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Original Research Article

Prevalence and its risk factors of diabetic patients in urban area of Palakkad: an observational study

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ABSTRACT

Background: Diabetes mellitus (DM) is emerging as a major health-care challenge for India. The worldwide prevalence of DM has risen dramatically in the developing countries over the past two decades. Most studies from western countries and urban studies of India point out that lifestyle changes, sedentary life, diet and related epidemiological transition as major risk factors in the development of DM.
Methods: It was a cross sectional observational study done in urban area covered under urban primary health Centre (UPHC) of Govt. Medical College, Palakkad. Adults more than 30 years of age in urban area were included and observation period was from 2016-2017.
Results: The overall prevalence of diabetes mellitus in the present study was found to be 268 (65.68%). In this 135 (50.37%) were the age group is 50-59 years and almost half 80 (29.85%) were diagnosed at the age of 40-49 years. Similarly, the risk factors such as age, occupation, diet, smoking, alcohol, truncal obesity and family history were significantly associated with prevalence of T2DM whereas alcohol and hypertension were not.
Conclusions: The result of the present study proves that prevalence of T2DM was influenced by many risk factors like age, diet, dyslipidaemia, truncal obesity and family history consider more important in the urban studies.

Keywords: Diabetes Mellitus, Obesity, Risk factors, Urban area

INTRODUCTION

Diabetes Mellitus (DM) is a major health problem owing to serious complications in India and worldwide. Because DM is heterogeneous metabolic disorders characterized by common feature of chronic hyperglycaemia with disturbance of carbohydrate, fat and protein metabolism.[1] Particularly Kerala is the diabetes capital of India with a high prevalence of diabetes mellitus.[2] As per reported by the Indian Council of Medical Research (ICMR), estimated that 62.4 and 77.2 million people have diabetes mellitus and prediabetes respectively in India of 2011 and may increases in the future.[3] The prevalence of diabetes mellitus can be attributed primarily to the modern lifestyle of urban Indians compared to the traditional lifestyle of rural Indians. Due to increase in the modifiable risk factors related to lifestyle at a young age, alike unhealthy diet, sedentary lifestyle, high consumption of alcohol, lack of physical activity and air pollution, along with very high intake of saturated fat.[4]

Unfortunately, people with diabetes are more prone to having unhealthy high cholesterol levels, hypertension, obesity and food habits, which contributes to cardiovascular disease (CVD).[5] Some studies clearly show that a link between insulin resistance with these risk factors, which is a precursor to type 2 diabetes and diabetic dyslipidemia, atherosclerosis and blood vessel disease. Because of diabetes tends to lower good cholesterol levels and raise triglyceride and bad

cholesterol levels, which increases the risk for heart disease and stroke. For example, one study shows the prevalence of diabetes to be double in urban areas than rural areas of Kerala, which leads to stimulates for other chronic disease complications development.[4]

So, DM requires continuing medical care and patient education to prevent acute complications and to reduce the risk for long term complications.[6] This is happened to be due to the combination of poor public awareness and limited opportunities for diagnosis.[7] Hence, it is important to detect diabetes mellitus early by screening of risk factors for DM to prevent its micro- and macrovascular complications.[8] There is widespread agreement that specific tests are necessary to monitor for early signs of diabetic complication. And also, it's important to assess the various risk factors contributing to the occurrence of the diseases so that by limiting these factors for the progression of the disease in patients can be controlled. Hence, the present study was undertaken to determine the risk factors for T2DM amongst adults aged above 30 years in urban population of Palakkad. This paper aims to emphasize the socioeconomic factors influence upon the risk factors underlying the occurrence of diabetes mellitus in the studied group of people.

METHODS

Study design and duration

A prospective observational study was carried out in 408 subjects from either sex with a prehospital diagnosis of Diabetes Mellitus. The study was carried out in Primary Health Centre (PHC) areas of Deira street at palakkad, Govt Medical College, palakkad, kerala, India during March 2016 to Feb 2017. These areas were chosen due to their proximity to palakkad facilitating collection of fasting blood samples in the early mornings.

Inclusion criteria

Individuals with typical symptoms of T2DM, physician diagnosed patients as T2DM (FBG>126 mg/dl), individuals who were 30 years and above aged, overweight (BMI>25 kg/m^2) and hypertension (>140/90 mm Hg).

Exclusion criteria

Individuals who declined for informed consent**,** not available at home after repeated visit, pregnant women/who had delivered a baby weighing >4.5 kg**,** by women who had gestational diabetes, individuals with psychological and endocrinal disorders.

