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A Cross-Sectional Study on Association Between Taste Dysfunction and Obesity in Type 2 Diabetes Mellitus Patients at a Tertiary Care Centre of West Bengal

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ABSTRACT

Background: Taste dysfunction is an often-overlooked complication of Type 2 Diabetes Mellitus (T2DM). Alterations in taste perception may contribute significantly to unhealthy dietary patterns, which in turn promote weight gain and worsen glycaemic control. This study aims to explore the association between taste dysfunction and obesity in patients with T2DM. **Objectives:** To determine the prevalence of taste dysfunction in T2DM patients and to assess its association with Body Mass Index (BMI). **Methods:** A hospital-based cross-sectional study was conducted at a tertiary care centre in West Bengal. A total of 82 diagnosed T2DM patients were enrolled using systematic random sampling. Taste dysfunction was assessed using the validated filter paper disc method. Anthropometric measurements and sociodemographic data were collected. Statistical analysis was performed using SPSS version 25.0, applying chi-square test and logistic regression. **Results:** Out of 82 patients, 62 (75.6%) demonstrated some form of taste dysfunction. Hypogeusia was the most common finding (46.3%), followed by dysgeusia (22.0%). A statistically significant association was observed between taste dysfunction and higher BMI categories ($p < 0.001$). Overweight and obese patients had significantly higher rates of taste dysfunction compared to those with normal BMI. **Conclusion:** Taste dysfunction is highly prevalent in T2DM patients and shows a significant positive association with obesity. Routine screening for taste abnormalities should be incorporated into diabetes management to facilitate better dietary counselling and improved outcomes.

Keywords: *Taste dysfunction, obesity, Type 2 Diabetes Mellitus, hypogeusia, BMI, West Bengal, cross-sectional study.*

1. INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is one of the fastest-growing non-communicable diseases globally, and India bears a disproportionately high burden of this epidemic. According to the International Diabetes Federation (IDF) 2021 report, India had approximately 74 million diabetic individuals, making it the second-largest diabetic population in the world. West Bengal, a densely populated state in eastern India, is no exception to this rising trend[1].

While much clinical attention is directed towards the classical complications of T2DM — such as retinopathy, nephropathy, neuropathy, and cardiovascular disease — the sensory complications, particularly taste dysfunction, have received comparatively little attention. Taste dysfunction encompasses a spectrum of disorders including hypogeusia (reduced taste sensitivity), ageusia (complete loss of taste), and dysgeusia (distorted or altered taste perception). These conditions can dramatically alter a patient's dietary preferences, often leading to increased consumption of sweeter, saltier, or high-calorie foods, thereby accelerating weight gain[2].

Obesity is a well-established risk factor for T2DM and its complications. The bidirectional relationship between taste dysfunction and obesity is biologically plausible. Adiposity alters the secretion of leptin, insulin, and other hormones that modulate taste receptor sensitivity. Conversely, impaired taste function may itself drive overeating behaviours, further promoting obesity. Despite this plausible biological link, studies specifically examining this relationship in Indian diabetic populations remain scarce[3].

The present study was therefore undertaken at a tertiary care centre in West Bengal to explore the prevalence of taste dysfunction among T2DM patients and to determine whether a statistically significant association exists between taste dysfunction and obesity as measured by BMI[4].

2. OBJECTIVES

Primary Objective:

To assess the prevalence of taste dysfunction in patients with Type 2 Diabetes Mellitus attending a tertiary care hospital in West Bengal.

Secondary Objectives:

1. To determine the association between taste dysfunction and BMI (obesity) in T2DM patients.
2. To describe the sociodemographic profile of the study participants.
3. To identify the pattern and types of taste dysfunction prevalent in the study group.

3. METHODOLOGY

Study Design and Setting:

This was a hospital-based cross-sectional study conducted at the Medicine Outpatient Department (OPD) and Indoor wards of a tertiary care centre in West Bengal, India. The study was carried out over a period of 12 months.

Eligibility Criteria:

Inclusion Criteria: (1) Patients aged 20 years and above with a confirmed diagnosis of T2DM as per ADA 2021 criteria; (2) Duration of diabetes ≥ 1 year; (3) Patients willing to give written informed consent.

Exclusion Criteria: (1) Patients with Type 1 DM, gestational diabetes, or secondary diabetes; (2) Known history of neurological disorders, oral pathology, sinusitis, or head-neck surgery; (3) Patients on medications known to

affect taste (e.g., metronidazole, ACE inhibitors); (4) Active COVID-19 infection or recent history (within 6 months) of COVID-19.

