

Original Research Article

Impact of vegetarian and non-vegetarian diets on glycaemic control in type 2 diabetes mellitus patients: a cross-sectional study

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ABSTRACT

Background: Effective management of type 2 diabetes mellitus (T2DM) requires lifestyle modification alongside pharmacological therapy. Although vegetarian diets have been associated with a lower diabetes burden in Western populations, evidence regarding their effect on glycemic control among Indian patients with T2DM is limited. This study evaluated the association between dietary pattern (vegetarian versus non-vegetarian) and glycemic control in T2DM patients receiving oral hypoglycemic agents (OHAs).

Methods: This cross-sectional study was conducted at a secondary care hospital in Alwar. 200 adults with T2DM were included (115 vegetarians, 85 non-vegetarians). Dietary classification was based on self-reported intake over the preceding 12 months. Fasting blood sugar (FBS), post-prandial blood sugar (PPBS), and glycated hemoglobin (HbA1c) were measured. Baseline demographics, body mass index (BMI), and medication adherence were recorded. Multivariate regression analysis was performed to assess independent association between diet and glycemic control after adjusting for confounders.

Results: Vegetarian patients had significantly lower mean FBS (137.11±25.35 mg/dl versus 161.75±33.93 mg/dl), PPBS (180.24±34.07 mg/dl versus 241.15±52.55 mg/dl), and HbA1c levels (7.47±0.71% versus 8.72±1.42%) compared to non-vegetarians ($p<0.001$ for all). BMI was comparable between groups ($p=0.089$). Multivariate analysis showed a vegetarian diet to be independently associated with better glycemic control (OR=2.31; 95% CI: 1.48–3.62; $p<0.001$). Medication adherence also significantly influenced HbA1c ($p=0.012$).

Conclusion: Vegetarian diet was associated with improved glycemic control in patients with T2DM, independent of BMI. These findings support dietary modification as an important adjunct to medical therapy, although larger, region-specific studies are needed to guide definitive dietary recommendations.

Keywords: T2DM, Vegetarian diet, Non-vegetarian diet, Glycemic control, HbA1c, FBS, PPBS, OHAs

INTRODUCTION

Diabetes mellitus is a major lifestyle disease with significant short- and long-term health impacts, particularly as a contributor to cardiovascular disease, among the main causes of death.¹ Pharmacological treatment is crucial, but dietary and lifestyle changes also

have a crucial role, especially in Asia, where diabetes prevalence is rising despite lower body mass index (BMI) levels.^{2,3} This trend is compounded by shifting dietary patterns, with traditional diets being replaced by Western influences, though the precise dietary contributors to increased diabetes incidence remain debated.⁴ A lower risk of diabetes is connected to vegetarianism among

populations in the West; however, its effects in Asians remain unclear.^{5,6} Unlike Western cohorts, meat and fish consumption in Asian populations shows variable effects on diabetes risk, potentially influenced by BMI.⁷⁻¹¹ Several mechanisms suggest vegetarian diets may enhance glycemic control, including reduced energy intake leading to weight loss, improved insulin secretion and glucose metabolism due to plant-based polyphenols, and gut microbiota alterations enhancing incretin secretion.¹²⁻²⁰

Different vegetarian diets -vegetarians, vegans, pescovegetarians, pollo-vegetarians, and lacto-ovo-vegetarians have been studied mainly in Western and East Asian populations, with limited data from the Indian subcontinent.¹⁹ Most studies focus on prevention, whereas the dietary patterns' impact on diabetic patients' glucose management is still unknown.

This study aims to evaluate glycemic differences between vegetarians and non-vegetarians, providing pilot data for a larger investigation. Conducted at a secondary care armed forces hospital, the study sample drawn from soldiers and their families with pan-India representation allows findings to be potentially generalised to the broader Indian population.

The study aimed to evaluate the relationship between glycemic control and vegetarian/non-vegetarian dietary habits in type 2 diabetes mellitus (T2DM) patients on oral hypoglycemic agents (OHAs) and to assess the correlation between HbA1c, fasting blood sugar (FBS), and postprandial blood sugar (PPBS) with vegetarian and non-vegetarian diets in T2DM patients managed with OHAs.