Procedure

WHO recommends standard glucometer to measure blood glucose for epidemiological purpose.[9] Information on socio-demographic variables such as age, gender and behavioral risk factors such as tobacco and alcohol use was collected using a structured interview schedule. Anthropometric measurements such as height, weight, and waist circumference were also measured as per the standard criteria.[10] Eligible individuals were subjected to a random blood sugar (RBS) screening by glucometer (FreeStyle, Optium H). Individuals who had RBS level of ≥140 mg/dL were subjected to fasting blood sugar (FBS) and postprandial blood sugar (PPBS) estimation by auto analyzer method (ChemWell Chemistry Analyzer, P-2900 series, version 6.3). Patients with newly diagnosed diabetes mellitus were provided proper counseling regarding diet and exercise, and were registered in the chronic disease clinic for further management. The total cholesterol, urea, creatinine levels were estimated as per standard protocol by using auto analayser available in health centre. Blood pressure was measured on the left arm in sitting posture, with the subject in a relaxed state. Standardized mercury sphygmomanometer (Diamond deluxe BP apparatus, Pune India) with adult size cuff was used. Individuals who had systolic blood pressure of ≥140 and/or diastolic blood pressure of ≥90 mmHg was considered as having hypertension. The participants were interviewed with a pretested questionnaire regarding identification, demographic details, behavioral components, social and biological variables. Detailed family history of T2DM was taken. This was verified either by blood glucose measurement of the parents or in the person's absence, by other circumstantial evidences such as physician report, diet modifications, consumption of drugs. Known cases of T2DM were included in the study. Smoking and alcohol were considered as risk factors. Smoking was measured in terms of frequency those who were smoking daily for 6 months and quantum tobacco chewing/beedies/ cigarettes/cheroots per day.[11]

Statistical analysis

Collected data were analyzed using SPSS 13 version (IBM, Illinois, Chicago). Frequency, percentage, mean and standard deviation were calculated and associations between variables were assessed using chi-square test. Also, t-test was used to find significant differences of two means and ANOVA was employed to find the significance of more than two means. In addition to the above statistical tools, simple binary logistic regression analysis and multiple binary logistic regression were performed to find crude and adjusted odds ratio (OR). The 95% confidence interval (CI) was calculated to find the significance of observed OR. In all cases, $p<0.05$ was considered statistically significant.

RESULTS

The study included 408 subjects with response rate of 65.68%. The baseline characteristics of the study subjects are shown in Table 1 The prevalence of T2DM among gender was observed elevated in females (64.92%) compared to males (35.07%). And also shows the prevalence of diabetes increased significantly with age.

The increased prevalence was observed in the middle age group 40-49 years (29.85%) and in the old age group above 50 years age group (50.37%). The study population included 26 (9.70%) study subjects in 30-39 years of age group and 80 (29.85%) of study subjects in 40 years of age group, 37 (13.80%) in >60 years. A majority of them were males in the age category of 50-59 years. The prevalence of type 2 DM increased with the family history of diabetes. The prevalence of T2DM was 60.07% amongst subjects having family history of diabetes. Urban participants were more likely to have risk factors of diabetic complications including age, sex, obesity, family history, whereas prehypertension is not significantly associated with prevalence of T2DM.

Table 2 shows that average proportion of daily, monthly, yearly case and investigation. It's clearly indicated that the getting investigation of glucose and cholesterol are increased day by day when compare with other of routine laboratory investigation in the health centre of Palakkad. From that its clearly indicates that risk factors associated with T2DM and its complications.

Table 3 shows the prevalence of T2DM with risk factors. The prevalence of T2DM in relation to substance abuse like smoking present (187), absent (81) when compare with normal patient's the p value is 0.47 and alcohol consumption present (160), absent (108) when compare with normal patient's the p value is 0.719. The prevalence of T2DM in high significantly association with truncate obesity was p<0.001 and cholesterol was p<0.001. Similarly, the participants having non-veg diet showed higher risk of T2DM when compare with veg diet ratio was p<0.032. The prevalence of T2DM with hypertension present (174), absent (94) when compare with normal patient's the p value is 0.087. In accordance with their importance of participant's age, occupation, diet, family history of diabetes, smoking and truncal obesity have showed statistically significant correlation with diabetic status level. whereas participant's hypertension and alcohol did not show any significant effect on T2DM.

