

 <p>ISSN NO. 2320-5407</p>	<p>Journal Homepage: www.journalijar.com</p> <h2 style="text-align: center;">INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)</h2> <p style="text-align: center;">Article DOI:10.21474/IJAR01/11776 DOI URL: http://dx.doi.org/10.21474/IJAR01/11776</p>	 <p>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR) ISSN 2320-5407 Journal Homepage: http://www.journalijar.com Journal DOI:10.21474/IJAR01</p>
---	--	---

RESEARCH ARTICLE

ASSOCIATION BETWEEN GLYCEMIC INDEX WITH THE COMPLICATIONS PREVALENT IN TYPE 2 DIABETES PATIENTS

Dr. Mayur Mewada

Assistant Professor, Dept. of Medicine, K.J. Somaiya Medical College, Sion, Mumbai.

Manuscript Info

Manuscript History

Received: 25 July 2020

Final Accepted: 28 August 2020

Published: September 2020

Key words:-

Diabetes Mellitus, Glycemic Index

Abstract

The glycemic index or G.I is a measure of the effects of carbohydrates on 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 and coronary heart disease than others. Therefore, attempt is made to study the complications prevalent in patients with long-standing diabetes and their co-relation with the glycemic index.

Objectives: To calculate the glycemic index (G.I) 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.

Methodology: Patients attending diabetic OPD as well as indoor patients were included. All patients with a history of type 2 diabetes mellitus of more than ten year duration with documented reports for the same were included. Duration of study : 1 year. Glycemic index of the mixed meal consumed by the patient based on this weekly dietary chart was calculated. Study subjects : 102. Data analysis done by SPSS. Ethical clearance was taken.

Results and Conclusions: All microvascular or macrovascular complications had a direct co-relation with glycemic index. The maximum glycemic index observed was 124.16 and the minimum was 36.73. The mean glycemic index seen was 72.06.

Copy Right, IJAR, 2020,. All rights reserved.

Introduction:-

The glycemic index or G.I is a measure of the effects of carbohydrates on blood sugar levels. Carbohydrates that break down quickly during digestion and release glucose rapidly into the bloodstream have a high G.I; carbohydrates that break down more slowly, releasing glucose more gradually into the bloodstream, have a low G.I. The concept was developed by Dr. David J. Jenkins and colleagues[1] in 1980–1981 at the University of Toronto in their research to find out which foods were best for people with diabetes. A lower glycemic index suggests slower rates of digestion and absorption of the foods' carbohydrates and may also indicate greater extraction from the liver and periphery of the products of carbohydrate digestion. A lower glycemic response usually equates to a lower insulin demand but not always, and may improve long-term blood glucose control[2].

Corresponding Author:- Dr. Mayur Mewada

Address:- Dept. of Medicine, K.J Somaiya Medical College, Somaiya Ayurvihar Complex, Eastern Express Highway, Sion East, Mumbai, Maharashtra-400022.

Diabetes Mellitus Type 2 is one of the most common endocrinopathy present today accounting for the most common cause for ESRD (End Stage Renal Disease) and other complications like blindness and CAD (Coronary Artery Disease). Therefore, attempt is made to study the complications prevalent in patients with long-standing diabetes and their co-relation with the effect of dietary carbohydrate intake on the prevalence of complications i.e. the co-relation with G.I.

Aim And Objectives:-

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

Materials And Methods:-

Study type: Observational study

Duration of study : 1 year

Study place: Diabetic OPD and indoor diabetic patients of a tertiary care hospital

Study Duration: August 2010 to August 2011.

Inclusion Criteria:

1. Patients of age > 40 years of either sex.
2. Duration of Type 2 Diabetes Mellitus for more than 10 years.
3. Patient with hypertension and hyperlipidemia.

