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Risk Factors For Type 2 Diabetes Mellitus in Nagpur: A Case Control Study

Community Medicine

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ABSTRACT

Introduction: Understanding risk factors for Type 2 diabetes mellitus(T2DM) is necessary to halt its global epidemic by identifying at-risk individual, by initiating primary prevention intervention. Therefore this study was conducted to study some risk factors associated with T2DM in patients catered by GMC,Nagpur.

Methodology: This case-control study was conducted in Diabetes OPD and urban field practice area of GMC,Nagpur.100 newly diagnosed patients of T2DM, aged ≥30years and urban residents attending D-OPD were selected as cases. Equal number of 5-year-age-group and gender matched non-diabetic individuals, were selected as controls from UHTC of GMC,Nagpur. Using predesigned preform, socio-demographic characteristics, and history about various risk factors were assesses. Anthropometric measurements and BP were recorded using standard protocol. After calculating Crude Odds Ratio(OR), Adjusted OR(AOR) was calculated by Binary Logistic Regression.

Results: Majority subjects were aged 45-60 years. Statistically significant association was established between T2DM and family history of diabetes AOR=4.15(2.26-7.61),p<0.001); spousal diabetes AOR=2.48(1.25-4.91),p=0.009; low physical activity AOR=3.38 (1.34–4.25), p=0.003; pre-obese/obesity AOR=5.77(3.03-10.98),p<0.001 and central obesity AOR=4.48(2.40-8.36)p<0.001).

KEYWORDS

"Case Control Study", "Risk Factors", "Type 2 Diabetes Mellitus"

Introduction:

Diabetes is one of the largest global health emergencies of the 21st century. WHO estimates that, globally, 422 million adults aged over 18 years were living with diabetes in 2014.[1] Around 90% of all diabetes is constituted by type 2 diabetes mellitus(T2DM).[2] Wild etal estimated the prevalence of diabetes to be doubled globally from 171 million in 2000 to 366 million in 2030.[3] Much of this increase is occurring in developing countries and is supposed to be due to population growth, ageing, rising living standards, steady urban migration, and lifestyle changes like unhealthy diets, obesity and sedentary habits.[4]

By 2025, while most people with diabetes in developed countries will be aged 65 years or more, in developing countries most will be in the 45-64 year age bracket.[5] India harbours 69.1 million diabetics with its prevalence in adults (20-79 years) to be 8.7%.[6] While genetic factors might contribute a little to the south Asian phenotype, the current diabetes epidemic is fuelled predominantly by lifestyle, which is related to environmental factors.[7] To curb escalating diabetes epidemic, primary prevention through promotion of healthy lifestyle should be a global public health policy. Thus this study was conducted with the objective to study some risk factors associated with T2DM in patients catered by GMC,Nagpur.

Methodology:

This case-control study was conducted in Diabetes OPD and urban field practice area of GMC,Nagpur after obtaining ethics approval. Sample size was calculated using the study done by Vidya GS etal [8] and estimated to be 100 in each group, i.e. total 200 subjects. After obtaining informed consent, cases were selected from diabetes OPD, which included patients ≥30 years of age with newly(within one month) diagnosed type 2 diabetes mellitus, whose diabetic status was confirmed as per 2006 World Health Organization diagnostic criteria of diabetes[9]. Only urban residents were selected for the study for the convenience of selecting controls. Equal number of 5 year age group and gender matched, non-diabetic individuals, who were permanent residents of the urban field practice area were selected as controls from the urban health training center. Individual with type 1 diabetes mellitus, gestational diabetes, pregnant women or on any anti-diabetic

drugs were excluded from the study. After selection of controls by matching and applying exclusion criteria, their fasting blood glucose levels were measured using glucometer after observing overnight fasting of 8hours. Individuals with fasting blood glucose levels below 110 mg/dl were selected as controls

Information about cases and controls were recorded in predesigned proforma by interview method. Socio-demographic details about subject and detailed history pertaining to various risk factors like family history of diabetes mellitus in parents and siblings, spousal history of diabetes. Status of physical activity was assessed and classified as moderate and vigorous intensity activity.[10] Status of smoking and alcohol was assessed as per the IDSP NCD risk factor survey classification.[11]

All the anthropometric measurement like height, weight and waist circumference was measured using standard guidelines.[12] BMI was calculated thereafter and classified according to WHO International Classification of BMI into adult underweight, overweight and obesity.[13] Waist circumference was classified according to the ethnic specific criteria for South Asian population.[14] Blood pressure was recorded using an aneroid sphygmomanometer by adhering to standard guidelines [15] and were classified according to JNC 8 criteria.[16]

Statistical Analysis:

Data was entered and analyzed using statistical software EpiInfo 7.1.5.2 and STATA (April-July 2016). Descriptive statistics were used to summarize baseline characteristics. To assess the association, Odds Ratio and 95% CI was calculated and Chi square test was applied. P value < 0.05 was considered to be statistically significant. Age and gender adjusted Odds Ratio was calculated by binary logistic regression analysis, for the factors which were significant in univariate analysis.

