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Association of Risk Factors with Type 2 Diabetes Mellitus: Era's Need

Harvir Singh Sodhi[1], Bayazuddin Mohammed[2*]

[1]Professor, [2*]Associate Professor,
Department of Physiology, Saraswati Medical College, Unnao, Uttar Pradesh, India.

ABSTRACT

Background: One of the commonly associated metabolic disorders in the world is diabetes mellitus. It is prevalent amongst majority of areas of the world and amongst subjects of different demographics. The present study was aimed at finding the risk factors associated with subjects having type 2 diabetes mellitus.

Materials and Methods: The present prospective study was conducted in the Department of Physiology, Saraswati Medical College, Unnao, Uttar Pradesh (India). Blood glucose values of more than 7mmol/L was regarded as diabetes. It was a questionnaire based study. Subject's medical history, family history and general condition were assessed to determine the health condition. Student t test was used to compare the results. Probability value of less than 0.05 was considered as significant.

Results: There were 31 cases (14.1%) and 42 controls (21%) that were less than 40 years of age. There were 48 cases (22.3%) and 62 controls (31%) that were 41-55 years of age. There were 79 cases (35.9%) and 48 controls (24%) that were 56-70 years of age. The mean LDL amongst cases and controls was 2.70±0.11 and 2.31±0.05 respectively. There was a significant difference in cholesterol level amongst cases and controls. The mean triglyceride level amongst cases was 1.67±0.06 and controls were 1.38±0.04.

Conclusion: Presence of family history of diabetes, sedentary lifestyle with lack of physical activity, increase body mass index and blood pressure are significant risk factors associated with diabetes. Also from our study it is seen that increased level of triglyceride and cholesterol are associated with risk or diabetes too.

Keywords: Diabetes, Cholesterol, Triglyceride.

*Correspondence to:
Dr. Bayazuddin Mohammed,
Associate Professor, Department of Physiology,
Saraswati Medical College, Unnao, Uttar Pradesh, India.

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INTRODUCTION

One of the commonly associated metabolic disorders in the world is diabetes mellitus. It is prevalent amongst majority of areas of the world and amongst subjects of different demographics. By the year 2030, it has been studied that about 400 million subjects would be affected by this metabolic condition.[1] According to an Algerian survey there were more than 12.29%% aging between 35-70 years having type 2 diabetes mellitus.[2] There is variation amongst the rural and urban subgroups that are affected by diabetes. Insulin resistance in type 2 diabetes mellitus is due to various genetic abnormalities[3,4] and due to acquired factors. Presence of family history of diabetes mellitus plays a significant role in its causation.[5] Genetic susceptibility has also been observed in certain population groups.[6-8] Risk factors like obesity, lack of physical activity and smoking also play a role in causing it.[9] There have been few evidences regarding its association with low socioeconomic groups.[10,11] The fast evolving changes in lifestyle lead to alteration in the metabolism and cause an increase in the number of diabetic subjects.[12] According to a survey amongst native American's, majority of the subjects having sedentary lifestyle are diabetic. Because of rapid urbanisation, there is increase in the incidence and prevalence of lifestyle diseases like obesity and diabetes.[12] Development of various public health policies focus more on the lifestyle intervention associated as a risk factor for type 2 diabetes and also focus on the identification of these risk factors.[13,14] In the recent years, all the age groups including the middle age and old age are found to be affected by type 2 diabetes. There is an urgent need to study the risk of diabetes amongst all the age groups.[15-18] The present study was aimed at finding the risk factors associated with subjects having type 2 diabetes mellitus.

MATERIALS AND METHODS

The present prospective study was conducted in the Department of Physiology, Saraswati Medical College, Unnao, Uttar Pradesh (India). The study was approved by the Institutional ethical committee and a written informed consent was obtained from all the subjects prior to initiation of the study. The consent was obtained in their vernacular language. The study was divided into

cases and controls. The classification of subjects as diabetic and non-diabetic was done based on the American diabetes association criteria. Blood glucose values of more than 7mmol/L was regarded as diabetes. It was a questionnaire based study. Subject's medical history, family history and general condition were assessed to determine the health condition. The questionnaire was divided into three parts- the first part had questions about demographics, the second one had information related to their lifestyle habits. Patient's body mass index was evaluated using the standard formula. BMI less than 25 kg/m^2 were regarded as normal and more than 30 Kg/m^{2}was considered as obese. Patients were instructed to wear light clothes to obtain their weight. Waist circumference was measured using a measuring tape. Every subject's blood pressure was noted. Blood pressure reading of more than 130/90 mm Hg was considered as hypertensive.

