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Study of risk factors of type 2 diabetes mellitus in the field practice area of rural health training centre of IIMSR Medical College, Badnapur, Jalna, Maharashtra

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Abstract

Background: The disease has been recognized as a global epidemic by WHO. According to the International Diabetes Federation (IDF), the number of people globally with type 2 diabetes mellitus (T2DM) will increase to 552 million by 2030, over twice the number in 2000. Nearly 21% of these new cases will be from India, which has the highest number of cases in any country.

Methods: A cross-sectional study was carried out in the field practice area of rural health center (RHTC) Kasturwadi, Department of Community Medicine, Indian Institute of Medical Science & Research, Badnapur, Jalna, Maharashtra. As WHO has given theme for WHO day 7th April 2016 as "Beat Diabetes", as a part of WHO day 2016 celebration a Diabetes Screening camp was organized at Kasturwadi village on 7th April 2016. Blood sugar level of all participants in camp above 30 years and who were willing to participate was taken for the study.

Results: Prevalence of IGT and diabetes (combined) was 60% in 61-70 yrs age group followed by 36% in 51-60 years, 35% in 41-50 years and 27% in 30-40 years. Prevalence of diabetes is 7.9% in males where as 3.8% in females. Prevalence of IGT is more among Muslims i.e. 31.8% than Hindus i.e. 25.6%. Prevalence of IGT and diabetes is 53.1% and 16.3% respectively in subjects with sedentary life style and difference was statistically significant among sedentary and non-sedentary subjects. There were significant difference in prevalence of IGT and Diabetes among persons with higher BMI (p=0.001). Also there is significant difference in normotensives and hypertensive as prevalence of IGT and diabetes is considered (p=0.039).

Conclusion: The present study found positive association between stress, sedentary lifestyle, family history of diabetes, and hypertension with abnormal glucose tolerance. Primary prevention is possible by modifying the environmental factors influencing diabetogenesis such as obesity, diet and physical activity.

Key words: Impaired Glucose Tolerance **(**IGT), Body Mass Index (BMI), Rural Health Training Centre (RHTC), World Health Organization (WHO)

Introduction

According to the International Diabetes Federation (IDF), the number of people globally with type 2 diabetes mellitus (T2DM) will increase to 552 million by 2030, over twice the number in 2000.(1) Nearly 21% of these new cases will be from India, which has the highest number of cases in any country.(1) India currently has 61.3 million diabetics, a figure that is projected to increase to 103 million by 2030.(2) Several studies from different regions of India have shown that prevalence of T2DM is increasing from 8.2% in 1992 to 18.6% in 2008 for urban areas, and from 2.4% in 1992 to 9.2% in 2008 in rural areas.(3-5) Though 72% of Indians reside in rural areas, T2DM incidence and its determinants among rural residents has not been studied to date. The disease has been recognized as a global epidemic by WHO.(6) The largest numbers of diabetic patients are present in our country making India as the diabetes capital of the world.(7) By 2030, India will lead the world at 79.4 million people with diabetes followed by China with 42.3 million and USA with 30.3 million.(8) Though the disease is common both in developed as well as developing countries, it remains uncommon in underdeveloped world.(9) Number of diabetic patients is showing discerning upward trend both in urban as well as rural areas. About 2/3rd of population is residing in rural areas and the rural population has different lifestyles, environment and sociocultural factors as they are mostly involved in agrarian and allied work pattern. The diabetic patients of the developing world are in 45-65 yrs of age group in contrast to 64-70 years age group in developed world and the figures are likely to touch 50 mn and 85 mn in developed and developing world respectively.(10) Various studies from developed world(11-13) and urban studies from India have pointed to lifestyle changes,(14) sedentary lifestyle, diet and epidemiological transition(15) as major factors in genesis of T2DM. Among the various risk factors, gender and age have been confirmed by many studies(16) besides area of residence and socioeconomic factors like income, literacy, marital status and employment status.(17,18) Among lifestyle risk factors exercise and physical activity are known to be protective while stress has been found to be a specific risk factor for women. Among the physiological risk factors, hypertension, serum triglyceride, high density lipoprotein, cholesterol and body mass index have been incriminated.(19,20) These risk factors may not all be applicable to rural population and it is imperative to identify factors predisposing to the disease in rural areas in particular. Hence the current study was undertaken to determine the risk factors of

T2DM among rural population (30 years and above) of Maharashtra.

Materials and Methods

A community-based cross-sectional study was carried out in the field practice area of rural health training center (RHTC) Kasturwadi under Department of Community Medicine of Indian Institute of Medical Science& Research Medical College, Badnapur, Jalna, Maharashtra during the month of April 2016. As World Health Organization (WHO) has given theme for WHO day 7th April 2016 as "Beat Diabetes", as a part of WHO day 2016 celebration a Diabetes Screening camp was organized at Kasturwadi village on 7th April 2016. A total of 180 subjects were interviewed in the camp, out of that, 142 subjects who fulfilling the inclusion criteria (age above 30 years and who were willing to participate) were enrolled for the study. Known diabetics and patients taking any sort of medicines for diabetics were excluded from the study.