Results:

The socio-demographic characteristics of the subjects as depicted in Table 1.

Table 1: Socio-demographic characteristics of the subject

Sr. No.	Variables	Cases No.(%)	Control No.(%)
1	Age (in years)		
	30-45	19(19%)	19(19%)
	45-60	51(51%)	51(51%)
	60–75	26(26%)	26(26%)
	>75	04(04%)	04(04%)
2	Gender		
	Male	62(62%)	62(62%)
	Female	38(38%)	38(38%)
3	Education		
	Illiterate	17(17%)	21(21%)
	Primary Literate	22(22%)	17(17%)
	High School	39(39%)	42(42%)
	Diploma	15(15%)	14(14%)
	Graduate and above	07(07%)	06(06%)
4	Occupation		
	Unemployed/Homemaker	27(27%)	34(34%)
	Retired	16(16%)	20(20%)
	Unskilled worker	11(11%)	05(05%)
	Skilled/Clerk/Shop/Farm Owner	40(40/%)	36(36%)
	Professional	06(06%)	05(05%)
5	Socio Economic Status*		
	I	05(05%)	07(07%)
	II	28(28%)	30(30%)
	III	60(60%)	51(51%)
	IV	07(07%)	12(12%)

*Modified Kuppuswamy classification of socio-economic status.

Table 2: Association between various risk factors and T2DM

Sr. No	Variables	Cases No.(%)	Control No.(%)	Unadjusted OR (95%CI)	P value
1	Family History			4.19 (2.28-7.69)	0.001
	Present	57(57%)	24(24%)		
	Absent	43(43%)	76(76%)		
2	Spousal History			2.47 (1.18–5.12)	0.014
	Present	32(32%)	16(16%)		
	Absent	39(39%)	48(48%)		
3	Smoking[11]			1.57 (0.86–2.85)	0.132
	Current Smoker	29(29%)	21(21%)		
	Past Smoker	09(09%)	07(07%)		
	Non-Smoker	62(62%)	72(72%)		
4	Alcohol Consumption[11]			1.13 (0.56–2.31)	0.723
	Current drinker	21(21%)	19(19%)		
	Former drinker	13(13%)	08(08%)		
	Life time abstainer	66(66%)	73(73%)		
5	Physical Activity[10]			2.35 (1.33–4.16)	0.002
	Low	04(04%)	43(43%)		
	Moderate	34(34%)	51(51%)		
	High	02(2%)	06(06%)		
6	Body Mass Index[13]			5.52 (2.93–10.37)	0.001
	Normal	42(42%)	80(80%)		
	Pre Obese	49(49%)	18(18%)		
	Obese	09(09%)	02(02%)		
7	Central Obesity[14]			3.97 (2.20–7.16)	0.001
	Present	70(70%)	37(37%)		
	Absent	30(30%)	63(63%)		
8	Hypertension[16]			1.65(0.93–2.92)	0.08
	Normal	25(25%)	56(56%)		
	Pre-Hypertension	29(29%)	10(10%)		
	Hypertension	46(46%)	34(34%)		

The results of univariate analysis are shown in table 2. It was seen that family and spousal history of diabetes, physical activity, pre-obese/obesity and central obesity were significant risk factors for T2DM. Significant association was not seen for smoking, alcohol and hypertension.

Table 3: Results of Binary Logistics Regression analysis of the significant variables

Sr. No.	Variables	Adjusted OR	95% CI	P value
1	Body Mass Index	5.77	3.03 - 10.98	<0.001
2	Central Obesity	4.48	2.40 - 8.36	<0.001
3	Family History of DM	4.15	2.26 -7.61	<0.001
4	Spousal History of DM	2.48	1.25 - 4.91	0.009
5	Low Physical Activity	2.38	1.34 – 4.25	0.003

The risk factors which were seen to be significant in univariate analysis were further analysed using Binary Logistics Regression to calculate age and gender adjusted OR. All the factors which were included in this model were seen to be significant even after adjusting for age and gender.

