

ORIGINAL ARTICLE

Risk Factors Associated with Type 2 Diabetes Mellitus- The Need of the Hour

Amitabh Agarwal¹, Prabhakar Singh Bais²¹Assistant Professor, Department of Physiology, T.S. Misra Medical College, Amausi, Lucknow, U.P., ²Department of Biochemistry, MLB Medical College, Jhansi, India**ABSTRACT:**

Background: Diabetes is an important public health problem, one of four priority noncommunicable diseases (NCDs) targeted for action by world leaders. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. This reflects an increase in associated risk factors such as being overweight or obese. The aim of the present study is to determine the various risk factors associated with type 2 diabetes mellitus. **Materials and methods:** The present cross sectional prospective study was conducted in the department of medicine, T.S. Misra Medical College and Hospital, Lucknow during a period of 1 year. There were a total of 150 cases that were diabetic and 120 controls who were non diabetic. The American diabetes association criteria was used to classify diabetes subjects. Subjects having fasting plasma glucose ≥ 7.0 mmol/L were considered as diabetic. All the participants were made to fill a questionnaire. All the data obtained was arranged in a tabulated form. The results were expressed as mean \pm Standard deviation. Student t test was used to compare the results. Probability value of less than 0.05 was considered as significant. **Results:** There were 21 cases (14%) and 25 controls (20.8%) that were less than 40 years of age. There were 32 cases (21.3%) and 37 controls (30.8%) that were 41-55 years of age. Amongst cases, 27.3% were normal, 35.3% were overweight and 37.3% were obese. Amongst controls, 60.8% were normal, 20% were overweight and 19.2% were obese. The mean triglyceride level amongst cases was 1.68 ± 0.05 mmol/L and controls were 1.37 ± 0.05 mmol/L. The p value came out to be more than 0.05. The mean serum glucose amongst cases and controls was 11.30 ± 0.30 mmol/L and 6.06 ± 0.44 mmol/L respectively. The mean systolic and diastolic pressure amongst cases was 134.07 ± 1.15 mm Hg and 81.62 ± 0.65 mm Hg. It was 119.75 ± 0.97 mm Hg and 73.70 ± 0.61 mm Hg amongst the controls. **Conclusion:** From the above study it can be concluded that presence of family history of diabetes is a significant risk factor for type 2 diabetes mellitus. Various other risk factors include increase in BMI, lack of physical activity, increase in blood pressure and increase level of triglyceride and cholesterol.

Keywords: Diabetes, Cholesterol, Triglyceride.**Correspondence Info:** Dr. Prabhakar Singh Bais, Department of Biochemistry, MLB Medical College, Jhansi, India**This article may be cited as:** Agarwal A, Bais PS. Risk Factors Associated with Type 2 Diabetes Mellitus- The Need of the Hour. J Adv Med Dent Sci Res 2017;5(12):63-67.

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INTRODUCTION

Diabetes is a serious, chronic disease of public health importance Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980 and that more than 400 million people would be affected by diabetes by the year 2030.¹ According to a study conducted in Algeria, more than 12.29% of subjects aged between 35-70 years are affected by type 2 diabetes mellitus.² However the ratio varies amongst urban and rural population. Multiple genetic abnormalities^{3,4} and various acquired factors lead to insulin resistance in type 2 diabetes mellitus. Presence of a family history of type 2 diabetes is strongly implicated in its causation.⁵ There have been various studies that also depict its genetic susceptibility in certain populations.^{6,7,8} Insulin resistance is also seen related to obesity, physical inactivity and smoking.⁹ Some studies have also found its association with low socio economic status.^{10,11} The changes in lifestyle affect the metabolism and lead to a sudden surge in the number of diabetic

population.¹² According to a study amongst native American tribe who mostly have a sedentary life style are diabetic.¹¹ Due to rapid surge in urbanisation there is an increase in incidence of obesity and diabetes.¹² Various public health policies have been developed that focus on early identification of the risk factors for type 2 diabetes mellitus such that they can be modified and various lifestyle interventions can be adopted to reduce the manifestations of the disease.^{13,14} Therefore there has been development of various researches that focus on the risk factors associated with type 2 diabetes mellitus and it is the middle aged subjects that are most vulnerable.^{15,16} During the recent years there has been a sudden increase of diabetics amongst adolescents also. So there is a need to determine risk factors amongst all age groups.^{17,18} The aim of the present study is to determine the various risk factors associated with type 2 diabetes mellitus.