Hence the total numbers of 142 subjects were screened. In all subjects, family history of diabetes was obtained and details on physical activities and other parameters were assessed. Waist measurements were obtained using a standardized technique. Socio-economic status was assessed according to modified BG Prasad classification based on CPI of April 2016,[19] and Asia pacific guidelines[20] was considered to classify BMI as underweight (<18.5), normal (18.5 to 23.0), overweight (23.1-27.5) and obese (>27.5). Study participants who were fasting at the time of interview were asked to take food and come after 2 hours and their blood sample were taken after 2 hours of food intake as post prandial blood sugar level. WHO criteria was considered to classify 2 hours glucose levels as normal (<140mg/dl), impaired glucose tolerance (140-200mg/dl) and diabetes (>200mg/dl).

Data analysis: Data was entered in Microsoft Excel and analyzed by using SPSS version 20.0**.**

Results

Table 1: Association of study subjects according to Non-modifiable risk factors of diabetes

		BSL Category								P-value
		NGT		IGT		Diabetic		Total		
		No.	%	No.	%	No.	%	No.	%	
Age Group	30-40yrs	38	73.1	11	21.2	03	5.8	52	100.0	0.351
	41-50yrs	26	65.0	13	32.5	01	2.5	40	100.0	
	51-60yrs	16	64.0	07	28.0	02	8.0	25	100.0	
	61-70yrs	08	40.0	10	50.0	02	10.6	20	100.0	
	>70yrs	04	80.0	01	20.0	00	0.0	05	100.0	
	Total	92		42		08		142	100.0	
Sex	Male	39	61.9	19	30.2	05	7.9	63	100.0	0.542
	Female	53	67.1	23	29.1	03	3.8	79	100.0	
	Total	92		42		08		142	100.0	
Religion	Hindu	24	61.5	10	25.6	05	12.8	39	100.0	0.213
	Muslim	57	64.8	28	31.8	03	3.4	88	100.0	
	Other	11	73.3	04	26.7	00	0.0	15	100.0	
	Total	92		42		08		142	100.0	
Family history of diabetes	Yes	13	27.1	28	58.3	7	14.6	48	100.0	0.001*
	No	79	84.0	14	14.9	01	1.1	94	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	

BSL- Blood Sugar level NGT- Normal Glucose Tolerance IGT-Impaired Glucose Tolerance

As far as non-modifiable risk factors of diabetes is concerned, our study shows that in age group of 61 to 70 years prevalence of IGT and diabetes (combined) is 60% followed by 36% in 51-60 years, 35% in 41-50 years and 27% in 30-40 years. Prevalence of diabetes is 7.9% in males where as in females it is 3.8 percent but there is almost equal prevalence of IGT among males and females. Prevalence of IGT is more among Muslims (31.8%) than Hindus (25.6%). But there is no significant difference in groups when age sex and religion was considered. Prevalence of IGT and diabetes is 58.3% and 14.6% respectively in subjects with positive family history of diabetes and difference was statically significant (p=0.001).

Table 2: Association of study subjects according to modifiable risk factors of diabetes

		BSL Category								P-value
		NGT		IGT		Diabetic		Total		
		No.	%	No.	%	No.	%	No.	%	
SES	Lower middle	17	65.4	07	26.9	02	7.7	26	100.0	0.843
	Upper lower	46	61.3	25	33.3	04	5.3	75	100.0	
	Lower	29	70.7	10	24.4	02	4.9	41	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
Occupation	Housewife	42	61.8	21	30.9	05	7.4	68	100.0	0.814
	Unemployed	20	64.5	09	29.0	02	6.5	31	100.0	
	Labourer	30	69.8	12	27.9	01	2.3	43	100.0	
	Professional	00	0.0	00	0.0	00	0.0	0	0.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
Education	Illiterate	47	64.4	21	28.8	05	6.8	73	100.0	0.913
	Primary	17	70.8	06	25.0	01	4.2	24	100.0	
	Middle	28	62.2	15	33.3	02	4.4	45	100.0	
	High school	00	0.0	00	0.0	00	0.0	00	0.0	
	HSC	00	0.0	00	0.0	00	0.0	00	0.0	
	Graduate and above	00	0.0	00	0.0	00	0.0	00	0.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
Lifestyle	Sedentary	15	30.6	26	53.1	08	16.3	49	100.0	0.001*
	Non sedentary	77	82.8	16	17.2	00	0.0	93	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	

BSL- Blood Sugar level NGT- Normal Glucose Tolerance IGT-Impaired Glucose Tolerance

As far as modifiable risk factors are considered (As shown in Table 2), our study shows that prevalence of IGT and diabetes (combined) is 38.6% in upper lower class of socioeconomic status which is slightly more than other socioeconomic classes but it was not significant. Occupation and educational status both doesn't show any significant difference in different groups. Prevalence of IGT and diabetes is 53.1% and 16.3% respectively in subjects with sedentary life style and difference was statistically significant among sedentary and non-sedentary subjects.

