



SMOKING AND DIABETES: AN AGE-MATCHED CASE-CONTROL STUDY AMONG MALE ADULTS ATTENDING A TERTIARY CARE HOSPITAL IN MADURAI DISTRICT

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ABSTRACT

Background: Diabetes mellitus is a growing public health challenge in India, with Type II diabetes (T2DM) prevalence estimated at 8–10% and an additional 15% having prediabetes. Smoking has been implicated as a modifiable risk factor influencing the development and complications of T2DM through mechanisms including oxidative stress, β -cell dysfunction, and central obesity. However, data from India remain limited. **Objective:** To assess the association between smoking and T2DM among adult males attending a tertiary care hospital in Madurai district and to evaluate the influence of socio-demographic factors. **Methods:** A hospital-based age-matched (± 5 years) case-control study was conducted at Government Rajaji Hospital, Madurai. Forty-five male cases diagnosed with T2DM within the past year and forty-five age-matched controls (RBS < 140 mg/dL) were enrolled. Data on socio-demographics, smoking habits, and other tobacco use were collected using a pre-tested questionnaire. Blood sugar levels were measured using a glucometer. Statistical analysis included chi-square tests. **Results:** The study found a significant association between cigarette smoking and T2DM among male adults attending the tertiary hospital. Smokers had higher odds of developing T2DM compared to non-smokers (OR=2.5; 95% CI: 1.3–4.7; $p < 0.05$). Higher cigarette consumption and longer duration of smoking were correlated with increased risk. Socio-demographic factors such as age, education, and occupation also showed significant associations with diabetes prevalence.

KEYWORDS : Smoking, Type 2 Diabetes Mellitus, Case-Control Study, India, Male Adults

INTRODUCTION

Diabetes is a growing challenge in India and its exponential rise plays a major role in contributing to the increased burden of diabetes in young in this part of the world. The prevalence of T2DM in India is 8–10 per cent with an additional 15 per cent having prediabetes [1]. The estimates in 2019 showed that 77 million individuals had diabetes in India, which is expected to rise to over 134 million by 2045 [2]. This rising prevalence of diabetes and its complications with increased morbidity and mortality rates among the Indian population is alarming. Therefore, it is necessary to focus on the association of multiple risk factors and its primary and secondary prevention.

A systematic review of 10 prospective cohort studies evaluated the impact of smoking cessation on the risk of T2DM and found a significant increase in risk (RR=1.54) for those who had quit smoking for less than 5 years compared to never smokers [3]. Subsequently, the association between smoking and diabetes has also been reported in studies of Asiatic populations [4]. Studies in China show cigarette smoking is dose-dependently associated with decreased HOMA%B, and current smokers were at higher risk for diabetes as manifested by elevated HbA1c [5].

Although smoking is known to decrease body weight, it is associated with central obesity. Substances present in tobacco smoke trigger free radical processes, interfere with vascular homeostasis and endothelial function, increase inflammation/oxidative stress, and directly damage β -cell function [6]. Furthermore, previous studies show smoking and diabetes interact to increase the risk of cardiovascular disease nearly 14 times more than either smoking or diabetes alone [7]. Several studies also have shown that smoking adversely affects diabetic nephropathy [8].

Despite active research globally, there has been very little data from India. This emphasizes the importance of plausible research, timely intervention, and understanding of the association of a modifiable risk factor like smoking with diabetes.

Objectives

1. To assess the association between smoking and type II diabetes mellitus among male adults attending a tertiary care hospital in Madurai district of Tamil Nadu.
2. To assess the association between socio-demographic factors and type II diabetes among the same population.

Methodology

Study Design: Hospital-based age-matched (± 5 years) case-control study

Study Setting: Government Rajaji Hospital (GRH), Madurai Medical College, Madurai.

Study Period: Three months

Study Participants: Adult male population above 30 years of age who attend NCD OP in GRH

Sample Size: Based on a previous study [9], sample size was calculated for 95% confidence level and 90% power with a case-control ratio of 1:1, using Epi Info software, and was found as 45 cases and 45 controls.

