



The risk of T2DM with Alcohol consumption, Smoking, Hypertension and Family History of Hypertension: A Study on Bengalee Hindu Caste Population

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KEYWORDS

T2DM, Alcohol Consumption, Smoking, Hypertension, Family History of Hypertension, Bengalee Hindu Caste.

ABSTRACT

The risk of T2DM has been proliferated with help of modifiable (smoking, alcohol consumption) and non-modifiable (hypertension, family history of hypertension) risk factors. The magnitude of risk varied in different populations. The present study was conducted to understand the association between T2DM with smoking, alcohol consumption, hypertension and family history of hypertension among the Bengalee Hindu caste population. The present study consisted of 104 clinically diagnosed Type 2 diabetes mellitus male patients (age range-23-80 years) and 176 apparently healthy males (age range 18-79 years) denoted as the control group from an endogamous linguistic group (Bengalee Hindu caste population). Purposive sampling method was used to collect the data. Data on alcohol consumption, smoking habit, hypertension and family history of hypertension have been collected by pretested prepared schedule. Statistical analysis was performed in appropriate places using (IBM SPSS-25) software. No significant differences were observed in alcohol consumption and smoking habits between T2DM patients and the control group. However, significant differences ($p=0.01$) were observed in hypertension and family history of hypertension between T2DM patients and the control group. Hypertensive individuals ran a 2.583 times greater risk [OR=2.583 (1.570-4.250) associated with T2DM than normotensive individuals. Similarly, individuals with a family history of hypertension ran a 2.495 times greater risk [OR=2.495 (1.439-4.325) $p=0.01$], associated with T2DM than individuals without a family history of hypertension. These non-modifiable factors might enhance an additional risk for T2DM and create a health burden in that population.

Introduction

Type 2 Diabetes Mellitus (T2DM) is a chronic condition due to the raised levels of glucose in the blood because the body cannot produce insulin or insulin efficacy (IDF Diabetic Atlas, 2019). It creates global health problems that affect the life quality of an individual, and in general increases economic health burden. The global prevalence of T2DM was estimated at around 366 million in 2030 by World Health Organization (WHO) and the largest increase of T2DM will be in the Indian population by 2030 (Raza et al., 2012). The aetiology of T2DM combines both genetic and lifestyle or environmental factors (Sharma et al., 2013)

Alcohol consumption is one of the important risk factors of T2DM in one's lifestyle. The effects of alcohol on diabetes through its contribution to the excess caloric intake and obesity, induction of pancreatitis, disturbance of carbohydrate and glucose metabolism, and impairment of liver

function (Kao et al.,2001). However, inconsistent results have been found in terms of the association between alcohol consumption and T2DM. (Djousse et al.,2007). The risk of T2DM increased in high consumption of alcohol. On the other hand, moderate consumption of alcohol has certain protective effects as well as no effects on T2DM. Furthermore, the effect of alcohol intake might be modified by sex (Dam, 2018). For example, the association between T2DM and alcohol consumption was only confined in males. In the case of females, no association has been reported (Carlsson et al.,2005).

Smoking is another habit-related risk factor for the development of T2DM. Tobacco smoke and tobacco products (cigars, pipes, and smokeless tobacco) contain many harmful and potentially harmful constituents (HPHC). These harmful constituents affect different organ systems and physiological processes in a tissue-specific manner. The association between smoking and T2DM was observed in past and current smokers irrespective of educational level, physical activity, alcohol consumption, and diet (Keith et al., 2016). In addition, T2DM risk increased with the number of cigarettes smoked (Chang, 2012). For example, heavy smokers (around 20 cigarettes daily) have a comparatively higher risk of T2DM followed by normal smokers (less than 20 cigarettes daily) and former smokers (Xie et al.,2009). β cells of pancreatic islets have neuronal nicotinic acetylcholine receptors(nAChRs). nAChRs play an important role in controlling the hormone release by β cells. For that reason, acute (60min) and chronic (48h) exposure to nicotine must decrease β cells insulin secretion.