Table 1: Distribution percentage of DM patients physical and clinical characteristics observed at an urban primary health centre, Palakkad (N=268/408).

Characteristic	T2DM	T2DM prevalence %
Overall[a]	268	65.68
Age group		
30-39 years	26	9.70
40-49 years	80	29.85
50-59 years*	135	50.37
≥ 60 years	37	13.80
Sex Male	94	35.07
Female	174	64.92
Family history[@]		
Diabetes	161	60.07
Non-diabetes	107	39.92
Waist circumference		
Obese*	188	70.14
Normal	80	29.85
Hypertension		
Present	174	64.92
Absent	94	35.07

a,- compared with age, family history, obese; statistical significance: [@]p<0.05, p<0.01, *p<0.001

Table 2: Average proportion of daily, monthly, yearly case and investigation.

	Daily case	Investigation		
		Daily	**Monthly**	**Yearly**
Sugar FBS	21	18	365	3395
PPBS		16	361	3392
Urea	1	0.5	18	212
Creatinine	3	0.6	5	58
T. cholesterol	15	7	105	933
LFT	2	0.03	3	18
U/Alb	1	0.13	2.5	17

Table 3: Risk factors correlate between cases and controls.

Characteristic		Total number screened DM	Normal	Total	P value
Case [a]		268	140	408	
Blood sugar [b]		365	205	570	
Cholesterol*	Present	163	2	165	<0.001
	Absent	105	138	243	
Hypertension	Present	174	78	252	0.087
	Absent	94	62	156	
Obesity*	Present	188	42	230	<0.001
	Absent	80	98	178	
Food habit[@]	Non-Veg	227	129	356	<0.032
	Veg	41	11	52	
Smoking	Yes	187	84	271	0.047
	No	81	56	137	
Alcohol	Yes	160	81	241	0.719
	No	108	59	167	

a,b- compared with Cholesterol, Obesity, Food habit; statistical significance: [@]p<0.05, p<0.01, *p<0.001

DISCUSSION

The risk factors like obesity, alcohol, smoking, sedentary lifestyle, excessive calorie diet intake and lack of physical activity, majority of genetic factors in their lives are that can play a key role for many diseases like diabetes mellitus.[12] Therefore, knowing the factors of risk that predispose to the development of T2DM is important to health professionals. Family history of diabetes could be an important public health tool in predicting development of diabetes. The present study showed that the 65.68% of diabetes among those with family history of T2DM were 60.07% as compared to those without a family history of T2DM. Similarly, reported by Rmachandran et al in urban area of South India 47% of the people who had diabetes had a positive family history.[13] In present study, similar results observed that significantly associated with higher risk of T2DM. This may be due to prolonged exposure to stress, obesity, genetic factor, advancement of age. However, few studies have showed a higher prevalence in females and some other studies showed higher prevalence in males. Alternatively, gender may not be a risk factor in T2DM.[14] This is possibly due to coexisting risk factors in specific gender. In our result, the high prevalence in among young adults 40- 49 years (29.85%) is bear by when compare with 30-39 years (9.70%), 50-59 years (50.37%), the most productive age group of the community is unacceptable due to life style modifications and hence focus on prevention of diabetes among young is essential.

Hence, dietary habits also demonstrated a significant association with incidence of T2DM in this study, because its play a major key risk factors for type 2 diabetes[15]. Surprisingly few studies have investigated the effects of fast food, non-vegetarian consumption were associated with for incident T2DM compared with those with good dietary habits.[16] To our knowledge, no data for fast-food non-vegetarian consumption and diabetes-related endpoints are available in the Palakkad region. For these reasons, we aimed to investigate the association between lifestyle modification and changes in bodyweight and insulin resistance which leads to hyperglycemia. Similarly, our observation result shows that non-vegetarian peoples are more prone to diabetes when compare with vegetarian. In view of the high and increasing rates of fast-food consumption now a day, further research into the effects of this dietary pattern on public health should be given priority.