Laboratory investigations of the subjects were put into third part of the questionnaire. Patient's fasting blood sugar was estimated using glucose oxidase method. Triglyceride levels were obtained using Calorimetric enzymatic method. All the data obtained was arranged in a tabulated form. The results were expressed as mean +/- Standard deviation. Student t test was used to compare the results. Probability value of less than 0.05 was considered as significant.

Table 1: Demographic and physical variables related to the study and control population.

VARIABLE		Cases (N/%)	Controls (N/%)	P Value
Age group	<40	31/14.1%	42/21%	>0.05
	41-55	48/22.3%	62/31%	
	56-70	79/35.9%	48/24%	
	>70	62/28.2%	48/24%	
Gender	Male	81/36.8%	74/37%	>0.05
	Female	139/63.2%	126/63%	
Marital status	Married	200/90.9%	192/96%	>0.05
	Unmarried	20/9.1%	8/4%	
Residence	Rural	79/35.9%	72/36%	
	Urban	141/64.1%	128/64%	
Physical activity	Yes	13/5.9%	32/16%	<0.05
	No	207/94.1%	168/84%	
Smoking	Smoker	24/10.9%	14/7%	>0.05
	Non smoker	196/89.1%	186/93%	
Dietary intake	Follow up	56/24.5%	36/18%	>0.05
	Average	91/41.4%	68/34%	
	Not followed	73/33.2%	96/48%	
BMI	Normal	59/26.8%	122/61%	<0.05
	Overweight	78/35.5%	40/20%	
	Obese	83/37.7%	38/19%	
Waist circumference (males)	<102	77/35%	158/79%	<0.05
	>102	143/65%	42/21%	
Waist circumference (females)	<88	11/5%	58/29%	<0.05
	>88	209/95%	62/31%	
Family history of DM	Yes	163/74.1%	120/60%	<0.05
	No	57/25.9%	80/40%	
Hypertension	Yes	104/47.3%	36/18%	<0.05
	No	116/52.7%	164/82%	

Table 2: Laboratory investigations amongst study subjects.

VARIABLE		Cases	Controls	P Value
BMI (Kg/m^2)		28.65±0.44	25.40±0.29	<0.05
Cholesterol (mmol/L)	Total	4.50±0.12	4.10±0.05	<0.05
	HDL	1.05±0.03	1.10±0.03	<0.05
	LDL	2.70±0.11	2.31±0.05	<0.05
Triglycerides (mmol/L)		1.67±0.06	1.38±0.04	<0.05
Serum glucose (mmol/L)		11.32±0.29	8.16±0.34	<0.05
Blood pressure (mmHg)	Systolic	135.07±1.25	119.50±0.87	<0.05
	Diastolic	81.52±0.64	73.71±0.64	<0.05

RESULTS

In the present study a total of 420 subjects (220 diabetics and 200 non diabetics) were enrolled aged between 38- 79 years. Table 1 illustrates the demographics and other variables studied in this population. There were 31 cases (14.1%) and 42 controls (21%) that were less than 40 years of age. There were 48 cases (22.3%) and 62 controls (31%) that were 41-55 years of age. There were 79 cases (35.9%) and 48 controls (24%) that were 56-70 years of age. There were 62 cases (28.2%) and 48 controls (24%) that were more than 70 years of age. There was no significant difference in the age group amongst the cases and controls. There were 81 males and 139 females in the case group. 74 males and 126 females were there in control group. Gender difference was insignificant between the two groups. Majority of the subjects i.e. 90.9% in cases and 96% in controls were married. There were 35.9% cases and 36% controls who resided in rural area. There were 64.1% cases and 64% controls who resided in urban areas. There was no significant difference between the groups. There were 5.9% cases who adopted for regular physical activity and 84% cases didn't have any physical activity. Amongst the controls 16% subjects had daily physical activity. There was a significant difference between the groups. There were 10.9% smokers amongst cases and 7% smokers amongst controls. There was a significant difference in the body mass index amongst the cases and controls. Amongst cases, 26.8% were normal, 35.5% were overweight and 37.7% were obese. Amongst controls, 61% were normal, 20% were overweight and 19% were obese. The waist circumference significantly differed amongst cases and controls, both in males and females. It was more than 102 cm in 65% male cases and 21% male controls. It was more than 88 cm amongst 95% female cases and 31% female controls. There was a family history of diabetes amongst 74.1% cases and 60% controls. Hypertension was seen in 47.3% cases and 18% controls. There was a significant difference in family history and hypertensive amongst both cases and controls. Table 2 shows the biochemical and laboratory investigations that were performed in our study. The mean body mass index amongst cases was 28.65±0.44 and controls were 25.40±0.29. There was a significant difference in the body mass index amongst cases and controls as p value was less than 0.05. The mean total cholesterol amongst cases and controls was 4.50±0.12 and 4.10±0.05 respectively. The mean HDL amongst cases and controls was 1.05±0.03 and 1.10±0.03 respectively. The mean LDL amongst cases and controls was 2.70±0.11 and 2.31±0.05 respectively. There was a significant difference in cholesterol level amongst cases and controls. The mean triglyceride level amongst cases was 1.67±0.06 and controls were 1.38±0.04. The p value was more than 0.05. The mean serum glucose amongst cases and controls was 11.32±0.29 & 8.16±0.34 respectively. The mean systolic and diastolic pressure amongst cases was 135.07±1.25 & 81.52±0.64. It was 119.50±0.87 and 73.71±0.64 amongst the controls. There was a significant difference amongst cases and controls.

