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Effect on glycemic control and body mass index due to current cigarette smoking in patients with type 2 diabetes mellitus

Biochemistry

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ABSTRACT

Smoking has been identified as an independent risk factor for insulin resistance, a precursor for type 2 diabetes mellitus. India being the second largest producer and consumer of tobacco and its products, the Indian population is at higher risk of developing diabetes and its complications. The present study was carried out to find out the association between current smoking, glycated hemoglobin (HbA1c) level and Body mass index (BMI) in patients with type2 diabetes mellitus. No association was found between current smoking, glycemic control and BMI in patients with type 2 diabetes mellitus. Though BMI was higher in patients with poor and very poor glycemic control in both smokers and non smokers, but the difference was not significant and more studies are required.

Introduction

Smoking is a well established causal factor in coronary heart disease (CHD) and heart stroke but it is not a well- documented risk factor for type2 diabetes, although diabetes and CHD have many common causal factors.[1,2] India being the second largest producer and consumer of tobacco and its products, the Indian population is at higher risk of developing diabetes and its complications.[3] Cigarette smoking is known to cause transient elevations in blood glucose concentration and also influence insulin sensitivity.[4,5] In 2007, Beaser RS et al observed the strong relationship between insulin resistance, metabolic syndrome and glucose intolerance and are the consequences of common background.[6] Also smokers tend to have lower BMI than non smokers, but are also more likely to have increased central adiposity.[7] Heavy smokers tend to have higher body weight and they are at higher risk of developing obesity.[8] It could be due to lifestyle favoring weight gain i.e., physical inactivity, low intake of fruits and vegetables, alcohol consumption.[9]

The study conducted by Albanes D et al observed that smoking was associated with an increase in HbA1c level and a decrease in body mass index (BMI) in type 2 diabetes mellitus.[10] Similar findings were observed by Nilsson et al.[11] On the other hand, Mc Culloch P et al (2002) and Ghazanfari Z et al (2010) did not observed any relationship between smoking, BMI and HbA1c levels.[12,13] In view of above literatures available, cigarette smoking may affect glycolsylation of hemoglobin, hence it could be associated with glycemic control i.e., HbA1c level in type 2 diabetic patients which varied from study to study. Investigating the association between smoking and glycemic control may clarify the role of smoking in type 2 diabetes mellitus and its complications. The aim of our study was to find out association between current smoking, body mass index and glycated hemoglobin (HbA1c) in patients with type 2 diabetes mellitus.

Materials and methods

The present study was conducted on 213 patients of type 2 diabetes aged between 35 – 86 years presented to the Medicine OPD and Department of Biochemistry King George's Medical University, Lucknow, Uttar Pradesh, India over a period of 3 months. Out of 213 patients, 126 (59%) were males and 87(41%) females. Informed consent was taken from all the patients. After taking history of current smoking and diabetes mellitus from the patient, height and body weight were taken to calculate body mass index (BMI). BMI is a measure of body fat based on height and weight and calculated by the formula weight (kg)/ height (metre^2). 2.5 ml whole blood sample was collected under aseptic conditions for estimation of HbA1c in EDTA vaccutianer and analyzed by High Performance Liquid Chromatography method (Biorad D 10). Type 2 diabetes mellitus patients with at least one year history of diabetes on treatment enrolled in this study were divided into three groups on the basis of HbA1c levels: group I- HbA1c ≤6.9% (good glycemic control), group II- HbA1c 7% - 9.9% (poor control), group III- HbA1c ≥10% (very poor control) . Statistical analysis was done on SPSS software version 16.00 chi square test, fisher exact test, one way analysis of variance, odd ratio with CI 95% and Mann Whitney U test were used. The p value below 0.05 was taken as statistical significance.

Results

On the basis of HbA1c level, 213 patients with type 2 diabetes mellitus were divided into three groups. 38 (17.84%) patients were with good glycemic control in group I, 112 (52.58%) patients in group II with poor glycemic control and 63 (29.58%) patients in group III with very poor glycemic control as shown in table 1.

Table 1: Number of current smokers and non smokers in three groups on the basis of HbA1c level

Group	Glycemic control	Current smoker	Nonsmoker	Total
I	Good	8 (21.05%)	30 (78.95%)	38 (17.84%)
II	Poor	24 (21.43%)	78 (78.57%)	112 (52.58%)
III	Very poor	11(17.46%)	52 (82.54%)	63 (29.58%)
Total		43 (20.19%)	170 (79.81%)	213 (100%)

Age wise no significant difference in mean age of patients were observed in 3 groups (ANOVA F= 3.39; p value 0.35). No significant difference was observed between males and females in all the groups (χ^2 = 1.57; p value 0.45). Three groups were compared for smoking habits and no significant difference observed as shown in table 2.

Table 2: Pair wise comparison of smokers in three groups

Groups	p value	OR (odd ratio)	CI 95%
I vs II	1.0 (NS)	1.125	0.45-2.77
I vs III	0.79 (NS)	0.79	0.28-2.19
II vs III	0.43 (NS)	1.41	0.04-3.12

No significant difference in mean HbA1c level was observed between current smokers (8.96% ± 2.25%) and non smokers (8.88% ± 2.24%) (Z=0.38; p value 0.71). Mean BMI was calculated for smokers and non smokers and no significant difference was observed as shown in table 3.

Table 3: Correlation of BMI and smoking habit

Group	Current smoker		Nonsmoker		Significance
	n	Mean BMI ± SD	n	Mean BMI ± SD	
I	8	24.28± 5.57	30	23.89± 5.26	t=0.65 P=0.52(NS)
II	24	26.21± 5.27	88	25.12± 5.33	t=0.89 P=0.38(NS)
III	11	27.36± 5.97	52	22.60 ± 5.37	t=0.63 P=0.52(NS)

Discussion

This study was aimed to find out the effect of current smoking on glycemic control and BMI in patients with type 2 diabetes mellitus. Out of 213 patients of type 2 diabetes and smoking currently enrolled in the study, 52.58% were with poor glycemic control followed by 29.58% with very poor glycemic control and 17.84% with good glycemic control. In our study no significant association were observed between current smokers and HbA1c in patients with good, poor and very poor glycemic control. Mean HbA1c levels in current smokers and non smokers were 8.96 ± 2.25 and 8.88 ± 2.24 (p value 0.71, non significant). Though mean BMI were not significantly different between current smokers and non smokers, mean BMI of group II (26.21±5.27) and III (27.36±5.97) were higher as compared to group I (24.28±5.57) in current smokers as shown in table 3.

In our study, BMI was higher in patients with poor and very poor glycemic control in current smokers as compared to patients with good glycemic control though not statistically significant, which could be due to the change in lifestyle, dietary habits and physical activity. Our findings are similar to the findings of Ghazanfari Z et al Perry IJ et al., in which no difference in mean HbA1c level between smokers and non smokers were observed.[13,14] However, Sargeant LA et al (2001) observed absolute difference of 0.2% – 0.3% in HbA1c levels between smokers and non smokers while in our study the difference was 0.07% - 0.09%.[15]

As the history of smoking was self reported by the patient who may not be correct, have influenced the study. Also in our study number of current smokers was much less as compared to non smokers. As diabetes is now declared an epidemic in developing countries, sample size was smaller in our study to find the association between smoking, glycemic control and body weight. A similar study on smokers with type 2 diabetes mellitus is needed on large population and factors like duration of smoking and diabetes, number of cigarettes smoked per day, dietary habits, lifestyle etc which may affect glycemic control should be taken in consideration.

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