Several studies reported truncal obesity due to consumption of high fat diets can be a risk factor for non-communicable diseases like diabetes, which increases as environments become more urban.[17] The obesity, high calorie diet coupled with sedentary lifestyle are the major contributing factor in the development of glucose intolerance, insulin resistance, hypertension and dyslipidaemia, due to adipose tissues releases large number of bioactive mediators that influence insulin resistance leading to endothelial dysfunction and atherosclerosis.[18] This is due to association with age, BMI, family history of diabetes, monthly income and sedentary physical activity. In our observation study showed that there was a significant association of occupation with increasing prevalence of T2DM, because now a day's people are facing a combined effect of physical inactivity in employees like house wife and work-related stress. Similar findings were reported by some other studies in India.[17] In view above, the similar effects were observed correlation associated with obesity and DM patients in our health care centre. Our observation result shows that the strongest significant relationship was seen with comparisons involving obesity in both patient groups (p<0.001). Because, the nutrition transition has been observed as a recent and rapid change in the diet among populations of many countries with

increases in the consumption of foods sourced from animals, caloric sweeteners, and fat along with consumption of fast foods.[19] In our study, we also found that people with sedentary and mild physical activity had a higher risk for diabetes.

Cardiovascular disease is the responsible for 80% of total mortality in diabetes. It is associated with dyslipidaemia due to depends activity of insulin, hormone sensitive lipase and free fatty acids lead to produce acetyl CoA. So, acetyl CoA pool is increased, and it is channelled to cholesterol synthesis. About 60% of patients are obese, due to insulin resistance develops as consequence of excess accumulation of fat in liver and skeletal muscle. This will ultimately create an increase in the amount of lipids in the blood. So, the link between diabetes and the development of cardiac disease revolves is strongly linked to these abnormalities. Our result shows that the strongest significant relationship was seen with comparisons involving cholesterol in both patient groups ($p<0.001$). Analyses of the patients in the glucose intolerant group show a somewhat strong inverse relationship between HDL and changing glucose levels. This helps to reinforce the idea that decreasing HDL is associated with insulin resistance.

Similarly, smoking is the most important modifiable risk factor for diabetes and CAD which depends on the age and number of cigarrete smoked per day. Nicotine of cigarrete will cause lipolysis and thereby increase acetyl CoA and cholesterol synthesis. Smoking habits were associated with 1.94 times odds for incident T2DM. This finding agrees with several other cohort studies.[20] Similarly, literature showed varied association of alcohol consumption and increased risk of diabetes.[21] This is probably due to the development of insulin resistance, which is a key factor in the pathogenesis of T2DM. In our observation study, we also found that people with smoking and alcohol had a higher risk for diabetes. Apart from DM, hypertension is a common chronic morbidity which affects population with the common lifestyle changes and diet related risk factors. According to the american diabetes association (ADA), the combination of hypertension and type 2 diabetes is particularly lethal and can significantly raise your risk of having a heart attack or stroke, which leads to chances of developing other diabetes-related diseases such as kidney disease and retinopathy. So, the evaluation of diabetes complication risk factors such as urea, creatinine and microalbumin in blood and urine is useful to detect the kidney problem. In India, the overall prevalence of hypertension was about 40.0%, more in urban (63.2%) than in rural (36.8%) areas.[22] Similarly, our observation also indicates prolonged diabetes are complication for kidney disease. One report shows that insulin is not significantly related to blood pressure in Pima Indians.[23] But obesity is an independent risk factor for the development and progression of hypertension, cardiovascular disease and chronic kidney disease. There is growing evidence that obesity and associated metabolic abnormalities may induce and accelerate renal complications in essential hypertension.[24] Similarly, current study observed that prevalence of hypertension (>120/80 mm of Hg) was 64.92%. The exact mechanism that leads to the development of diabetes in hypertension is not known. The present study was cross-sectional community based study in urban population of Palakkad and there were no other studies which reported the prevalence and associated risk factor for T2DM in this region, further research is needed.

CONCLUSION

A high prevalence of type 2 diabetes was noted in the urban area population of Palakkad. In the present study, it was observed that advanced age, occupational changes, substance abuse like alcohol and smoking, truncal obesity and family history of diabetes were highly associated risk factors for T2DM. Besides that, three-fourth of the population was found in the category of doing low physical activity. It was prevalent in both sexes, but higher in females compare with male. It was prevalent in all education levels and occupational categories. Similarly, the increasing pattern of prevalence of hypertension was recorded with increasing age of people. So, this study created awareness of diabetes and its complication in urban area population of this region. This is because that people from the urban region mainly due to less physical activity, consumes carbohydrate and fat rich foods wide availability. Dietary restrictions and physical activities must be insisted for diabetic patients and aware of the importance of taking food rich in dietary fibers and antioxidants for prevent prevalence of DM. Therefore, future research is needed in this direction.

