Research Article

A cross-sectional study of impact of lifestyle determinants on middle-aged male diabetic patients

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Abstract

Background: India, now designated as diabetes capital of the world, is facing a serious threat from this pandemic. General awareness about the risk factors precipitating this illness is the need of the hour.

Objective: To analyze the effect of cigarette smoking, alcohol consumption, and total energy consumption among middle-aged male diabetic patients and compare it with healthy middle-aged men.

Materials and Methods: This cross-sectional study was done among 100 middle-aged men, 50 diabetic patients without complication or other comorbidities and 50 healthy individuals aged between 30 and 50 years, regarding their cigarette smoking, alcohol consumption, and total calorie intake. Comparison was done among the two groups.

Result: There was a significant association between cigarette smoking and diabetes ($p = 0.026$). There was an increased association between occasional alcohol consumption among nondiabetic subjects (22%) when compared with diabetic patients (12%), but it was not statistically significant. Moreover, total energy consumption was significantly higher among diabetic patients (1,392 kcal/day) when compared with nondiabetic subjects (1,062 kcal/day).

Conclusion: Cigarette smoking was found to be a significant risk factor for diabetes. In addition, increased energy consumption worsened the diabetes. Alteration in lifestyle, inculcating healthy eating practices, cessation of smoking, and routine physical activity should be stressed to the general public. Only then, it is possible to contain this pandemic.

KEY WORDS: Alcohol consumption, diabetes mellitus, smoking, total energy consumption

Introduction

Diabetes mellitus, a noncommunicable disease which is spreading in pandemic proportions is posing a serious threat to humanity in the twenty-first century.[1] Diabetes prevalence across the globe for all given age groups was estimated to be 2.8% in 2000 and is said to rise to 4.4% in 2030.[2] In India, there are around 35 million diabetic patients, and this more than likely is a gross underestimation as the diagnosed cases are only a tip of the iceberg. Majority of the people are mostly unaware of their diabetes status.[3] The factors that have favored this pandemic outbreak in India are increase in lifespan, genetic background, sedentary lifestyle, urbanization, stressful jobs, and unhealthy eating practices.[1] Studies done on migrant Indians have shown that their genetic composition has made them more susceptible to this disease.[4] The "Asian Indian Phenotype" has been phrased to describe the unique combination of clinical and biochemical characteristics that place the Indians more at risk of developing this disease.[5]

It has been found that, for any given body mass index (BMI), the waist circumference and waist–hip ratio of an Indian is higher when compared with other ethnicities.[6] Studies also indicate that, for any given body fat, insulin resistance is higher among Indians.[7] This central type of fat distribution and

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increased insulin resistance are important risk factors for developing diabetes.

Cigarette smoking and alcohol consumption are social behaviors that are extensive among the Indian masses. Studies done on Western population showed that current and former smokers were at enhanced risk of developing diabetes subsequently. It was hypothesized that smoking has an acute effect on insulin sensitivity and exerts deleterious effect on insulin secretion in the long term. It was also observed that moderate alcohol consumption was actually beneficial to men and placed them at a lower risk of developing diabetes when compared with nonalcoholic subjects.[8] There is lack of such studies in the Indian settings. Smoking is associated with an increased risk of developing stroke, ischemic heart disease, and peripheral vascular disease among the diabetic patients.[9] The interactive effect of smoking and diabetes enhances the risk of developing cardiovascular disease by 14%, which is much more than their individual additive effect.[10]

When a study was done to determine the extent of tobacco use and the existence of awareness of harmful effects of smoking among South Indian diabetic patients, more than half the number of diabetic patients used tobacco, and there was a void in their knowledge about the same. Cessation of smoking was advised only to about half the number of diabetic patients studied, and more than half the sample population did not link smoking to complications of diabetes.[11] Thus, this study showed the appalling lack of awareness among the general population.

Hence, the aim of this study was to analyze the effect of these lifestyle determinants, namely cigarette smoking, alcohol consumption, and total energy consumption as risk factors for developing diabetes and, thereby, spread a strong message on the need for following healthy lifestyle practices. In addition, disease proportion is burdening the health-care facilities and available resources in our country. Simple lifestyle modifications, healthy eating practices, inculcating exercise routines, and maintaining normal body weight will go a long way in preventing this debilitating disease.[1]

Materials and Methods

A descriptive study was conducted on 100 middle-aged men aged between 30 and 50 years in the General Medicine Department of a private Medical College and Hospital of Karnataka, India, from June 2014 to August 2014. Purposive sampling was done. Of the 100 sample population, 50 were type II diabetic patients without any complications or other comorbidities and 50 healthy volunteers who accompanied the patients to the hospital. Ethical approval was obtained for this study from the Institutional Ethics review committee. Written informed consent was taken from each participant after describing in full detail the procedure and purpose of the study.

General physical examination, vital signs, and complete systemic examinations were done on all the subjects. A detailed history including diabetic history, personal history, drug history, and family history was taken. Their age, anthropometric measurements, blood pressure (BP) by JNC 7 criteria, BMI using Quetelet's formula, and fasting blood sugar (FBS) were recorded.