The insulin resistance index was significantly increased among smokers after an hour of smoking. Smoking also reduced insulin-mediated glucose uptake by 10-40% among men smokers compared to non-smokers. Nicotine (HPHC) is more sensitive to impaired insulin action for reducing blood glucose levels through triggering free radical process among T2DM patients (Xie et al.,2009; Sliwiska-Mosson and Milnerowicz,2017). This process interferes with vascular homeostasis, which disturbs the proper functioning of the vascular endothelium and increases inflammation or oxidative stress for damaging β -cell function (Sliwiska-Mosson and Milnerowicz,2017), loss of β -cell mass and increased β -cell apoptosis. This apoptosis may lead to the development of postnatal dysglycemia and obesity. Therefore, hyperglycemia and dyslipidemia including low HDL cholesterol and postprandial lipid intolerance were higher among smokers due to disorders of glucose and lipid metabolism (Xie et al.,2009). Smokers have a lower BMI and higher abdominal fat accumulation due to a higher energy expenditure and lower appetite. However, abdominal obesity is associated with insulin resistance and progression of T2DM. Smokers with presence of abdominal obesity might also have an additive risk of T2DM (Diabetes care, 2014). Smokers with T2DM have higher insulin and C-peptide responses against oral glucose load (Chang, 2012). Higher glycated hemoglobin (HbA1c) levels and severe hypoglycaemia were observed in smokers with T2DM (Nagrebetsky et al., 2014). Furthermore, the exposure pattern of smoking among T2DM patients differed as regards race/ethnicity due to smoking trends (Keith et al., 2016). The risk of cardiovascular events and deaths increased the risk of death by 48%, coronary heart disease, by 54%, stroke, by 44% and myocardial infarction, by 52% among smokers with T2DM (Nagrebetsky et al., 2014).

Hypertensive patients with diabetes also had four-fold greater risk of cardiovascular disease compared to non-diabetic normotensive controls (Lastra et al.,2014; Kim et al.,2015). Hypertension and diabetes simultaneously co-occurred and found to share a common risk factor (Kim et al.,2015). Hypertension is associated with an elevated risk of developing T2DM (Yamamoto-Honda et al., 2017). Moreover, a family history of hypertension is also associated with insulin resistance. (Yamamoto-Honda et al., 2017).

The discrepancy of results has been obtained in terms of association between T2DM with lifestyle

related risk (smoking and alcohol consumption), hypertension and family history of hypertension. On this background, the present study is to understand the association between T2DM with smoking, alcohol consumption, hypertension and family history of hypertension among the Bengalee Hindu caste population.

Materials and Methods

The Present study consisted of 104 clinically diagnosed Type 2 diabetes mellitus male patients and 176 apparently healthy males denoted as the control group from Bengalee Hindu caste population of West Bengal, India, an endogamous linguistic group. The age ranging from 23-80 years for T2DM patients and 18-79 years for the control group respectively. Purposive sampling method was used to collect the data. Data on alcohol consumption, smoking habit, hypertension and family history of hypertension have been collected by pretested prepared schedule. The study was approved by the institutional Ethical Committee (Ref No. 009/17-18/1682 dated-30/11/2017). Statistical analysis was performed using (IBM SPSS-25) software. Chi square was performed to understand the association of smoking and alcohol consumption, hypertension and family history of hypertension with T2DM. Simultaneously, odds ratio was obtained from subsequent analysis.

Results

Table-1 Distribution of alcohol consumption among the control group and T2DM patients

| Variables | Status | Control Group (n=176) | T2DM patients (n=104) | OR (95% CI) |
|---------------------|--------|-----------------------|-----------------------|-------------------------------|
| Alcohol Consumption | Yes | 15 (8.5) | 11 (10.6) | 1.270 (0.560-2.879) p=0.56 |
| | No | 161 (91.5) | 93 (89.4) | |

No significant differences were observed in alcohol consumption between T2DM patients and the control group (Table-1).

Table -2 Distribution of smoking habits among the control group and T2DM patients

| Variables | Status | Control Group (n=176) | T2DM patients (n=104) | OR (95% CI) |
|----------------|--------|-----------------------|-----------------------|----------------------------|
| Smoking habits | Yes | 39 (22.2) | 19 (18.3) | 0.785 (0.426-1.447) p=0.43 |
| | No | 137 (77.8) | 85 (81.7) | |

No significant differences were observed in smoking habit between T2DM patients and the control group (Table-2).

