

A comparative study on carbohydrate intake, quality and its association with blood glucose levels among diabetic and non-diabetic individuals

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Abstract

Background: Diabetes mellitus is a major public health problem worldwide, and dietary management plays a key role in its prevention and control. Both the quantity and quality of carbohydrate intake influence blood glucose levels, while dietary fiber and low glycemic index foods help improve glycemic control. However, misconceptions such as the belief that all carbohydrates are harmful or should be completely avoided are common among the general population.

Objective: The present study aimed to compare carbohydrate intake, carbohydrate quality, and their association with blood glucose levels among diabetic and non-diabetic individuals. A comparative cross-sectional study was conducted among 150 participants aged 18–55 years in Hyderabad, Telangana, including 75 diabetic and 75 non-diabetic individuals. Data were collected using a structured questionnaire, Food Frequency Questionnaire (FFQ), and 24-hour dietary recall. Body Mass Index (BMI) and recent blood glucose values were also recorded.

Results: The results revealed no statistical significance in the mean carbohydrate intake (336.20 ± 220.50 g/day vs. 325.49 ± 18.34 g/day) and mean dietary fiber intake (26.22 ± 15.36 g/day vs. 23.16 ± 13.99 g/day) between diabetic and non-diabetic individuals ($p > 0.05$). Comparison of actual intake with the Recommended Dietary Allowance (RDA) showed no statistical significance among males ($p = 0.413$), compared with females where statistical significance was observed for carbohydrate intake ($p = 0.02$). A moderate positive correlation ($r = +0.58$) was observed between blood glucose levels and carbohydrate intake ($r = +0.58$). Diabetic individuals reported a higher daily consumption of whole grains (90.7%), pulses (65.3%), sugary foods (26.7%), processed foods (18.7%), refined foods (22.7%), while non-diabetic individuals reported daily consumption of whole grains (65.3%), pulses (48.0%), sugary foods (25.3%), processed foods (18.7%) and refined foods (21.3%).

Conclusion: The study concludes that both carbohydrate quality and quantity are important determinants of blood glucose management. Although diabetic individuals demonstrated relatively healthier dietary practices, misconceptions regarding carbohydrates were prevalent in both groups. Nutrition education focusing on balanced carbohydrate intake, dietary fiber, and glycemic index concepts is essential to improve dietary choices and support effective glycemic control.

Keywords: Diabetes mellitus, carbohydrate intake, carbohydrate quality, dietary fiber, glycemic index, blood glucose levels

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia due to insufficient insulin secretion, insulin resistance, or both. It is one of the fastest-growing global public health concerns, with Type 2 diabetes being the most common form, largely associated with unhealthy diet and physical inactivity^[1]. According to the International Diabetes Federation (IDF), about 537 million adults were living with diabetes in 2021, and this number is expected to rise to 783 million by 2045. India has one of the highest diabetes burdens globally, with approximately 77 million affected individuals. Poor dietary habits, sedentary lifestyle, urbanization, and lack of awareness are major contributing factors^[1, 2]. Carbohydrates are the body's primary source of energy and should contribute about 45–65% of daily energy intake. However, both the quantity and quality of carbohydrates influence blood glucose levels. Complex carbohydrates, whole grains, fruits, vegetables, and fiber-rich foods help maintain better glycemic control, whereas refined carbohydrates and sugary foods cause rapid rises in blood glucose^[2, 3].

The Glycemic Index (GI) is an important measure of carbohydrate quality, indicating how quickly carbohydrate-containing foods raise blood glucose levels. Diets rich in low-GI and high-fiber foods have been associated with

improved metabolic health and reduced risk of diabetes-related complications^[4]. Carbohydrate intake remains a key component of diabetes management. Rather than eliminating carbohydrates, current recommendations emphasize individualized meal planning that considers carbohydrate quality, quantity, fiber intake, medications, and glycemic response to achieve better blood glucose control^[5]. Despite increasing awareness, misconceptions about carbohydrates remain common. Many individuals believe that all carbohydrates are harmful, that they should be completely avoided in diabetes, or that products like honey or jaggery are healthier alternatives to sugar. Such misconceptions can negatively affect dietary practices and diabetes management^[6]. Therefore, the present study was undertaken to compare carbohydrate intake, carbohydrate quality, and their association with blood glucose levels among diabetic and non-diabetic individuals. It also compares carbohydrate intake with Recommended Dietary Allowances (RDA) to support evidence-based nutritional strategies for better metabolic health.

