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General Medicine

GLYCEMIC INDEX AND ITS ASSOCIATION WITH THE COMPLICATIONS OF DIABETES MELLITUS TYPE-2

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ABSTRACT The Glycemic Index(G.I) classifies carbohydrate-containing foods according to their potential to raise your blood sugar levels. The individuals who followed a low-GI diet over many years are at a significantly lower risk for developing both type 2 diabetes & coronary heart disease than others. Therefore, attempt is made to study the complications prevalent in patients with longstanding diabetes & their co-relation with the glycemic index. **Objectives:** If controlling the glycemic index of the diet would be preventing the future development of these pathologies and complications. **Methodology:** Patients attending diabetic OPD were included. All cases with a history of type 2 diabetes mellitus of >10 years time with documented reports for the same were only included in our study. GI of the mixed meal consumed by the patient based on this weekly dietary chart was considered.

Duration of study: 1.5 year

Sample size: 210

Results and Conclusions: All complications were directly related with the GI. Choosing healthy foods with low Glycemic Index help to control diabetes and lower the risk for diabetic complications.

KEYWORDS : Diabetes Mellitus, Glycemic Index, Complications

INTRODUCTION:

The glycemic index classifies carbohydrate-containing foods according to their potential to raise your blood sugar level. Foods with a high glycemic index value tend to raise your blood sugar higher and faster than do foods with a lower value. By definition, the GI compares equal quantities of available carbohydrate in foods and provides a measure of carbohydrate quality. Available carbohydrate can be calculated by summing the quantity of available sugars, starch, oligosaccharides, and maltodextrins.

Factors altering the Glycaemic Index of a food?

1. The degree of processing/cooking/chewing: the more processed/refined a food is, the higher the GI. Foods which are more textured, chewy, crunchy, fibrous tend to take longer to be digested and release their glucose into the blood stream more slowly than soft, refined or pre-cooked foods. Food that has not been properly chewed also has a lower GI &it may also give you indigestion.

2. Fibre type: Soluble fibre slows down the digestion of starches and the absorption of glucose into the bloodstream e.g. oat fibre (oats, oat bran, oat fibre flour), fruit pectin (especially cold climate fruits), legume fibre (baked beans, lentils etc) and psyllium (Metamucil, Fybogel).

3. Starch type: Resistant starch is a type of starch which is slowly digested. Cold cooked potato has a lower GI than freshly cooked white potatoes; new potatoes have lower GI than desiree potatoes and long grain rice lower GI than short grain rice.

4. Degree of ripeness: The riper the food the higher the GI e.g. yellow/black bananas vs. greenish bananas.

5. Acidic VS Salty: Acidic foods in a meal help slow digestion of starches generally, which reduces the GI of the meal e.g. lemon juice on vegetables, vinaigrette dressings on salad, pickled foods such as gherkins. Salt and salty foods/condiments tend to speed the rate of digestion of starches and increase the rate of absorption of glucose and increases the GI of the meal.

6. Types of sugars: Pure glucose has a maximum effect on blood glucose e.g. Glucodin, glucose syrup (used in cake/confectionery manufacture), some sports drinks. These foods will have a high GI.Fructose occurs naturally in many fruits, some vegetables (corn, sweet potato), corn syrup, and honey. Fructose is absorbed as fructose and contributes very little to blood glucose levels. High fructose foods have a lower GI

The concept of GI has meant that people with diabetes do not need to be as strict about every teaspoon of sugar as they once were. For someone with diabetes, a moderate amount of table sugar, say the equivalent of 2 tablespoons over a day, is now generally acceptable.

7. Combination of foods in mixed meals: Eating protein rich food in the same meal lowers the overall GI of the meal. Protein foods delay stomach emptying which delays digestion of the starches. Like protein, fats also delay stomach emptying.

AIMS AND OBJECTIVES

To calculate the glycemic index of the diet (Mean G.I) considering dietary chart of one week) of patients with Type2 Diabetes of more than 10 years duration.To study the complications prevalent at the time of inclusion in the study, in these patients with type 2 diabetes of chronic duration.To co-relate the G.I (Glycemic Index) of the diet with the prevalence of complications in patients with type 2 diabetes.

MATERIAL AND METHOD

Study type: Observational study

Duration of study: 1.5 year

Settings: Diabetic OPD and indoor diabetic patients of a tertiary care hospital.

Study Duration: March 2018 to September2019.

Sample size: 210

INCLUSION CRITERIA- Patients with Type2 Diabetes of more than 10 years duration

INVESTIGATIONS

Complete hemogram, fasting and post prandial blood sugars, liver function tests, chest X-Ray, ECG; and USG abdo-pelvis wherever indicated &were done.

