Research Paper :

Glycemic index of developed therapeutic foods

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ABSTRACT

Two therapeutic foods Diet I and Diet II were developed utilizing low glycemic index food stuffs. The food stuffs used were rajmah, horse gram dhal, green gram dhal, soybean, other pulses and leafy vegetables. The developed recepies were evaluated for their acceptability and nutrient content was analysed. The clinical implication of these recepies were assessed on 30 normal female subjects belonging to age group of 20-30 years.Diet I and Diet II recorded almost same scores for acceptability. However, Diet II recorded the higher values for protein, fat, energy, calcium and iron content and low values for carbohydrate content as compared to that of Diet I. The glycemic index of Diet I and Diet II was 37.06 ± 12.40 and 31.46 ± 8, respectively.

Diabetes mellitus is a silent disease and is now recognized as one of the most important and fastest growing health problems in almost all the countries of the world. Diabetes is the mother of all illnesses, which affects every part of our body. It can not be cured completely but it can be kept under control by using combination of diet, drugs and exercise. Diet planning for diabetic people using glycemic index of food is useful in maintaining blood sugar level.

The glycemic index (G.I.) indicates the extent of rise in blood sugar in response to a food in comparison with the response to an equivalent amount of glucose. Glycemic index is a rating system for evaluating how different foods affect blood sugar levels. This system has been used to select foods and create diets that aim to control obesity and manage diabetes. Hence it is suggested that therapeutic food should be developed using low glycemic index foods. Considering the same facts, the present study was taken up to formulate two therapeutic foods utilizing low glycemic index foodstuff and its implication was assessed on normal healthy female subjects.

METHODOLOGY

Two therapeutic foods, Diet I and Diet II were developed utilizing low glycemic index foodstuff *viz.,* rajmah, horse gram dhal, green gram dhal, soybean and other pulses and leafy vegetables. Diet I was prepared using the flours of horse gram dal , Bengal gram dhal, jowar and wheat, coriander leaves and cucumber. Diet II was developed utilizing greengram dhal flour, rajmah flour,

soybean flour, coriander leaves and onion. The recepies were evaluated by panel members for acceptability. These recepies were analysed for proximate composition and minerals like calcium, iron and vitamin C content. The clinical implication of these recepies were assessed on thirty normal female subjects belonging to age group 20-30 years. The experiment was carried out by giving 50 g of glucose on first day of experiment followed by developed therapeutic foods *i.e.* Diet I and Diet II. The elevated level of blood glucose was measured at fasting and post-parandial stage at different intervals 0,30, 60,90 and 120 minutes. The blood glucose tolerance curve and food tolerance curve were used to calculate the glycemic index of the test food using formula given by Jenkins *et al.* (1984). The post parandial blood glucose incremental areas were calculated by measuring incremental areas on graph paper above fasting level.

$$\text{Glycemic index} = \frac{\text{AUC of diet}}{\text{AUC of standard glucose}} \times 100$$

FINDINGS AND DISCUSSION

The data regarding the acceptability scores of developed therapeutic foods Diet I and Diet II for different organoleptic characteristics are presented in Table 1. The acceptability scores of Diet I for different characteristics ranged from 4.2 (colour) to 4.6 (overall acceptability) whereas taste and texture recorded same ranking (4.5). However, In case of Diet II, the acceptability scores ranged from 4.5 (colour and overall acceptability) to 4.6

Table 1 : Mean values of acceptability scores of developed diets for glycemic index

Particulars	Colour	Taste	Texture	Flavour	Overall acceptability
Diet I	4.2±0.71	4.56±0.50	4.56±0.504	4.53±0.50	4.6±0.49
Diet II	4.57±0.49	4.63±0.49	4.63±0.49	4.63±0.49	4.57±0.50

Table 2 : Nutrient compositions of developed diets for glycemic index per 100g (Dry weight basis)

Name of Diet	Moisture (g.)	Protein (g.)	Fat (g.)	CHO (g.)	Fibre (g.)	Ash (g.)	Energy (Kcal)	Calcium (mg.)	Iron (mg.)	Vitamin C (mg.)
Diet I	47.74	11.66	12.68	17.30	4.91	5.71	229.96	180.00	5.13	26.75
Diet II	48.86	18.08	20.04	5.32	4.47	3.23	274.08	202.00	6.76	12.63

Table 3 : Nutrient compositions of developed diets for glycemic index per serving basis

Name of Diet	Moisture (g.)	Protein (g.)	Fat (g.)	CHO (g.)	Fibre (g.)	Ash (g.)	Energy (Kcal)	Calcium (mg.)	Iron (mg.)	Vitamin C (mg.)
Diet I	47.74	7.89	8.58	11.70	3.32	3.86	155.65	121.83	3.47	18.10
Diet II	48.86	12.14	13.46	3.57	3.00	2.16	184.11	135.69	4.54	8.48

(texture, flavour and taste). Overall acceptability of Diet I and Diet II recepies were 4.6 and 4.5, respectively.