Table-3 Distribution of hypertension status and family history of hypertension among the control group and T2DM patients.

| Variables | Status | Control Group (n=176) | T2DM patients (n=104) | OR (95% CI) |
|--------------------------------|--------|-----------------------|-----------------------|-------------------------------|
| Hypertension | Yes | 64 (36.4) | 62 (59.6) | 2.583 (1.570-4.250) p=0.01 |
| | No | 112 (63.6) | 42 (40.4) | |
| Family History of hypertension | Yes | 33 (18.8) | 38 (36.5) | 2.495 (1.439-4.325) p=0.01 |
| | No | 143 (81.2) | 66 (63.5) | |

In Table-3, significant differences (p=0.01) were observed in hypertension and family history of hypertension between T2DM patients and the control group. Hypertensive individuals showed

a 2.583 times greater risk [OR=2.583 (1.570-4.250)] associated with T2DM than normotensive individuals. Similarly, individuals with a family history of hypertension ran a 2.495 times greater risk [OR=2.495 (1.439-4.325) $p=0.01$] associated with T2DM than individuals without a family history of hypertension.

Discussion

Alcohol consumption and smoking are modifiable risk factors of T2DM. Lifestyle modifications reduce the risk of T2DM due to these modifiable risk factors. In the present study, there was no evidence of T2DM risk associated with alcohol consumption. The present study corroborates earlier works among US adults, where moderate alcohol consumption did not increase the risk of T2DM (Kao et al.,2001). Similar findings have been obtained among people in Auckland in terms of no association between alcohol consumption and T2DM (Metcalf et al.,2014). Contrary to previous findings, high alcohol consumption increased the risk of T2DM among Finnish women (Carlsson et al., 2005) and Korean men (Lee et al.,2017). Light and moderate alcohol consumption were also associated with T2DM among US elderly adults (Djousse et al., 2007). Therefore, US male physicians and Korean men have a decreased risk of T2DM associated with light to moderate alcohol consumption (Ajani et al.,2000; Lee et al.,2017). Similarly, the risk of T2DM was inversely associated with alcohol consumption in Chinese men (Shi et al.,2013).

Moreover, the present study showed no association between smoking and T2DM, contrary to the present study, where smoking is associated with T2DM among Chinese men and people of Trondheim, Norway (Carlsson et al.,2005; Lee et al.,2017).

High Blood pressure/ hypertension is another risk factor for T2DM. The risk of T2DM was significantly higher among hypertensive individuals compared to normotensive individuals of the Bengalee Hindu Caste group. Similarly, hypertensive Korean individuals run a greater risk of T2DM compared to normotensive Korean individuals (Kim et al.,2015).

A family history of hypertension also increased the risk of T2DM among the Bengalee Hindu caste group. Individuals with a family history of hypertension ran a 2.5 times greater risk compared to those without a family history of T2DM. The present study corroborates earlier work in Japanese, where a family history of hypertension is the accelerated onset of diabetes at younger age (Yamamoto-Honda et al., 2017). Moreover, a family history of hypertension is significantly higher in diabetic nephropathy patients of China compared with controls (Ma et al., 2019).

The etiology of T2DM is associated with various risk factors. Lifestyle-related risk (smoking and alcohol consumption) was not any independent effect on T2DM. However, hypertension and a family history of hypertension have a certain impact on T2DM progression. Those unalterable factors might enhance an additional risk for T2DM and create a health burden in that population.

Contribution statement

Pranabesh Sarkar (PS)- initiated and design, acquisition of data or analysis, interpretation of data and preparing the initial draft of the manuscript and revised the draft of the manuscript.

Diptendu Chatterjee (DC)- Acquisition of data, preparing the revised draft of the manuscript.

Arup Ratan Bandyopadhyay (ARB) - Preparing revised the draft of the manuscript.

Declaration of Competing Interest

The authors declare that they have no conflict of interest associated with this manuscript.

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