.72 p = 0.007 [VS]	t = 1.19 p = 0.23 [NS]	t = 1.33 p < 0.19 [NS]	t = 2.29 p = 0.02 [S]	t = 2.32 p = 0.02 [S]	t = 4.77 p < 0.0001 [HS]

* (at zero period) v/s (after 2 months)
** (at zero period) v/s (after 4 months)
*** (after 2 months) v/s (after 4 months)

Author Profile

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