The BP was recorded by sphygmomanometric method in supine position (JNC 7 Criteria) in the right arm to the nearest 2 mm Hg using the mercury sphygmomanometer (Diamond Deluxe; Industrial Electronic and Products, Electronic Co-op. Estate, Pune, India). Two readings were taken 5 min apart, and the mean of two was taken as the BP. For those whose BP was $\geq \frac{140}{90}$ mm Hg, three BP recordings were recorded, with a gap of 1 day in between. The average of second and third was considered as the final BP.

Blood sample was collected under all aseptic conditions, and FBS levels were measured by glucose oxidase–peroxidase end point by Trinder's method using glucose reagent. (Transasia BioMedicals Ltd., Solan, Himachal Pradesh, India).

Participants were weighed in light clothing using a digital load cell balance (Soehnle, West Germany), which had a precision of 0.1 kg. The heights of the subjects were recorded without footwear, using a vertically mobile scale (Holtain, Crymych, United Kingdom) and expressed to the nearest 0.1 cm. BMI was calculated from the height and weight as follows: BMI = weight (kg)/height^2 (meters)—Quetelet's formula.

Their diet histories were collected with respect to the amount of daily food intake for 1 week for individual subjects. This includes the frequency and quantity of food consumption, type of food, vegetarian food, nonvegetarian food, milk, and other beverages. Quantification of the diet with respect to different food items consumed in grams/week was plotted. The intake of nutrients was computed by multiplying the frequency of consumption of each unit of food by its nutrient content.

Smoking history of all the participants was taken in detail. For former smokers, question such as years since quitting was asked. For each decade of life, average number of cigarettes smoked daily was tabulated. From these data, pack years of smoking were calculated. A pack year is defined as smoking 20 cigarettes daily for 1 year.[12]

Participants were asked about their alcohol consumption. They were asked "how often do you usually consume alcoholic beverages? The response categories listed were as follows: "rarely/never," "1–3/month," "1/week," "2–4/week," "5–6/week," "daily," and "2+/day". The responses were interpreted as the number of drinks consumed in specified period as first reported by Gaziano et al in 2000.

Responses of lifestyle determinants were analyzed among the participants statistically. Age, BP, BMI, and FBS parameters among the study group were analyzed by using the statistical software SPSS, version 17.0 and MS Excel. The χ^2-test to compare the frequencies and unpaired *t*-test to check the significance were used. All tests were two-tailed, and $p < 0.05$ was considered as significant.

Result

On comparing diabetes status with smoking status of the sample population, we found that a significant number of diabetic patients (56%) with a p value of < 0.05 were either former or current smokers. About 36% of diabetic patients had since quit smoking, and 20% of them continued to smoke [Table 1].

On comparing the diabetes status with smoking history [Table 2], there was no significant association found between the groups. There was, however, an increase in severity of clinical symptoms observed among the diabetic patients who were chronic smokers.

On comparing diabetes status with the alcohol consumption history [Table 3], it was found that there was no significant difference between them. But, 42% of people who consumed alcohol in moderation were found to be nondiabetic subjects when compared with 22% of diabetic patients consuming alcohol.

On comparing the status of diabetes with alcohol consumption history [Table 4], it was found that the percentage of diabetic patients was less when compared with healthy subjects in the occasional and moderate alcohol (60–120 mL/day) consumption category, although it was statistically not significant. However, diabetes was higher among people consuming larger portions of alcohol, which was again not statistically significant.

Total energy consumption among diabetic patients (1,392 ± 335 kcal/day) [Figure 1] was significantly higher ($p < 0.05$) than the normal subjects (1,062 ± 171 kcal/day).

Discussion

We found a very strong association between history of smoking and occurrence of diabetes [Tables 1 and 2]. Significant number of diabetic patients showed a positive smoking history. About 36% of these diabetic patients have since quit smoking, and 20% of them still smoked. Certain clinical and experimental findings have shown that, following smoking, there is a reduction in insulin sensitivity or insufficient responses to compensatory insulin secretion,[13] thus leading to disruption in glucose and lipid metabolisms. This in turn leads to hyperglycemia, dyslipidemia, postprandial lipid intolerance and lowers HDL cholesterol.[14–17] Bruin et al, in their animal studies, recently found that, on exposure of fetal pancreatic tissue to maternally-derived nicotine, a loss of β cells occurred owing to oxidative stress and mitochondrial damage resulting in apoptosis mediated by nicotinic acetylcholine receptors.[18,19]

Our study failed to show any correlation between pack years of smoking and diabetes risk in contrast to earlier meta-analysis study.[13] This can be attributed to the smaller sample size. More such studies are required on a larger Indian population.