Sample Size Calculation:

The sample size was calculated using the formula for estimation of proportion:

$$n = Z^2 \times P \times (1 - P) / d^2$$

Where:

Z = 1.96 (for 95% confidence interval)

P = 0.52 (52% — estimated prevalence of taste dysfunction in T2DM based on prior literature)

d = 0.11 (11% — acceptable margin of error)

$$n = (1.96)^2 \times 0.52 \times 0.48 / (0.11)^2 = 3.8416 \times 0.2496 / 0.0121 \approx 79.2 \approx 80$$

Adding approximately 2.5% attrition, the final sample size was rounded up to 82 patients.

Sampling Method:

Systematic Random Sampling was employed. From the diabetic OPD register, every 3rd eligible patient was selected after the first subject was chosen randomly. This ensured equal probability of selection and minimised selection bias.

Data Collection Tools:

A pre-tested, semi-structured questionnaire was used to collect sociodemographic data (age, sex, education, occupation, income, residence) and clinical details (duration of DM, medications, comorbidities). Anthropometric measurements including weight, height, and BMI were recorded. BMI was classified as per WHO criteria: Normal (18.5–24.9 kg/m²), Overweight (25–29.9 kg/m²), and Obese (≥ 30 kg/m²).

Assessment of Taste Dysfunction:

Taste dysfunction was assessed using the validated Filter Paper Disc (FPD) method, in which impregnated filter discs with four basic tastes — sweet (sucrose), salty (sodium chloride), sour (citric acid), and bitter (quinine) — were placed on different areas of the tongue. Patients were asked to identify the taste. Responses were scored and categorised as: Normal taste, Hypogeusia (reduced sensitivity), Dysgeusia (altered taste), or Ageusia (complete loss). This method has been validated and used widely in clinical taste research.

Statistical Analysis:

Data were entered in Microsoft Excel and analysed using SPSS version 25.0. Categorical variables were expressed as frequencies and percentages. The chi-square test was used to assess associations, and logistic regression was employed to identify independent predictors of taste dysfunction. A p-value of < 0.05 was considered statistically significant.

Ethical Clearance:

The study was approved by the Institutional Ethics Committee (IEC). Written informed consent was obtained from all participants prior to enrolment. Confidentiality of all data was maintained throughout the study.

4. RESULTS

A total of 82 patients with confirmed Type 2 Diabetes Mellitus were enrolled in this study. The findings are presented under the following sub-sections:

4.1 Sociodemographic Profile

Table 1 presents the sociodemographic and clinical characteristics of the study participants.

Table 1: Sociodemographic and Clinical Characteristics of Study Participants (n = 82)

Variable	Category	n (Frequency)	Percentage (%)
Age Group (years)	20–35	18	21.9
	36–50	35	42.7
	51–65	22	26.8
	>65	7	8.6
Sex	Male	47	57.3
	Female	35	42.7
Education	Illiterate	12	14.6
	Primary	20	24.4
	Secondary	30	36.6
	Graduate & above	20	24.4
Occupation	Unemployed / Homemaker	28	34.1
	Labourer / Farmer	24	29.3
	Service / Business	30	36.6
Residence	Urban	49	59.8
	Rural	33	40.2
Monthly Income	< ₹10,000	26	31.7
	₹10,000–₹25,000	38	46.3
	> ₹25,000	18	22.0
BMI Category	Normal (18.5–24.9)	18	22.0
	Overweight (25–29.9)	32	39.0
	Obese (≥30)	32	39.0
Duration of DM	< 5 years	30	36.6
	5–10 years	35	42.7
	> 10 years	17	20.7

The mean age of participants was 48.6 ± 11.2 years. The majority (42.7%) belonged to the 36–50 years age group. Males constituted 57.3% of the sample. More than half of the participants (59.8%) were from urban areas. Regarding BMI, 39.0% were overweight and 39.0% were obese, with only 22.0% having a normal BMI. The mean duration of diabetes was 6.4 ± 3.8 years.

4.2 Prevalence and Pattern of Taste Dysfunction

Table 2: Distribution of Taste Dysfunction among Study Participants (n = 82)

Type of Taste Dysfunction	n	Percentage (%)
Hypogeusia (reduced taste)	38	46.3
Ageusia (complete loss of taste)	6	7.3
Dysgeusia (altered / distorted taste)	18	22.0
Normal taste	20	24.4

Out of 82 participants, 62 patients (75.6%) demonstrated some form of taste dysfunction. Hypogeusia was the most common form, affecting 38 patients (46.3%), followed by dysgeusia in 18 patients (22.0%). Ageusia was noted in 6 patients (7.3%). Only 20 patients (24.4%) had normal taste perception.