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REFERENCES

1. Kanaya AM, Wassel CL, Mathur D. Prevalence and correlates of diabetes in South asian indians in the United States: findings from the metabolic syndrome and atherosclerosis in South asians living in america study and the multi-ethnic study of atherosclerosis. Metabolic Syndrome Related Disorders. 2010;8(2):157-64.
2. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007;125(3):217-30.

3. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the Indian Council of Medical Research India Diabetes (ICMR-INDIAB) study. Diabetologia. 2011;54:3022-7.
4. Thankappan KR, Shah B, Mathur P. Risk factor profile for chronic non-communicable diseases: results of a community-based study in Kerala, India. Indian J Med Res. 2010;131:53-63.
5. Menon VU, Guruprasad U, Sundaram KR, Jayakumar RV, Nair V, Kumar H. Glycaemic status and prevalence of comorbid conditions among people with diabetes in Kerala. Natl Med J India. 2008;21(3):112-5.
6. American Diabetes Association (ADA). Standard of medical care for patients with diabetes mellitus. Diabetes Care. 2001;24(1):S33-43.
7. Saurabh S, Sarkar S, Selvaraj K, Kar S, Kumar SG, Roy G. Effectiveness of foot care education among people with type 2 diabetes in rural Puducherry, India. Indian J Endocrinol Metab. 2014;18:106.
8. Ambady R, Chamukuttan S. Early diagnosis and prevention of diabetes in developing countries. Rev Endocr Metab Disord. 2008;9:193–201.
9. World Health Organization (1999), Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications. Geneva: Department of Non-Communicable Disease Surveillance. Available at Http://whqlibdoc.who.int/hq/1999/who-ncd_ncs-99.2.pdf.
10. Somannavar S, Ganesan A, Deepa M, Datta M, Mohan V. Random capillary blood glucose cut points for diabetes and pre-diabetes derived from community-based opportunistic screening in India. Diabetes Care. 2009;32:641-3.
11. Toshimi S, Hiroyasu I, Akio N, Takako H, Fujiko I, Yoko S, Atsushi M, Hisayuki F. Cigarette smoking and risk of type 2 diabetes mellitus among middle-aged and elderly Japanese men and women. Am J Epidemiol. 2004;160:158-62.
12. de Lima CLJ, de Oliveira PS, Ferreira TMC, da Silva EC, Ferreira JDL, de Andrade RS, et al. Risk Factors for Type II Diabetes Mellitus. An Integrative Rev. 2016;9(308):1-11.
13. Ramachandran A, Jali MV, Mohan V, Snehalatha C, Viswanathan M. High prevalence of diabetes in an urban population in south india. Br Med J. 1988;297:587-90.
14. Prabhakaran D, Chaturvedi V, Ramakrishnan L. Risk factors related to the development of diabetes in men working in a north Indian industry. National Med J India. 2005;20(1):4-10.
15. Edelstein SL, Knowler WC, Bain RP. Predictors of progression from impaired glucose tolerance to NIDDM: an analysis of six prospective studies. Diabetes. 1997;46:701-10.
16. Binkley JK, Eales J, Jekanowski M. The relation between dietary change and rising US obesity. Int J Obes Relat Metab Disord. 2000;24:1032–9.
17. Khan S, Hull R, Utzschneider K. Review Article Mechanisms linking obesity to insulin resistance and type 2 diabetes. Nature. 2006;444:840-6.
18. Kahn BB, Flier JS. Obesity and insulin resistance. J Clin Invest. 2000;104:473-81.
19. Astrup AJ, Dyerberg M, Selleck, Stender S. Nutrition transition and its relationship to the development of obesity and related chronic diseases. Obesity Reviews. 2008;9(1):48- 52.
20. Sakai Y, Yamaji T, Tabata S. Relation of alcohol use and smoking to glucose tolerance status in Japanese men. Diabetes Res Clin Pract. 2006;73:83-8.
21. Howard A, Arnsten J and Gourevitch M. Effect of alcohol consumption on diabetes mellitus. Annals of Int Med. 2004;140:211-9.
22. Moore WV, Fredrickson D, Brenner A. Prevalence of hypertension in patients with type II diabetes in referral versus primary care clinics. J Diabetes Complications.1998;12(6):302–6.
23. Michael EH, Jussara MC, Alexandre AS, Luis AJ, Zhen W, John EH. Obesity, hypertension and chronic kidney disease. Int J Nephrol Renovasc Dis. 2014;7:75-88.
24. Narkiewicz K. Obesity and hypertension- the issue is more complex than we thought. Nephrol Dial Transplant. 2006;21(2):264-7.

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