Discussion:

The present case-control study was conducted for establishing association between T2DM and some risk factors like family history of diabetes, spousal history of diabetes, physical activity, smoking, alcohol consumption, hypertension, pre-obese/obese and waist circumference. As matching was done, age and gender distribution of subjects were similar, highlighting that matching was conducted properly. Majority belonged to socio-economic class III, with none from class IV. No significant association was observed in this study between T2DM and smoking, alcohol consumption and hypertension.

Family history of diabetes was 4 times higher in cases in comparison with control; this result are in concordance with studies conducted by Kotresh M etal[17] (OR=4;2.23–7.35), Nagar SR etal[18] (OR=3.8;2.14–6.80) and Valliyot B etal[19] (OR=3.09(1.16 - 6.12). This proves that development of T2DM has genetic mechanism too. Our study asserted spousal history of diabetes as a risk factor for diabetes with twice higher risk. Only few studies like Khan A etal[20], Stimpson JP etal[21] and Leong A etal[22] have taken this as a variable. Spousal concordance of diabetes mellitus is seen due to the shared environmental and lifestyle factors, such as unhealthy dietary practices, physical inactivity, stress etc. Thus, this can be used as an indication for undertaking concomitant screening of spouses for diagnosis of T2DM in them.

In this study, presence of low physical activity was seen to increase the risk of having T2DM by 2 times, similar to studies by Nagar SR etal[18] (OR=2.4;1.3-4.3), Vidya GS etal[8] (OR=1.7;1.2-2.4), Ekpenyong CE etal[23] (OR=2.37;1.24 – 5.70) and Middet FM etal[24] (OR=2.5;1.2 - 5.0). Physical activity effects by increasing both insulin-mediated and non-insulin-mediated glucose disposal and also increases peripheral sensitivity to insulin[25].

Having BMI $\geq 25kg/m^2$ and central obesity, had 5.5 and 4.5 times higher risk of developing T2DM respectively. This results were supported by Megerssa YC etal[26], Murad MA etal[27] and Vijayakumar G etal[28]. These factors lead to developing T2DM by different of mechanism which ultimately causes insulin resistance.

The above shown risk factors and the so-called "south Asian" or "Asian-Indian" phenotype makes this ethnic group more susceptible to T2DM and other chronic diseases[29]. Health education of masses should be carried out focusing these risk factors. Attempts must be made to identify at-risk individuals and set up primary prevention intervention to prevent the occurrence of T2DM.

Conclusion:

It is concluded that family history of diabetes, spousal history of diabetes, low physical activity, pre-obese/obesity, central obesity are some of the risk factors which are significantly associated with type 2 diabetes mellitus.

REFERENCES
1.   WHO. Global Report on Diabetes.France;2016.
2.   International Diabetes Federation. IDF Diabetes Atlas.7th ed.2015.
3.   Wild S, Roglic G, Green A, Sicree R, King H. Global Prevalence of Diabetes Estimates for the year 2000 and projections for 2030.Diabetes Care. 2004;27(5):1047–53.
4.   WHO Factsheet on Diabetes Mellitus [Internet]. Available from: (http:// www.who.int/ mediacentre/factsheets/fs138/en/)
5.   King H, Aubert RE, H HW. Global Burden of Diabetes,1995–2025 Prevalance, Numerical estimates and projection. Diabetes Care.1998;21(9):1414–31.
6.   IDF.India Profile [Internet].Available from: (http://www.idf.org/membership/sea/india).