Exclusion Criteria:

1. Patient presenting in DKA or HHS or any other acute severe metabolic complication of Diabetes.
2. Duration of disease less than 10 years.
3. Significant comorbid illnesses such as liver disease, cancer, pregnancy or nursing mothers.
4. Bed ridden patients.
5. Patients not giving consent.

Complete general and systemic examination done.

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.

A detailed weekly dietary chart was obtained also care was taken to avoid taking dietary history during festival period wherein there are temporary but gross changes in diet.

The average Glycemic index of the mixed meal consumed by the patient based on this weekly dietary chart was calculated using the following formula-

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 give the G.I contribution of that food to the total meal glycemic index; for example:

$MG.I(A) = P(A) \times G.I(A)$

where MG.I(A) [Mean Glycemic Index of food A] is the G.I contribution of food A to the total meal 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)**:

$MG.I = MG.I(A) + MG.I(B) + MG.I(C)$

Using this formula the total meal glycemic index was calculated for each meal consumed by the patient in a week's time. 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.

Data Analysis:

SPSS, Chi square test, ANOVA

Ethical clearance was obtained for the study.

Results:-

Out of the 114 patients who fulfilled the criteria for inclusion 12 denied the consent for the same and hence excluded from the study. Therefore this observational study consists of 102 patients with type two diabetes mellitus of more than ten years duration.

The cases in this study were ranging from 38 to 82 years with average age being 57.95 years, where 49.0% cases were male and 51.0% cases were female.

49.0% cases in this study belonged to lower economic status group followed by 48.1% cases that belonged to lower middle economic status and 2.9% cases belonged to upper middle economic status.

Parameter	The mean glycemic index seen in the group	Anova test
Creatinine >1.7 mg%	87.81 +/- 16.38	* p < 0.05 significant
Urine proteinuria-		
No proteinuria	55.35 +/- 10.49	* p < 0.05 significant
1+	75.05 +/- 14.55	
2+	94.43 +/- 14.23	
Presence of ischemic heart disease	96.03 +/- 16.11	* p < 0.05 significant
Retinopathy-		* p < 0.05 significant
No retinopathy	55.52 +/- 10.51	
Grade 1	74.51 +/- 11.61	
Grade 2	91.51 +/- 14.97	
Grade 3	104.13 +/- 12.63	
Neuropathy-		* p < 0.05 significant
No neuropathy	55.12 +/- 10.48	
Mild	74.61 +/- 12.36	
Moderate	92.15 +/- 16.87	

Severe	101.03 +/- 10.80	
Patients requiring insulin	94.25 +/- 14.55	* p < 0.05 significant

Discussion:-

Consuming diet with high glycemic index has higher association with the prevalence of microvascular complications. This can be attributed to various reasons including high levels of blood glucose seen following consumption of high G.I diets and also high oxidative stress seen with high glucose levels. [9][10]. Epidemiologic data in a past study suggest that a high dietary glycemic load from refined carbohydrates increases the risk of CHD (coronary heart disease) independent of known coronary disease risk factors. [3][4] [5]

The above findings re-emphasize that dietary factors have a great influence on the control of diabetes mellitus. Patients consuming diets with low glycemic index have well controlled sugars as evident by a low HbA1c and also less prevalence of complications of diabetes mellitus. This protective effect of low glycemic index diet on development of complications of diabetes mellitus needs further study as significant amount of morbidity arising from diabetes mellitus can be prevented by making dietary modifications. Also dietary patterns are different for different communities and with different cultures. Hence it is important to find out the common foods used by different communities which have a low Glycemic index and encourage their use more regularly. This move can be effective in a resource constrained country like India especially considering the fact that India is the potential diabetic capital of the world in 2030. [6]