Methodology

1. Selection of Population

The study was conducted in community settings in Hyderabad, Telangana. Adult individuals aged 18–55 years,

including both diabetic and non-diabetic participants, were included in the study.

2. Selection of Samples

A total of 150 participants were selected using purposive and convenience sampling. The study included 75 diabetic and 75 non-diabetic individuals who were willing to participate.

3. Data Collection

Data were collected using a pre-designed questionnaire. Information on demographic profile, clinical details, carbohydrate knowledge, dietary practices, misconceptions, 24-hour dietary recall, and food frequency questionnaire (FFQ) was collected.

Results and Discussion

Table 1: Distribution of Demographic Profile of Diabetic & Non-diabetic Individuals

Characteristics	Categories	Diabetic Percentage (%) n=75	Non-diabetic Percentage (%) n=75
Age	18–35 years	13.3%	80.0%
	36–55 years	86.7%	13.3%
Gender	18–35 Male	6.7%	34.7%
	18–35 Female	16.0%	54.7%
	36–55 Male	38.7%	9.3%
	36–55 Female	49.3%	10.7%
BMI	Underweight	0%	1.3%
	Normal	33.3%	56.0%
	Overweight	42.7%	26.7%
	Obese	24.0%	16.0%
Blood Sugar Level	Normal	41.3%	100%
	Slightly High	38.7%	0%
	High	20.0%	0%
Qualification	No Formal Education	16.0%	2.7%
	School Level	37.3%	13.3%
	Graduate	36.0%	48.0%
	Post Graduate	10.7%	36.0%
Occupation	Self Employed	12.0%	4.0%
	Business	20.0%	2.7%
	Unemployed	22.7%	25.3%
	Employed	18.7%	32.0%
	Other	24.0%	36.0%
Dietary Habits	Vegetarian	17.3%	6.7%
	Non-Vegetarian	82.7%	86.7%

Among the 150 participants, 75 were diabetic and 75 were non-diabetic individuals. Most diabetic participants (86.7%) belonged to the 36–55 years age group, whereas the majority of non-diabetic participants (80%) were aged 18–35 years. Females formed the larger proportion in both groups. Overweight and obesity were more common among diabetic individuals, while most non-diabetic participants had a normal BMI (56%). All non-diabetic participants had normal blood glucose levels, whereas diabetic participants

showed normal (41.3%), slightly elevated (38.7%), and high (20%) blood glucose levels. Graduates formed the largest educational group among non-diabetics, while school-level education was more common among diabetics. In both groups, the majority of participants followed a non-vegetarian diet.

Distribution of Diabetics & Non-Diabetics based on BMI [Body Mass Index]

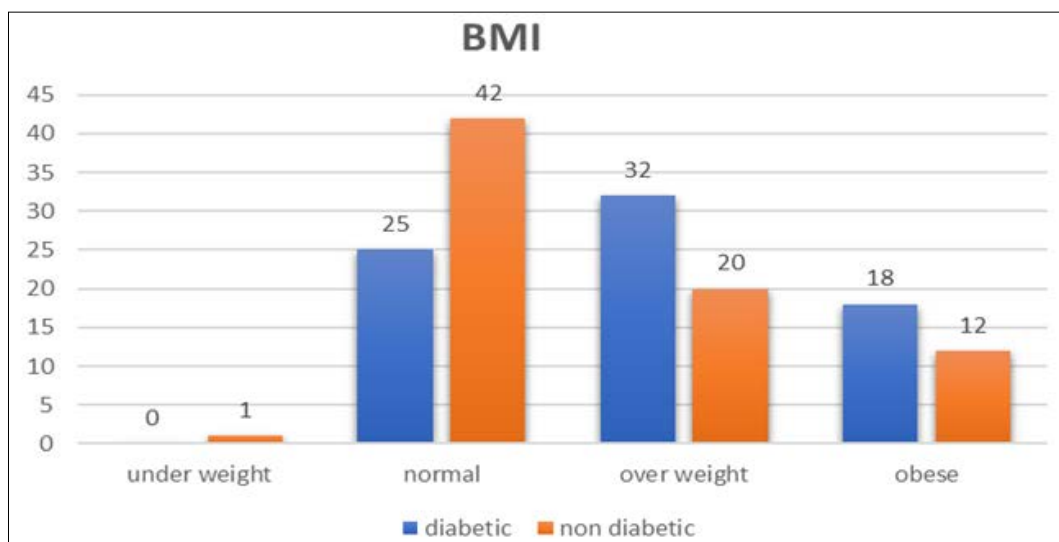


Fig 1: Distribution of subjects based on BMI

The study analyzed the distribution of Body Mass Index (BMI) among 150 individuals aged between 18–55 years, including both diabetic and non-diabetic groups. The findings revealed that the majority of participants had normal BMI (44.7%), followed by overweight (34.7%) and

obese individuals (20.0%), while a very small proportion were underweight (0.7%). The results indicate a higher prevalence of overweight and obesity within the study population, which may contribute to increased risk of metabolic disorders, including diabetes.