4.3 Association Between Taste Dysfunction and BMI (Obesity)

Table 3: Association Between BMI Category and Taste Dysfunction (n = 82)

BMI Category	Normal Taste	Taste Dysfunction	p-value
Normal BMI	Normal: 12 (66.7%)	Dysfunction: 6 (33.3%)	$p < 0.05$*
Overweight	Normal: 6 (18.8%)	Dysfunction: 26 (81.2%)	$p < 0.001$*
Obese	Normal: 2 (6.3%)	Dysfunction: 30 (93.7%)	$p < 0.001$*

**Statistically significant (chi-square test)*

A statistically significant association was found between BMI category and taste dysfunction ($p < 0.001$). Among patients with normal BMI, only 33.3% had taste dysfunction. In contrast, 81.2% of overweight patients and 93.7% of obese patients demonstrated taste dysfunction. Logistic regression analysis revealed that obese T2DM patients were 7.4 times more likely (OR = 7.4, 95% CI: 2.9–18.6) to have taste dysfunction compared to those with normal BMI.

5. DISCUSSION

The present study was designed to evaluate the prevalence of taste dysfunction in T2DM patients and to determine its association with obesity at a tertiary care centre in West Bengal. The overall prevalence of taste

dysfunction in this study was 75.6%, which is consistent with findings from similar studies conducted in diabetic populations. Gondivkar et al. (2009) and Naka et al. (2010) reported prevalences of taste dysfunction between 60–80% in T2DM patients, supporting the high occurrence found in the present study[5].

Hypogeusia was the most predominant form of taste dysfunction (46.3%), followed by dysgeusia (22.0%) and ageusia (7.3%). This pattern is in alignment with previously published literature. The predominance of hypogeusia is thought to arise from diabetic neuropathy affecting the chorda tympani nerve and the glossopharyngeal nerve, which are primarily responsible for taste conduction. Chronic hyperglycaemia leads to oxidative stress and microvascular damage, which can impair the peripheral taste receptor cells (taste buds) as well as the central gustatory pathways[6].

One of the key findings of this study is the strong and statistically significant positive association between taste dysfunction and higher BMI categories. The prevalence of taste dysfunction rose progressively from 33.3% in the normal BMI group to 81.2% in the overweight group and to 93.7% in the obese group ($p < 0.001$). This dose-response relationship strongly suggests a bidirectional link between obesity and taste dysfunction in diabetic patients[7].

This association may be explained by several biological mechanisms. Adiposity is associated with altered leptin signalling, and leptin receptors are expressed on taste receptor cells. Elevated circulating leptin in obese individuals may downregulate taste sensitivity, particularly for sweet taste. Furthermore, obesity-induced chronic low-grade inflammation may damage taste buds directly. On the other hand, diminished taste perception may lead to compensatory overconsumption of energy-dense, highly palatable foods — further driving weight gain and creating a vicious cycle [8].

The findings also revealed that duration of diabetes was an important co-variable. Patients with a longer duration of diabetes (> 10 years) had a higher prevalence of taste dysfunction, which may reflect cumulative neuropathic damage over time. This is consistent with the understanding that diabetic peripheral neuropathy worsens with disease duration and poor glycaemic control [9].

From a public health perspective, the high prevalence of taste dysfunction in this cohort underscores the need for routine gustatory assessment in diabetes clinics. Currently, taste dysfunction is not part of the standard diabetic complication screening protocol in most Indian hospitals. Identifying taste impairment early may allow clinicians to address dietary maladaptation that contribute to poor glycaemic and weight control[10].

The study was limited by its cross-sectional design, which precludes causal inference. Additionally, the sample was drawn from a single tertiary centre, which may limit generalisability to the broader population. Future longitudinal studies with larger sample sizes and objective biochemical markers (such as HbA1c and leptin levels) should be undertaken to establish the causal direction of the association.

6. CONCLUSION

This cross-sectional study demonstrates that taste dysfunction is highly prevalent (75.6%) among Type 2 Diabetes Mellitus patients attending a tertiary care centre in West Bengal. Hypogeusia is the most common form of taste impairment. A statistically significant and clinically meaningful association exists between taste dysfunction and obesity, with the likelihood of taste dysfunction increasing progressively with higher BMI categories.

These findings highlight the importance of incorporating routine gustatory assessment into standard diabetes care. Early identification of taste dysfunction can enable targeted dietary counselling, behavioural interventions, and better patient education — all of which are essential to breaking the cycle of impaired taste, poor dietary choices, weight gain, and worsening diabetes. Clinicians and policymakers in India should consider taste dysfunction as a relevant and underscreened complication of T2DM.

7.DECLARATION

Conflict of Interest: The authors declare no conflict of interest.

Source of Funding: The study received no external funding. It was conducted as a departmental academic research project

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