METHODS

All patients with T2DM attending the medicine OPD with disease duration >1 year, age 18 - 85 years and currently on 1-3 OHAs were included in the study. Those having anaemia or poor compliance to medications, Type 1 diabetes or T2DM on insulin, and patients not fitting clearly into vegetarian/non-vegetarian definitions were excluded from the study. This cross-sectional, open-label pilot research was conducted at Military Hospital

(secondary care hospital), Alwar, Rajasthan. The study duration was one year and was conducted from January 2019 to January 2020. All eligible diabetic patients from OPD/IPD were included.

Sample size calculation

Using its formula given, sample size was calculated, where $Z_{1-\alpha/2}=1.96Z$ (95% confidence interval), $p=0.15$ (based on Indian prevalence of 6.1–16.6% and $d=0.05$ (absolute error)).²¹ The calculated sample size was 196, rounded to 200 for accuracy and ease of data analysis.

$$Sample\ size = Z_{1-\alpha/2}^2 \times p(1 - p)/d^2$$

Patient classification

Participants were categorised into- vegetarians, those excluding meat/fish for ≥ 1 year, including dairy and eggs and non-vegetarians, those consuming meat/fish at least once a month in the past year.

Ethical clearance was taken from the hospital ethics committee before commencing the study. Each participant provided their informed written consent. Clinical and demographic information has been recorded, including compliance with OHAs has been confirmed. Data analysis occurred using statistical package for the social sciences (SPSS) software. Values were summed together using percentages and mean±standard deviation (SD).

RESULTS

This study comprised 200 patients with T2DM, divided into 115 vegetarians and 85 non-vegetarians. The BMIs of the groups did not differ significantly ($p=0.089$), along their mean age ranged from 34 to 86 years. Most vegetarians were from Rajasthan, while non-vegetarians were from various regions across India. Disease duration ranged from 1 to 24 years. The baseline characteristics of the study population are as mentioned in Table 1. Vegetarians had considerably lower levels of FBS, PPBS, and HbA1c than non-vegetarians (Table 2).

Table 1: Baseline characteristics of the study population.

Variable	Vegetarian (n=115)	Non-vegetarian (n=85)	P value
Age (years)	34–86	36–85	0.134
BMI (kg/m ²)	27.51±3.01	28.26±3.16	0.089
Male (%)	56 (48.7)	45 (52.9)	0.611
Female (%)	59 (51.3)	40 (47.1)	0.611
Diabetes duration (years)	1–24	1–22	0.157

Utilised statistical tests include the Chi-square test for categorical variables and the independent t-test for continuous variables

A multivariate regression analysis, controlling for age, BMI, duration of diabetes, or medication compliance, has been utilised to assess the impact of food on glycemic control. Vegetarians had significantly lower FBS, PPBS,

and HbA1c compared to non-vegetarians ($p<0.001$) (Table 2).

BMI was comparable between the groups ($p=0.089$), indicating dietary influence on glycaemic control was independent of weight differences. Improved glycaemic control was independently linked to a vegetarian diet (OR=2.31, $p<0.001$) (Table 3). Medication compliance significantly influenced glycaemic outcomes ($p=0.012$). This study demonstrates a substantial variation in

glycaemic control, independent of BMI, between diabetes patients consuming vegetarian and non-vegetarian diets. HbA1c, postprandial glucose, and fasting glucose had all been considerably lower in vegetarians. As per these results, a vegetarian diet could be beneficial in managing T2DM, though larger studies controlling for potential confounders are needed.

Table 2: Glycaemic control in vegetarian versus non-vegetarian groups.

Glycaemic parameter	Vegetarian (mean±SD)	Non-vegetarian (mean±SD)	P value
FBS (mg/dl)	137.11±25.35	161.75±33.93	<0.001
PPBS (mg/dl)	180.24±34.07	241.15±52.55	<0.001
HbA1c (%)	7.47±0.71	8.72±1.42	<0.001

Statistical test used: independent t-test

Table 3: Subgroup analysis and regression analysis.

