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

Community Medicine

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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. This case-control study was conducted in Diabetes OPD and urban field practice area of GMC, Nagpur. 100 newly diagnosed patients of T2DM, aged ≥30 years 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 assessed. 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 (1.34-8.25), 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. Around 90% of all diabetes is constituted by type 2 diabetes mellitus (T2DM). Wild et al. estimated the prevalence of diabetes to be doubled globally from 171 million in 2000 to 366 million in 2030. 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.

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. India harbours 69.1 million diabetics with its prevalence in adults (20-79 years) to be 8.7%. 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. 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 et al. 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. 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 8 hours. 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. Status of smoking and alcohol was assessed as per the IDSP NCD risk factor survey classification.

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

Statistical Analysis:

Data was entered and analyzed using statistical software EpInfo 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.

ABSTRACT

"Case Control Study", "Risk Factors", "Type 2 Diabetes Mellitus"
Significant association was not seen for smoking, alcohol and obesity and central obesity were significant risk factors for T2DM. 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 1: Socio-demographic characteristics of the subject**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variables</th>
<th>Cases No. (%)</th>
<th>Control No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age (in years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Socio Economic Status*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2: Association between various risk factors and T2DM**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variables</th>
<th>Cases No. (%)</th>
<th>Control No. (%)</th>
<th>Unadjusted OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Family History Present Absent</td>
<td>57(57%)</td>
<td>24(24%)</td>
<td>4.19 (2.28-7.69)</td>
<td>0.001</td>
</tr>
<tr>
<td>2</td>
<td>Spousal History Present Absent</td>
<td>32(32%)</td>
<td>16(16%)</td>
<td>2.47 (1.18-5.12)</td>
<td>0.014</td>
</tr>
<tr>
<td>3</td>
<td>Smoking Current Smoker Past Smoker Non-Smoker</td>
<td>29(29%) 21(21%) 7(7%)</td>
<td>1.57 (0.86-2.85)</td>
<td>0.132</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Alcohol Consumption Current drinker Former drinker Life time abstainer</td>
<td>21(21%) 19(19%) 6(6%)</td>
<td>1.13 (0.56-2.31)</td>
<td>0.723</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Physical Activity Low Moderate High</td>
<td>04(04%) 34(34%) 02(02%)</td>
<td>2.35 (1.33-4.16)</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Body Mass Index Normal Pre Obese Obese</td>
<td>42(42%) 18(18%) 02(02%)</td>
<td>5.52 (2.93-10.37)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Central Obesity Present Absent</td>
<td>70(70%)</td>
<td>30(30%)</td>
<td>3.97 (2.20-7.16)</td>
<td>0.001</td>
</tr>
<tr>
<td>8</td>
<td>Hypertension Normal Pre-Hypertension Hypertension</td>
<td>25(25%) 10(10%) 46(46%)</td>
<td>1.65 (0.93-2.92)</td>
<td>0.08</td>
<td></td>
</tr>
</tbody>
</table>

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**

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

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/obesity 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 study conducted by Kortlesh M et al. (OR=4.2; 2.23–7.35), Nagar SR et al. (OR=3.8; 2.14–6.80) and Valliyot B et al. (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 et al., Stimpson JP et al. and Leong A et al. 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 et al. (OR=2.4; 1.3-4.3), Vidya GS et al. (OR=1.71;1.2-2.4), Ekpenyong CE et al. (OR=2.37; 1.4-5.70) and Middet FM et al. (OR=2.51;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.

Having BMI ≥ 25kg/m² and central obesity, had 5.5 and 4.5 times higher risk of developing T2DM respectively. This results were supported by Megerssa YC et al., Murad MA et al. and Vijayakumar G et al. 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 diabetes mellitus due to the shared genetic and lifestyle factors. Thus, this can be used as an indication for undertaking concomitant screening of spouses for diagnosis 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**

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