MATERIALS AND METHODS

The present cross sectional prospective study was conducted in the department of medicine, T.S. Misra Medical College and Hospital, Lucknow during a period of 1 year. The study was conducted from August 2016 to July 2017. Ethical committee clearance was obtained from the institute's ethical board and all the subjects were informed about the study and a written consent was obtained from all in their vernacular language. The study included two groups- cases and the controls. There were a total of 150 cases that were diabetic and 120 controls. The American diabetes association criteria was used to classify diabetes subjects. Subjects having fasting plasma glucose ≥ 7.0 mmol/L were considered as diabetic. All the participants were made to fill a questionnaire. Health condition of the participants was assessed on the basis of their medical history, family history and general examination. The first part of the questionnaire had questions regarding the demographics and the second part of the questionnaire had questions regarding their lifestyle habits. The body mass index of the participants was also obtained. Participants were made to wear light clothes to obtain their weight. A measuring tape was used to obtain their waist circumference. Body mass index of less than 25kg/m² was taken as normal and BMI of more than 30 kg/m² was taken as obese. Readings of blood pressure were also obtained in sitting position. Blood pressure of more than 130/90 mm Hg was regarded as hypertensives. The third part of the questionnaire consisted of laboratory investigations. In this fasting plasma glucose was estimated using glucose oxidase method. Fluorometric method was used to obtain triglyceride and cholesterol levels. 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.

RESULTS

In the present study a total of 270 subjects were enrolled. They were aged between 38- 79 years. There were 150 diabetics and 120 non diabetics enrolled in this study. Table 1 illustrates the demographics and other variables studied in this population. There were 21 cases (14%) and 25 controls (20.8%) that were less than 40 years of age. There were 32 cases (21.3%) and 37 controls (30.8%) that were 41-55 years of age. There were 54 cases (36%) and 29 controls (24.2%) that were 56-70 years of age. There were 43 cases (28.7%) and 29 controls (24.2%) that were more than 70 years of age. There was no significant difference in the age group amongst the cases and controls. There were 55 males and 95 females in the case group. 47 males and 73 females were there in control group. Gender difference was insignificant between the two groups. Majority of the subjects i.e. 90% in cases and 95.8% in controls were married. There were 35.3% cases and 35.8% controls who resided in rural area. There were 64.7% cases and 64.2% controls who resided in urban areas. There was no significant difference between the groups. There were 5.3% cases who adopted for regular

physical activity and 94.7% cases didn't have any physical activity. Amongst the controls 15.8% subjects had daily physical activity. There was a significant difference between the groups. There were 10.7% smokers amongst cases and 6.7% smokers amongst controls. There was a significant difference in the body mass index amongst the cases and controls. Amongst cases, 27.3% were normal, 35.3% were overweight and 37.3% were obese. Amongst controls, 60.8% were normal, 20% were overweight and 19.2% were obese. The waist circumference significantly differed amongst cases and controls, both in males and females. It was more than 102 cm in 66% male cases and 20.8% male controls. It was more than 88 cm amongst 80% female cases and 51.7% female controls. There was a family history of diabetes amongst 74% cases and 59.7% controls. Hypertension was seen in 47.3% cases and 18.3% 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 27.75 \pm 0.34 and controls were 24.45 \pm 0.28. 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 \pm 0.11 mmol/L and 4.09 \pm 0.09 mmol/L respectively. The mean HDL amongst cases and controls was 1.04 \pm 0.02 mmol/L and 1.10 \pm 0.04 mmol/L respectively. The mean LDL amongst cases and controls was 2.71 \pm 0.10 mmol/L and 2.32 \pm 0.04 mmol/L respectively. There was a significant difference in cholesterol level amongst cases and controls. The mean triglyceride level amongst cases was 1.68 \pm 0.05 mmol/L and controls were 1.37 \pm 0.05 mmol/L. The p value came out to be more than 0.05. The mean plasma glucose amongst cases and controls was 11.30 \pm 0.30 mmol/L and 6.06 \pm 0.44 mmol/L respectively. The mean systolic and diastolic pressure amongst cases was 134.07 \pm 1.15 mm Hg and 81.62 \pm 0.65 mm Hg. It was 119.75 \pm 0.97 mm Hg and 73.70 \pm 0.61 mm Hg amongst the controls. There was a significant difference amongst cases and controls.

DISCUSSION

Diabetes, a chronic disease of global health importance, is on the rise both in number and prevalence over the last few decades being more evident in the low- and middle-income countries than in high-income countries. This can be attributed to various risk factors associated with the disease like obesity, smoking and lack of physical activity, low socio economic status.¹⁹ Certain vascular diseases are also associated with a risk factor of low socio economic 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 been fewer studies to investigate this relation.²² A study conducted amongst nine town of England found an inverse association between the incidence of type 2 diabetes mellitus and the influence of town.²³

Table 1: Variables related to the study and control population.