Variables	Odds ratio (OR)	95% Confidence interval (CI)	P value
Vegetarian diet	2.31	1.48–3.62	<0.001
BMI	1.14	0.98–1.29	0.102
Diabetes duration	1.08	0.97–1.21	0.143
Age	0.93	0.81–1.07	0.274
Medication compliance	1.54	1.22–1.98	0.012

Statistical test used: multivariate logistic regression

DISCUSSION

The present study demonstrates significantly better glycaemic control among vegetarian patients with T2DM compared to non-vegetarians, as reflected by lower fasting blood glucose, post-prandial glucose, and HbA1c levels. These findings suggest that dietary pattern plays a meaningful role in glycaemic regulation, independent of body mass index and other measured confounders.¹⁹

Vegetarian participants exhibited significantly lower HbA1c levels despite comparable BMI values between the two groups, indicating that improved glycaemic control was not merely a consequence of lower adiposity. This observation aligns with earlier population-based and cohort studies demonstrating improved insulin sensitivity and glycaemic parameters with plant-based diets.^{5,6,13,19} The lower glycaemic indices, higher fibre content, and reduced saturated fat intake associated with vegetarian diets may contribute to improved glucose metabolism and insulin action.^{14,16}

The multivariate regression analysis confirmed that adherence to a vegetarian diet was independently associated with superior glycaemic control, even after adjusting for age, BMI, duration of diabetes, and medication compliance. Similar associations have been reported in both Western and Asian cohorts, including the Adventist Health Study-2 and multi-ethnic cohort studies, where vegetarian or plant-predominant diets were linked

to lower HbA1c levels and reduced diabetes-related complications.^{5,11,19} In contrast, higher consumption of red and processed meat has been consistently associated with poorer glycaemic outcomes and increased diabetes risk.^{7,9,10} Medication compliance was another significant determinant of glycaemic control in this study, reinforcing the importance of adherence alongside dietary modification. This finding is consistent with prior evidence indicating that lifestyle interventions combined with pharmacotherapy yield superior metabolic outcomes compared to medication alone.^{12,17} The lack of subgrouping based on identical drug regimens, however, limits definitive conclusions regarding the interaction between diet and specific oral hypoglycaemic agents.

Unlike several previous studies that primarily examined the role of vegetarian diets in diabetes prevention, this study focuses on patients with established T2DM receiving treatment, thereby providing clinically relevant insights into dietary modification as an adjunctive therapeutic strategy.^{5,6,19} The observed differences in glycaemic parameters underscore the potential of dietary counselling as a cost-effective and culturally adaptable intervention in diabetes management, particularly in resource-limited settings such as India.²¹

Limitations

This study has several limitations. First, the geographical distribution differed between groups, with most

vegetarians being long-term residents of Rajasthan and non-vegetarians originating from diverse regions, introducing potential dietary and lifestyle heterogeneity. Second, patients were not stratified based on identical treatment regimens or dosages of oral hypoglycaemic agents, which may have influenced glycaemic outcomes. The inclusion of older patients up to 86 years and recruitment from subsidiary centres may have introduced selection bias. As the study was cross-sectional and limited to non-insulin-treated T2DM patients, causal inference cannot be established, and the findings cannot be generalised to insulin-dependent diabetes or other diabetes subtypes.

CONCLUSION

The glycaemic control of vegetarians differs significantly from non-vegetarians in patients with T2DM. However, large-scale studies are required before making recommendations in this regard. Recurrence of similar results would result in a significant change in the dietary advice of patients towards curbing the intake of non-vegetarian food products.

Recommendations

It is recommended that large-scale studies be conducted under similar lines. However, the study to be conducted should include patients from a particular geographical area who have a similar duration of diabetes and who are on a similar kind of therapy, preferably with the same dose of similar oral hypoglycaemic agents.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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