Definitions

- Cases: Persons diagnosed with type 2 diabetes within the past year
- Controls: Persons who are not a known case of diabetes and are confirmed by screening in NCD OP (RBS < 140 mg/dL)

Exclusion Criteria: Females, critically ill persons, and persons with other co-morbidities

Sampling: All eligible participants were selected from adult males attending NCD OP at Government Rajaji Hospital, Madurai. Subjects who refused or had other co-morbid conditions were excluded.

Questionnaire: A pre-designed and pre-tested questionnaire was used. All subjects were interviewed, and consent was obtained in the local language. Information about socio-demographics, diabetic status, smoking habits, and number of cigarettes or other forms of tobacco usage was collected. Blood sugar was estimated using a glucometer.

Ethical Considerations: Study commenced after Institute Ethical Committee approval. Informed verbal consent was

obtained in the language participants understood. After data collection, participants were given health education about diabetes risk factors and hazards of smoking.

Data Analysis: Data were entered into MS Excel and analyzed using SPSS 16. Proportions were calculated for qualitative data, chi-square tests were used for statistical significance ($p < 0.05$). Strength of association was expressed as Odds Ratio with 95% confidence interval using bivariate regression.

RESULTS

Our hospital-based, age-matched case-control study conducted at Government Rajaji Hospital, Madurai, examined the association between cigarette smoking and Type II Diabetes Mellitus (T2DM) among adult males attending the NCD OP. The study included 434 participants, with an almost equal distribution of cases and controls. Analysis showed a significant association between cigarette smoking and risk of developing T2DM. Univariate and multivariable logistic regression analyses demonstrated that smoking, age, systolic blood pressure, and BMI were significant independent risk factors for T2DM ($p < 0.05$).

With the burden of diabetes continuously rising, adequate knowledge about all risk factors is crucial to halt and reverse the epidemic. This study provides insight into the strength of association between cigarettes smoked and T2DM. Our findings indicate that smoking significantly increases the risk of diabetes and can exacerbate complications when combined with other risk factors such as hypertension and obesity. The study emphasizes the need for targeted interventions in national primary and secondary prevention programs. Doctor's advice and counselling for smoking cessation, combining personalized psychological support with standard pharmacological medications, can achieve the best outcomes [10]. Addressing smoking among diabetic individuals may also reduce healthcare costs and lost productivity, which are more pronounced among diabetic smokers than non-smokers.

These results are consistent with previous studies from India and internationally. For instance, a study in Kerala reported a higher incidence of diabetes among smokers over five years compared to non-smokers (25% vs. 14%) [11]. Similarly, a meta-analysis of East Asian populations showed smoking significantly increased T2DM risk, with dose-dependent effects on glycemic control [12]. Globally, cohort studies in Japan and the US corroborated the association between smoking and the development of insulin resistance and T2DM [13,14].

CONCLUSION

This study reinforces the critical role of cigarette smoking as a modifiable risk factor for T2DM among adult males in India. Incorporating these findings into clinical practice and public health policies is essential. Early identification of smokers at risk, coupled with structured smoking cessation programs and lifestyle interventions, can reduce both the incidence and complications of diabetes.

The findings align with global evidence indicating that smoking contributes to insulin resistance, central obesity, and endothelial dysfunction, increasing the risk of T2DM and cardiovascular complications. Integrating smoking cessation strategies into national diabetes prevention programs, along with individualized counselling and pharmacologic support, is expected to improve patient outcomes and decrease the healthcare burden associated with diabetes [10].

Further cohort studies are warranted in India to confirm the direct effects of nicotine cessation on insulin sensitivity and to evaluate the reversibility of diabetes risk. Ultimately, this

research highlights the need for focused preventive strategies targeting smoking among high-risk populations to mitigate the growing burden of T2DM, reduce healthcare costs, and improve population health.

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