Table 2: Association of carbohydrate and fiber intake between diabetic and non-diabetic individuals

Variables	Diabetic [n=75]	Non-Diabetic [n=75]	t-test	p-values
Carbohydrates	336.20 ± 220.50	325.49 ± 18.34	0.319	0.750
Fiber	26.22 ± 15.36	23.16 ± 13.99	1.320	0.18

(p=0.05)

The present study compared the mean carbohydrate and fiber intake among diabetic and non-diabetic individuals. The findings revealed no statistically significant difference [$p>0.05$] in carbohydrate intake ($p=0.750$) and fiber intake

($p=0.18$) between the two groups.

The study findings were similar to a study which reported that there was no significant difference in carbohydrate intake between diabetic and non-diabetic individuals^[7].

Table 3: Relationship between blood glucose levels with actual intake of carbohydrates and fiber among diabetic and non-diabetic individuals

Group	Carbohydrates	Fiber	Blood glucose values	[v/p]	R - value
Diabetic [n=75]	336.20±220.5	26.22±15.36	150.93±43.36	1.17	+0.58
Non-diabetic [n=75]	325.49±189.34	23.16±12.99	100±0		

(p=0.05)

The present study assessed the correlation between blood glucose levels and actual carbohydrate and fiber intake among diabetic and non-diabetic individuals. Among diabetic participants, the findings revealed a moderate positive correlation between dietary intake and blood glucose levels, with a correlation coefficient ($r = +0.58$) and v/p value of 1.17, indicating that increased carbohydrate intake may be associated with higher blood glucose levels.

In non-diabetic individuals, blood glucose values remained within the normal range, and no significant correlation was observed. The results suggest that dietary carbohydrate intake may influence blood glucose levels more prominently among diabetic individuals.

The study findings were in accordance with a study which revealed differences in carbohydrate metabolism and glycemic response between males and females^[8].

Table 4: Association of actual carbohydrate and fiber intake with RDA among diabetic and non-diabetic individuals

Group	Gender	Carbohydrates	RDA	P Value	Fibre	RDA	P value
Diabetics	Male [n=34]	350.74 ± 240.6	316.5	0.413	24.72 ± 14.9	25	0.913
	Female [n=41]	324.15 ± 204.6	249	0.02	27.47 ± 15.8	30	0.31
Non diabetics	Male [n=28]	330.6 ± 217.3	316.5	0.73	24.70 ± 16	25	0.92
	Female [n=47]	322.41 ± 173	249	0.006	22.24 ± 10.9	30	0.001

(p=0.05)

The present study compared the actual carbohydrate and fiber intake with the RDA among diabetic and non-diabetic individuals based on gender. Significant differences in carbohydrate intake were observed among diabetic females ($p=0.02$) and non-diabetic females ($p=0.006$), while fiber intake differed significantly only among non-diabetic females ($p=0.001$). No significant differences were observed among males in either group. These findings are comparable to previous research reporting a positive relationship between dietary fiber intake and blood glucose control among diabetic individuals^[9].

Conclusion

Based on the findings of the present study, it can be concluded that carbohydrate intake, carbohydrate quality, and dietary practices have an important association with blood glucose levels among both diabetic and non-diabetic individuals. Although carbohydrates are essential nutrients and serve as the primary source of energy for the body, several misconceptions regarding their role in diabetes management continue to exist among the population. The study findings showed that diabetic individuals were comparatively more conscious about their dietary intake and

blood glucose management than non-diabetic individuals. A higher proportion of diabetic participants attempted to avoid or reduce carbohydrate intake and preferred whole grains and fibre-rich foods in their daily diet. However, despite this awareness, misconceptions such as completely avoiding carbohydrates, considering all carbohydrates harmful, and believing honey, jaggery, or brown sugar to be healthier alternatives to sugar were still commonly observed in both groups.

Overall, the findings of the present study highlight the importance of proper nutrition education and awareness regarding carbohydrate quantity, carbohydrate quality, fibre intake, and healthy dietary practices. Public health education programs should focus on correcting common misconceptions and promoting balanced diets rather than unnecessary restriction of carbohydrates.

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