DISCUSSION

Various risk factors are associated with diabetes. There has been association of diabetes with socioeconomic status. Risk factors like obesity, smoking and lack of physical activity are generally associated with low socio economic status.[19] There is also a risk of vascular diseases associated with lower socioeconomic status.[20,21] Therefore lower socio economic strata subjects are likely to be associated with a higher risk of type 2 diabetes mellitus. However there have not been much studies to prove this relation.[22] According to a study conducted amongst nine towns of England has shown an inverse relation between the incidence of type 2 diabetes mellitus and the influence of town.[23] With urbanisation of lifestyle there is change in the dietary habits that includes increase in the consumption of refined carbohydrates and saturated fats, reducing the intake of fibre.[24] It is also associated with reduced amount of physical activity.[25,26] In our study, there were 31 cases (14.1%) and 42 controls (21%) that were less than 40 years of age. There were 48 cases (22.3%) and 62 controls (31%) that were 41-55 years of age. There were 79 cases (35.9%) and 48 controls (24%) that were 56-70 years of age. There were 62 cases (28.2%) and 48 controls (24%) that were more than 70 years of age. There was no significant difference in the age group amongst the cases and controls. There were 81 males and 139 females in the case group. 74 males and 126 females were there in control group. Gender difference was insignificant between the two groups. Majority of the subjects i.e. 90.9% in cases and 96% in controls were married. There were 35.9% cases and 36% controls who resided in rural area. There were 64.1% cases and 64% controls who resided in urban areas. There was no significant difference between the groups. There were 5.9% cases who adopted for regular physical activity and 84% cases didn't have any physical activity. Amongst the controls 16% subjects had daily physical activity. There was a significant difference between the groups. There were 10.9% smokers amongst cases and 7% smokers amongst controls. There was a significant difference in the body mass index amongst the cases and controls. Amongst cases, 26.8% were normal, 35.5% were overweight and 37.7% were obese. In rural areas the chief mode of transportation is and they often indulge in intense physical activity through agricultural work.[27] There is a high rate of physical activity amongst the rural population as compared to the urban subgroups.[28] Thus the incidence of diabetes is comparatively higher amongst urban compared to rural subjects.[26,28]

In our study, there was a significant difference in the body mass index amongst cases and controls as p value was less than 0.05. The mean total cholesterol amongst cases and controls was 4.50±0.12 and 4.10±0.05 respectively. The mean HDL amongst cases and controls was 1.05±0.03 and 1.10±0.03 respectively. The mean LDL amongst cases and controls was 2.70±0.11 and 2.31±0.05 respectively. There was a significant difference in cholesterol level amongst cases and controls. The mean triglyceride level amongst cases was 1.67±0.06 and controls were 1.38±0.04. The p value came out to be more than 0.05. The mean serum glucose amongst cases and controls was 11.32±0.29 and 8.16±0.34 respectively. The mean systolic and diastolic pressure amongst cases was 135.07±1.25 and 81.52±0.64. It was 119.50±0.87 and 73.71±0.64 amongst the controls. There was a significant difference amongst cases and controls. There was a significant difference in family history and hypertensive amongst both cases and controls. A study conducted in the Indian population has shown that central and general obesity were associated with the family history of type 2 diabetes mellitus.[29] A family history of diabetes is also associated with increased risk of hypertension as both are associated with body mass index.[30]

CONCLUSION

Presence of family history of diabetes, sedentary lifestyle with lack of physical activity, increase body mass index and blood pressure are significant risk factors associated with diabetes. Also from our study it is seen that increased level of triglyceride and cholesterol are associated with risk or diabetes too. Timely intervention is necessary to prevent this disease from reaching a grave level.

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