When we tried to find an association between alcohol consumption and diabetes status, nearly 64% of the diabetic patients were nonalcoholic subjects when compared with only 46% of the healthy subjects [Table 3]. This, however, was not a significant difference probably owing to smaller sample size. In addition, 22% of the subjects who consumed alcohol occasionally did not develop diabetes when compared with 12% of occasional diabetic alcohol consumers, which was again not significant [Table 4]. A Harvard study revealed that moderate alcohol consumption among healthy individuals reduces risk of developing diabetes[8] probably by increasing insulin sensitivity or reducing hepatic gluconeogenesis.[20] Shimomura and Wakabayashi[21] recently found an inverse linear relationship between alcohol intake and ratio of LDL cholesterol/HDL cholesterol in diabetic patients and a nonlinear inverse relationship between alcohol intake and ratio of triglyceride/HDL cholesterol. Thus, by altering the lipid profile, moderate alcohol consumption is beneficial to diabetic patients in preventing the atherosclerosis and other macrovascular complications. More studies are required to elucidate the molecular basis of this beneficial effect of moderate alcohol consumption among diabetic patients.

When we compared the total calorie intake between diabetic patients and normal subjects, there was significantly higher intake among diabetic patients. Studies have shown that high calorie intake on a long-term basis is associated with a significant decrease in insulin sensitivity and β-cell compensation.[22] Other mechanisms such as lipotoxicity[23] and inflammation[24] resulting owing to high calorie intake are also likely causes of decline in β-cell functioning. High fat diet is said to interfere in insulin action and thus alters glucose tolerance.[25] On the other hand, calorie restriction was shown to reverse the decline in β-cell functioning and enhance the hepatic insulin sensitivity.[26] Furthermore, Weiss et al have recently found that calorie restriction combined with exercise among sedentary diabetic patients showed additive beneficial effects in glucoregulation. There was also a significant reduction in postprandial glucagon-like peptide-1 in them.

Smaller sample size and area of study restricted to one place are the limitations of this study. As this study highlights the importance of promoting healthy lifestyle interventions,[27] including a larger sample among different age group at different setting forms the future scope of the study. Further studies are required to elucidate the various molecular mechanisms of cell dynamics, which are affected by smoking and alcohol consumption on a larger sample size. We also found that the energy consumption of diabetic patients was significantly more than that of normal subjects. Awareness among the masses to alter their sedentary lifestyle and inculcate healthy eating practices is the need of the hour to control this pandemic outbreak in our country.

Table 1: Comparison of diabetes status with smoking status of the study group ($n = 100$)

	Nonsmoker		Former smoker		Current smoker		p
	N	%	*N*	%	*N*	%	
Non diabetic subjects	25	50	7	14	18	36	0.026
Diabetic subjects	22	44	18	36	10	20	

Table 2: Comparison of diabetes status with smoking history of the study group ($n = 100$)

Diabetes status	Nonsmoker (%)	Occasional (%)	Former smoker, <1 year (%)	Former smoker, 2–3 years (%)	Former smoker, 4–5 years (%)	Current smoker, one pack year (%)	Current smoker, 2–3 pack years (%)	p
Non diabetic subjects	48	4	2	4	6	24	12	0.25
Diabetic subjects	48	–	10	8	10	12	12	

$p < 0.05$ is considered significant.

Table 3: Comparison of diabetes status with alcohol status of the study group ($n = 100$)

Diabetes status	Nonalcoholic (%)	Former alcohol intake (%)	Current alcoholic (%)	p
Non diabetic subjects	46	12	42	0.09
Diabetic subjects	64	14	22	

$p < 0.05$ is considered significant.

Table 4: Comparison of diabetes status with alcohol consumption history of the study group ($n = 100$)

Diabetes status	Nonalcoholic (%)	Former, 3–4 years	Former, 2–3 years (%)	Occasional (%)	60–120 mL/day (%)	180–300 mL/day (%)	500–700 mL/day (%)	p
Nondiabetic	48	8	4	22	12	2	4	0.32
Diabetic	64	6	6	12	2	4	6	

$p < 0.05$ is considered significant.

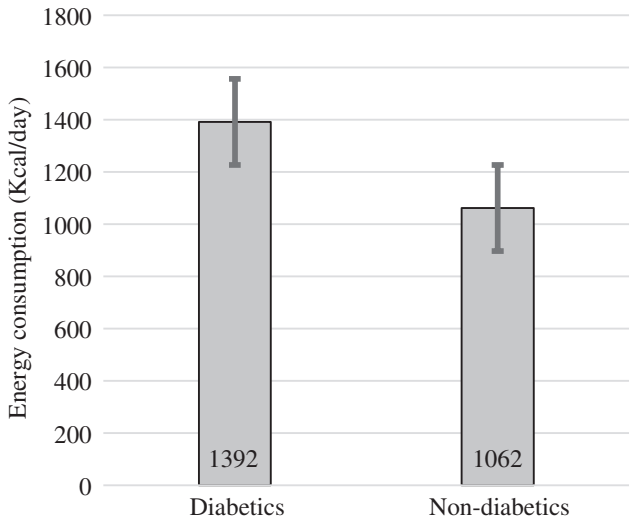

Figure 1: Energy consumption of study group (kcal/day), $n = 100$.

Conclusion

This study concludes that the occurrence of diabetes was more prevalent among people with history of smoking. There was no significant association between alcohol consumption and diabetes, although moderate alcohol consumption was numerically more among the healthy subjects. In addition, we found an excess calorie intake among the diabetic patients.

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