VARIABLE	CASES (N/%)	CONTROLS (N/%)	P VALUE	
Age group	<40	21/14%	25/20.8%	>0.05
	41-55	32/21.3%	37/30.8%	
	56-70	54/36%	29/24.2%	
	>70	43/28.7%	29/24.2%	
Gender	Male	55/36.7%	47/37.2%	>0.05
	Female	95/63.3%	73/60.8%	
Marital status	Married	135/90%	115/95.8%	>0.05
	Unmarried	15/10%	5/4.2%	
Residence	Rural	53/35.3%	43/35.8%	
	Urban	97/64.7%	77/64.2%	
Physical activity	Yes	8/5.3%	19/15.8%	<0.05
	No	142/94.7%	101/84.2%	
Smoking	Smoker	16/10.7%	8/6.7%	>0.05
	Non smoker	134/89.3%	112/93.3%	
Dietary intake	Follow up	38/25.3%	22/18.3%	>0.05
	Average	62/41.3%	41/34.2%	
	Not followed	50/33.3%	57/47.5%	
BMI	Normal	41/27.3%	73/60.8%	<0.05
	Overweight	53/35.3%	24/20%	
	Obese	56/37.3%	23/19.2%	
Waist circumference (males)	<102	51/34%	95/79.2%	<0.05
	>102	99/66%	25/20.8%	
Waist circumference (females)	<88	30/20%	58/48.3%	<0.05
	>88	120/80%	62/51.7%	
Family history of DM	Yes	111/74%	71/59.7%	<0.05
	No	39/26%	49/40.8%	
Hypertension	Yes	71/47.3%	22/18.3%	<0.05
	No	79/52.7%	98/81.7%	

Table 2: Biochemical variables amongst study subjects.

VARIABLE	CASES	CONTROLS	P VALUE	
BMI (Kg/m ²)	27.75±0.34	24.45±0.28	<0.05	
Cholesterol (mmol/L)	Total	4.50±0.11	4.09±0.09	<0.05
	HDL	1.04±0.02	1.10±0.04	<0.05
	LDL	2.71±0.10	2.32±0.04	<0.05
Triglycerides (mmol/L)	1.68±0.05	1.37±0.05	<0.05	
Serum glucose (mmol/L)	11.30±0.30	6.06±0.44	<0.05	
Blood pressure (mmHg)	Systolic	134.07±1.15	119.75±0.97	<0.05
	Diastolic	81.62±0.65	73.70±0.61	<0.05

In our study, there were 21 cases (14%) and 25 controls (20.8%) that were less than 40 years of age. There were 32 cases (21.3%) and 37 controls (30.8%) that were 41-55 years of age. There were 54 cases (36%) and 29 controls (24.2%) that were 56-70 years of age. There were 43 cases (28.7%) and 29 controls (24.2%) that were more than 70 years of age. There was no significant difference in the age group amongst the cases and controls. There were 55 males and 95 females in the case group. 47 males and 73 females were there in control group. Gender difference was insignificant between the two groups. Majority of the subjects i.e. 90% in cases and 95.8% in controls were married. There were 35.3% cases and 35.8% controls who resided in rural area. There were 64.7% cases and 64.2% controls who resided in urban areas. There was no significant difference between the groups. Urbanisation of lifestyle involves changes in the

dietary habits which includes increase in the consumption of refined carbohydrates and saturated fats, reducing the intake of fibre.²⁴ Along with it there is also reduction in the amount of physical activity associated with urbanisation.^{25,26} Rural population relies on walking as a mode of transportation and often indulge in intense physical activity through agricultural work.²⁷ Therefore there is a high rate of physical activity in the rural compared to the urban areas.²⁸ Thus the incidence of diabetes is comparatively higher amongst urban compared to rural subjects.^{26,28} In our study, there were 5.3% cases who adopted for regular physical activity and 94.7% cases didn't have any physical activity. Amongst the controls 15.8% subjects had daily physical activity. There was a significant difference between the groups. There were 10.7% smokers amongst cases and 6.7% smokers amongst

controls. There was a significant difference in the body mass index amongst the cases and controls. Amongst cases, 27.3% were normal, 35.3% were overweight and 37.3% were obese. Amongst controls, 60.8% were normal, 20% were overweight and 19.2% were obese. The waist circumference significantly differed amongst cases and controls, both in males and females. It was more than 102 cm in 66% male cases and 20.8% male controls. It was more than 88 cm amongst 80% female cases and 51.7% female controls. There was a family history of diabetes amongst 74% cases and 59.7% controls. Hypertension was seen in 47.3% cases and 18.3% controls. There was a significant difference in family history and hypertensive amongst both cases and controls. As per a study conducted in Indian suburbs central and general obesity were associated with the family history of type 2 diabetes mellitus.²⁹ Presence of family history of diabetes also increases the risk of hypertension indirectly through its association with body mass index.³⁰

CONCLUSION

From the above study it can be concluded that presence of family history of diabetes is a significant risk factor for type 2 diabetes mellitus. Various other risk factors include increase in BMI, lack of physical activity, increase in blood pressure and increase level of triglyceride and cholesterol. Timely interventions to identify these risk factors can prevent the occurrence of diabetes mellitus.

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