Conclusion:-

1. 41 patients out of 102 (41.19%) were aged less than or equal to 55 years and had been suffering from the disease for more than 10 years .
2. 57/102 (55.88%) patients had hypertriglyceridemia and 32/102 (31.37%) had hypercholesterolemia. Also 23/102 (22.54%) patients had hypertension .
3. The study of the average glycemic index of the diet of the patients showed that the maximum glycemic index observed was 124.16 and the minimum glycemic index observed was 36.73. The mean glycemic index seen was 72.06.
4. Mean glycemic index of the cases with serum creatinine < 1.7mg% was 56.31 that was less than 87.81 among the cases with serum creatinine > 1.7 mg% and the difference between the two was found to be statistically significant. Also the mean glycemic index of the cases with urine proteinuria 1+ was 75.05 and 94.43 among cases with urine proteinuria 2+; which was significantly more than 55.35 among cases that showed absence of urine proteinuria.
5. Also the mean glycemic index was 96.03 in the group of patients that showed presence of IHD (Ischemic Heart Disease) and it was significantly more than G.I of 63.86 among the cases with absence of IHD.
6. Mean glycemic index of the cases with retinopathy grade 3 on fundus examination was 104.13 that was significantly more than mean glycemic index of the cases with other grades of retinopathy and with the cases that showed absence of retinopathy on fundus examination. Mean glycemic index of the cases with retinopathy grade 2 was 91.51 that was significantly more than mean glycemic index of the cases with retinopathy grade 1 and cases that showed absence of fundus retinopathy.
7. Mean Glycemic index of the cases with severe grade of neuropathy on biothesiometry was 101.03 that was more than 92.15 among cases with moderate grade of neuropathy and was also more than a glycemic index of 74.61 among cases with mild grade neuropathy.
8. Mean glycemic index of the cases who were on insulin was 94.25 that was more than 60.47 among the cases who were not on insulin and the difference between them was statistically significant.
9. A higher mean glycemic index was in general more significantly associated with high prevalence of chronic complications in patients with diabetes mellitus type 2 of chronic duration.

References:-

1. Jenkins DJ. et al. "Glycemic index of foods: a physiological basis for carbohydrate exchange." Am J Clin Nutr. 1981;34:362-366.
2. Jenkins DJ. et al. "Effect of a Low-Glycemic Index or a High-Cereal Fiber Diet on Type 2 Diabetes". JAMA. 2008;300(23):2742-2753.

3. Simin Liu, Walter C Willett, Meir J Stampfer, Frank B Hu, Mary Franz, Laura Sampson, Charles H Hennekens, and JoAnn E Manson. "A prospective study of dietary glycemic load, carbohydrate intake, and risk of coronary heart disease in US women." *Am J Clin Nutr.* June 2000;71(6):1455–61.
4. Kaushik S, Wang JJ, Wong TY, Flood V, Barclay A, Brand-Miller J, Mitchell P. Glycemic index, retinal vascular caliber and stroke mortality. *Stroke.* 2009 Jan;40 (1):206-212.
5. Frost G, Leeds A, Trew G, Margara R, Dornhorst A. "Insulin sensitivity in women at risk of coronary heart disease and the effect of a low glycemic diet." *Metabolism.* 1998 Oct;47(10):1245-51.
6. Sabina Sieri, Vittorio Krogh, Franco Berrino, et al. "Dietary Glycemic Load and Index and Risk of Coronary Heart Disease in a Large Italian Cohort: The EPICOR Study." *Arch Intern Med.* 2010;170(7):640-647.
7. IDF Diabetes Atlas, 4th edition. International Diabetes Federation, 2009.
8. Park, 24th edition.
9. Fong DS, Aiello LP, Ferris FL 3rd, Klein R. "Diabetic retinopathy." *Diabetes Care.* 2004;27:2540-2553.
10. Kunisaki M, Bursell SE, Clermont AC, Ishii H, Ballas LM, Jirousek MR, Umeda F, Nawata H, King GL. "Vitamin E prevents diabetes-induced abnormal retinal blood flow via the diacylglycerol-protein kinase C pathway." *Am J Physiol.* 1995;269 :E239-E246.