Serum creatinine, fundus for retinopathy, urine routine and microscopy especially for proteinuria, bio-thesiometry for peripheral neuropathy,serum triglycerides and cholesterol and 2D

ECHO were recorded.

Detailed dietary history in order to calculate the Glycemic index of the diet was taken.

The method of **calculating Glycemic Index [93]** of a meal containing for example three carbohydrate containing foods, A, B, and C with G.I (Glycemic Index) of G.I(A), G.I(B), and G.I(C), respectively-
The total meal carbohydrate in grams (g) equals the sum of the three carbohydrate components:
g = g(A)+ g(B)+ g(C) [g(A)=gram carbohydrate in food A, g(B)and g(C), for grams carbohydrate in food B and C respectively]

The proportion of carbohydrate from each food is calculated first; for example:
P(A)= (gA/g) [P(A) is the proportion of carbohydrate in food A]

This value is multiplied by the GI for that food to givethe G.I contribution ofthat food to the total meal glycemicindex; for example:
MG.I(A)= P(A) X G.I(A) where MG.I(A) [Mean Glycemic Index of food A] is the G.I contribution of food A to the totalmeal glycemic index. The G.I contributions of each food [MG.I(A), MG.I(B), and MG.I(C)] are added to give- the **total meal glycemic index (MG.I):**
MG.I = MG.I(A) + MG.I(B) + MG.I(C)

The mean glycemic index of a meal for that patient was calculated by summing up the total meal glycemic index of each meal of the week and then dividing it by the number of meals taken by the patient during that week.

DATAANALYSIS
Data analysis done by SPSS, Chi square test & ANOVA.

RESULT
Average age of patient in our study is 54.8 years and out of 210 patients, 40% are female and rest 126 (60%) patients were male.

Parameter	The mean glycemic index seen in the group	Anova test
Creatinine >1.7 mg%	85.5+/-16.2	P<0.05
Urine proteinuria		P<0.05
No proteinuria	54.55+/-10.6	
1+	70.42+/-15.5	
2+	89.64+/-15.9	
Presence of ischemic heart disease	96.05+/-17.2	P<0.05
Retinopathy-		P<0.05
No retinopathy	57.44+/-12.4	
Grade-1	72.34+/-10.23	
Grade-2	90.67+/-11.8	
Grade-3	104.8+/-15.7	
Neuropathy		P<0.05
No Neuropathy	57.82+/-13.86	
Mild	74.6+/-16.5	
Moderate	88.64+/-13.9	
Severe	100.62+/-11.9	
Patients requiring insulin	103.8+/-16.55	P<0.05

DISCUSSION:
The glycemic index (GI), quantifies the postprandial blood glucose and insulin responses to carbohydrate composition of diet[1]and has beneficial effects in addition to carbohydrate counting.

The maximum GI in our study was 120.67 & the minimum was 41.20. The mean glycemic index observed was 74.02 . Mean glycemic index of the patients with grade3 retinopathy was 104.8 and that was significantly more than mean GI of the patients with milder grades of retinopathy and with the cases that showed absence of retinopathy on fundus examination. Mean glycemic index of the cases with retinopathy grade II was 91.51 that was significantly more than mean glycemic index of the cases with retinopathy grade I and cases that showed lack of fundus retinopathy. Mean Glycemic index of the cases was found to increase with the severity of the neuropathy and was found to be 100.62 in severe grade of neuropathy. Results of our study were in accordance with the study of Mayur Mewada[2]

CONCLUSION:
The relevance of the GI continues to be debated. Since the first GI publication in 1981 [3], Several studies have investigated the impact of GI and GL on health [4,5,6,7]. However, despite their established importance, the use of these parameters is not a consensus and results of clinical studies are still conflicting [4,7,8]. As per our study choosing healthy foods with low Glycemic Index and maintaining a healthy weight are enough to control diabetes and lower the risk for complications. Few other prospective observational studies have found that the overall GI and glycemic load (GI × g carbohydrate) of the diet, but not total carbohydrate content, are independently related to the risk of developing type 2 diabetes (9,10), cardiovascular disease (), and some cancers (11,12). However, not all studies are in agreement, and further research is needed (13).The American Diabetes Association acknowledges that use of low-GI foods may reduce postprandial hyperglycemia but asserts that there is not sufficient evidence of long-term benefit to recommend their use as a primary strategy (14). In contrast, the European Association for the Study of Diabetes recommends the substitution of low-GI foods for high-GI foods (15).

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