Table 2 inferred the information on nutrient composition of developed recepies per 100 g. The results revealed that Diet II recorded higher values for protein (18.08g), fat (20.04 g), energy (274 kcal), calcium (202 mg) and iron content (6.76mg) as compared to that of Diet I. Where as carbohydrate content (17.30) and vitamin C content (26.75mg) of Diet I were found to be more than that of Diet II.

Data regarding nutrient composition of developed recepies per serving basis are depicted in Table 3. Diet II provided more amount of protein, fat, energy, calcium and iron than Diet I *vice versa* Diet I provided more amount of carbohydrate and vitamin C content.

Table 4 and 5 inferred the data regarding the mean values of blood glucose at fasting and post parandial stage (Fasting, 30, 60, 90 and 120 minutes) and AUC for standard glucose and two test recepies were measured and calculated. The glycemic index of Diet I and Diet II ranged from 13.93 to 57.98 and 11.71 to 54.4 with mean value of 37.06 ± 12.40 and 31.46 ± 8, respectively. Mean glycemic response to the test recepies when observed comparatively between two recepies, it was noticed that the glycemic index of Diet II was less than Diet I. The recipes were developed utilizing low glycemic index food. Hence, it can be concluded from the results that developed therapeutic foods are of low glycemic index. The study conducted by Urooj and Puttaray (2000) also reported that the post parandial responses to the developed foods were significantly lower than those of the reference glucose. The glycemic index values ranged from 44 to 69 in normal healthy subjects. The study conducted by

Table 4 : Blood glucose (mg/100ml) at the fasting and post parandial (hrs)

Particular	Mean ± SD	Range
For standard glucose		
Fasting	78.20±13.79	51 to 103
30 minutes	116.73±22.16	82 to 154
60 minutes	118.37±23.95	80 to 186
90 minutes	102.67±17.84	77 to 153
120 minutes	92.07±18.98	70 to 133
Area Under Curve(AUC)	3093±1131.7	1248 to 4878
For test Diet I		
Fasting	80.73±9.51	56 to106
30 minutes	94.03±10.13	74 to120
60 minutes	90.13±14.0	72 to131
90 minutes	87.30±13.52	69 to121
120 minutes	84.07±12.43	65 to113
Area Under Curve(AUC)	1094.62±485.29	431 to 2370
Glycemic Index of Diet I	37.06±12.40	13.93 to 57.98
For test Diet II		
Fasting	76.80 ± 9.81	58 to101
30 minutes	93.03 ±18.37	75 to 171
60 minutes	85.73±14.23	62 to 128
90 minutes	79.43 ±8.92	60 to 101
120 minutes	79.10±11.95	58 to 115
Area Under Curve(AUC)	929.24±349.36	393 to 1995
Glycemic Index of Diet II	31.46±8.46	11.7 to 54.4

Table 5 : Glycemic Index of developed diets

Particular	Mean AUC	Glycemic Index
Glucose	3093	-
Diet I	1094.62	37.06
Diet II	929.24	31.46

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Nalwade *et al.* (2004) on glycemic index value of commonly consumed recepies on diabetic and normal people indicated that dry pees found to have lowest glycemic index values (15.0) in normal subjects and rajmah found to have lowest glycemic index value (7.7) in diabetic subjects. Similar type of observetion was also made by Potdar (2002).

Conclusion:

Developed therapeutic food of Diet I and Diet II recorded almost same ranking for acceptability scores. Diet II recorded the higher values for protein, fat, energy, calcium and iron content as compared to that of Diet I. Where as carbohydrate and vitamin C content of Diet I was found to be more than that of Diet II. The glycemic index of Diet I and Diet II was 37.06 ± 12.40 and 31.46 ± 8. Further it was noticed that the glycemic index of Diet II was less than Diet I. Hence, it can be concluded that developed therapeutic foods are of low glycemic index and can be advocated among diabetics as the diets with lower G I are generally rich in fibre and high fibre diets improve the glucose tolerance and reduce diabetic symptoms and the dose of oral antibiotic drugs required.

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