Table 3: Association of study subjects according to BMI and Blood pressure

		BSL Category								P –value
		NGT		IGT		Diabetic		Total		
		No.	%	No.	%	No.	%	No.	%	
BMI Asian Criteria	Underweight	12	85.7	02	14.3	00	0.0	14	100.0	0.001*
	Normal	59	77.6	16	21.1	01	1.3	76	100.0	
	Pre-obese	18	56.2	14	43.8	00	0.0	32	100.0	
	Obese	03	15.0	10	50.0	07	35.0	20	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
SBP	Normotensive	51	64.6	25	31.6	03	3.8	79	100.0	0.516
	Hypertensive	41	65.1	17	27.0	05	7.9	63	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	
DBP	Normotensive	81	61.8	42	32.1	08	6.1	131	100.0	0.039*
	Hypertensive	11	100.0	00	0.0	00	0.0	11	100.0	
	Total	92	64.8	42	29.6	08	5.6	142	100.0	

BSL- Blood Sugar level NGT- Normal Glucose Tolerance IGT-Impaired Glucose Tolerance

Table 3 shows that, in our study among 20 obese subjects 50% shows impaired glucose tolerance and 35% shows diabetes and there is significant difference in prevalence of IGT and Diabetes among persons with higher BMI (p=0.001). Also there is significant difference in normotensives and hypertensive as prevalence of IGT and diabetes is considered (p=0.039).

Discussion

Abnormal glucose tolerance in relation to blood pressure: In the present study, prevalence of diabetes

and IGT in hypertensive population was 7.9% and 27% respectively. We observed that there was significant association between blood pressure and abnormal glucose tolerance (p<0.001). Similar observation was also made by Hamit Acemoglu et al[21] that Type 2 DM was more frequent among people with hypertension than with norma-tension and also was significantly associated (11.5% vs. 3.38%, p=0.0001). According to regression analysis, DM was 2 times higher in hypertensive than in normotensives.

Abnormal glucose tolerance in relation to family history: Amongst 8 diabetics, 7 had family history of diabetes and 50% of persons with IGT had family history of diabetes. Family history of diabetes was significantly associated with abnormal glucose tolerance (p<0.001). In a similar study done by Kokiwar et al[22] also revealed that high prevalence was in individuals having family history of diabetes (46.93%) as compared to those with those with no such history 11.3% (p<0.001).

Abnormal Glucose Tolerance and Physical Activity: Prevalence of IGT and diabetes is 53.1% and 16.3% respectively in subjects with sedentary life style and difference was statistically significant among sedentary and non-sedentary subjects (p<0.001). Similarly observations were seen by Kokiwar et al[22] study, it was found that prevalence of diabetes was significantly greater amongst people doing sedentary physical activity (33.84%) as compared to people involved in heavy physical activity (11.53%). The protective effect of physical activity against diabetes mellitus is possibly due to increased insulin sensitivity which can be accentuated by weight loss achieved through physical activity.

Abnormal Glucose Intolerance and BMI: In our study, among 20 obese subjects 50% shows impaired glucose tolerance and 35% shows diabetes. There is significant difference in prevalence of IGT and Diabetes among persons with higher BMI (p=0.001). BMI was significantly associated with abnormal glucose tolerance (p<0.001).Similarly in a study done by Kokiwar et al,[22] it was observed that abnormal glucose tolerance was significantly higher in those with BMI ≥ 25kg/m2 (27.47%) as compared to those having BMI <25kg/m2 (9.7%) (p<0.001). Another study by Dhadwal D et al[23] also found obesity was significantly associated with diabetes (p<0.05). Prevalence of diabetes was 4.15% in <25 BMI subjects and it was 6.7% in the individuals with BMI >25 (p<0.05). Obesity causes stress in endoplasmic reticulum, this stress results in suppression of signals of insulin receptors leading to insulin resistance.

Conclusion

The present study found positive association between stress, sedentary lifestyle, family history of diabetes, and hypertension and alcohol consumption with abnormal glucose tolerance. It was also found that type of family and type of diet were not significantly associated with abnormal glucose tolerance. Primary prevention is possible by modifying the environmental factors influencing diabetogenesis such as obesity, diet and physical activity. Long term studies have shown that beneficial effects of life style.

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