7.   Mohan V, Ruchi V, Gayathri R, Ramya Bai M, Sudha V, Anjana RM, etal. Slowing the diabetes epidemic in the World Health Organization South-East Asia Region:The role of diet and physical activity. WHO South-East Asia J Public Heal.2016;5(1):5–16.
8.   Vidya GS, H SA. A Study on Risk Factors of Type-2 Diabetes Mellitus-A Case-Control Study.Indian J Public Heal Res Dev.2013;4(1):236–40.
9.   WHO. Prevention and Control of Non-Communicable Diseases:Guidelines for primary health care in low resource setting or World Health Organization.Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia:Report of a WHO/IDF consultation.2006.
10.   WHO. Global Recommendations on Physical Activity for Health. Switzerland:WHO Press.WHO;2010.
11.   National Institute of Medical Statistics, Indian Council of Medical Research (ICMR).IDSP Non-Communicable Disease Risk Factors Survey, Phase-I States of India,2007-08.Ministry of health and family welfare. New Delhi, India: National Institute of Medical Statistics and Division of Non-Communicable Diseases,Indian Council of Medical Research;2009.
12.   World Health Organization.WHO STEPS Surveillance.Part 3:Training and Practical Guides.Section 3:Guide to Physical Measurements(Step2) [Internet]. 2008.Available from: http://www.who.int/chp/steps/Part3_Section3.pdf
13.   World Health Organization. WHO Global Database on BMI [Internet].Available from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html
14.   International Diabetes Federation. The IDF consensus worldwide definition of the metabolic syndrome [Internet].2006.Available from:
      https://www.idf.org/webdata/docs/MetS_def_update2006.pdf
15.   Smith L. Practice Guidelines:New AHA Recommendations for Blood Pressure Measurement-American Family Physician.Am Fam Physician.2005;72(7):1391–8.
16.   James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, etal. 2014.Evidence-Based Guideline for the Management of High Blood Pressure in Adults.Report from the panel memebers appointed to the Eight Joint National Committe (JNC 8).JAMA.2013;E1-14.
17.   Kotresh M, Kumar P.A Case Control Study on Risk Factors of Type-2 Diabetes Mellitus in a Primary Health Centre Area of Karnataka.J Prev Med Holist Heal.2015;1(2):53–8.
18.   Nagar SR, Jain M, Sharma S.A Study To Identify Socio-Demographic and Lifestyle Risk Factors Associated With Type 2 Diabetes Mellitus and Hypertension.Natl J Community Med.2016;7(3):155–9.
19.   Valliyot B, Sreedharan J, Muttappallymyalil J, Valliyot S.Risk Factors of Type 2 Diabetes Mellitus in the Rural Population of North Kerala,India:A Case-Control Study.Diabetol Croat.2013;42(1):33–40.
20.   Khan A, Lasker SS, Tahseen A, Chowdhury B. Diabetes?Are Spouses of Patients With Type 2 Diabetes at Increased Risk of Developing Diabetes.Diabetes Care.2003; 26:710–2.
21.   Stimpson JP, Peek MK.Concordance of chronic conditions in older Mexican American couples.Prev Chronic Dis.2005;2(3):A1-7.
22.   Leong A, Rahme E, Dasgupta K.Spousal diabetes as a diabetes risk factor:A systematic review and meta-analysis.BMC Med.2014;12(1):12.
23.   Ekpenyong CE, Akpan UP, Ibu JO, Nyebuk DE.Gender and age specific prevalence and associated risk factors of type 2 diabetes mellitus in Uyo metropolis, South Eastern Nigeria.Diabetol Croat.2012;41(1):17–28.
24.   Midhet FM, Al-mohaimeed AA, Sharaf FK.Lifestyle related risk factors of type 2 diabetes mellitus in Saudi Arabia.Saudi Med J.2010;31(7):768–74.
25.   Wang L, Yamaguchi T, Yoshimine T, Katagiri A, Shirogane K, Ohashi Y.A case-control study of risk factors for development of type 2 diabetes:Emphasis on physical activity.J Epidemiol.2002;12(6):424–30.
26.   Megerssa YC, Gebre MW, Birru SK, Goshu AR, Tesfaye DY.Prevalence of Undiagnosed Diabetes Mellitus and its Risk Factors in Selected Institutions at Bishoftu Town, East Shoa, Ethiopia. Diabetes Metab.2013;S12(8):1–7.
27.   Murad MA, Abdulmageed SS, Iftikhar R, Sagga BK.Assessment of the common risk factors associated with type 2 diabetes mellitus in Jeddah.Int J Endocrinol. 2014: 616145. Available from http://dx.doi.org/10.1155/2014/616145
28.   Vijayakumar G, Arun R, Kutty VR.High prevalence of type 2 diabetes mellitus and other metabolic disorders in rural Central Kerala.J Assoc Physicians India.2009;57:563–7.
29.   Mohan V, Ruchi V, Gayathri R, Ramya Bai M, Sudha V, Anjana RM, etal.Slowing the diabetes epidemic in the World Health Organization South-East Asia Region:The role of diet and physical activity. WHO South-East Asia J Public Heal. 2016;5(1):5–16.