Association of Self-Reported Type 2 Diabetes Mellitus with Certain NCD Risk Factors in a Community Based Study

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ABSTRACT

Background: Type 2 Diabetes is a significant cause of mortality and morbidity, individually as well as in the presence of other non-communicable diseases and their risk factors.

Aims & Objective: To determine the association between type 2 diabetes mellitus and certain NCD risk factors. Materials and Methods: The present study is a part of cross sectional, community based study conducted among the employees of a University in North India. A total of 540 employees selected through random sampling proportionately from all grades of university staff. The definition of diabetes was based on the already diagnosed type 2 diabetes, by physician, as reported by the subjects themselves. The secondary analysis was done to look for an association between self-reported diabetes mellitus and certain other risk factors for non-communicable diseases.

Results: The prevalence of self-reported diabetes mellitus was found to be 7.9%. The self-reported diabetes was found to be higher with higher age (49±6 years vs. 42±10 years), weight (71.02±12.73 kg vs. 67.44±11.65 kg), higher BMI (25.46±3.89 kg/m² vs. 25.04±3.78 kg/m²), higher waist circumference (93.01±8.03 cm vs. 88.01±10.46 cm) and mean systolic blood pressure (133±11 mm of Hg vs. 125±13 mm Hg). The proportions of subjects with abdominal obesity, hypertension and hyper-cholesterolaemia were found to be significantly higher among known diabetic subjects as compared to non-diabetics.

Conclusion: The self-reported type 2 diabetes mellitus was found to be significantly associated with raised waist circumference, hypertension and hyper-cholesterolaemia among the study population.

Key Words: type 2 diabetes mellitus, association, NCD risk factors.

INTRODUCTION

The raising burden of non-communicable diseases is the major public health concern globally. This group of diseases has been found to be the biggest cause of death worldwide (¹) accounting for 63% of the 57 million deaths (²) in 2008. The majority of these deaths were attributed to cardiovascular diseases, diabetes, cancers and chronic respiratory diseases. (³) Diabetes Mellitus has been classified as the third leading cause of premature mortality worldwide. (³) According to recent estimates, around 387 million people world-wide are
living with diabetes while southeast region is home to 75 million people with diabetes. As per International Diabetes Federation (IDF) 4.9 million deaths occurred due to diabetes during 2014, and every 7 second one person dies due to it. Common risk factors have been found to be implicated in the development of these diseases. The major behavioural risk factors identified by World Health Report 2002 are; tobacco use, harmful alcohol consumption, unhealthy diet (low fruit and vegetable consumption) and physical inactivity. While overweight and obesity, raised blood pressure, raised blood glucose, abnormal blood lipids and its subset raised total cholesterol have been identified as major biological risk factors.

These risk factors are mostly interrelated and promote each others’ development. Diabetes is a significant cause of mortality and morbidity, individually as well as in the presence of other non-communicable diseases. For instance, the mortality due to coronary heart disease has been found to be 2-4 times higher in diabetics as compared to non-diabetics. Similarly the chances of stroke are increased by two times in diabetics as compared to non-diabetics. These diseases have reached to epidemic proportion but are amenable to prevention through reduction in their risk factors. The present study is a part of larger study which was conducted on the non-communicable diseases risk factors. The aim of the present study was to determine the association between self-reported diabetes and certain NCD risk factors.

MATERIALS AND METHODS

Present study is part of a larger cross sectional community based study that was conducted on the non-communicable disease risk factors among the employees of Aligarh Muslim University during study period of 1 year (June 2012 to May 2013). An estimated sample size of 540 was chosen. The subjects were taken from all the four sections of university staff namely; teaching, clerical, technical and grade four staff. The number of employees to be taken from each category was calculated as per probability proportionate to size (PPS) method. Individual subject then selected through simple random sampling from the respective lists of these four groups. The selected candidates were interviewed and examined.

Definitions: The definition of diabetes based on the already diagnosed type 2 diabetes by physician as reported by the subjects themselves. For defining Obesity and overweight, BMI was calculated and classified according to WHO classification. Central or abdominal obesity was defined as the waist circumference ≥90 cm in males and ≥80 cm in females. Hypertension was considered as to be Blood Pressure ≥140/90 mm Hg or taking anti-hypertensive medications. Hypercholesterolemia defined as total lipids ≥ 240 mg/dl (NCEP-ATP III) or under the treatment with hypolipidaemic drugs.

Statistical analysis: Data recorded, tabulated and was presented as percentages, proportions (qualitative data) and means±standard deviation (quantitative data). Statistical test of significance such as Chi-square and unpaired t test were used wherever applicable.

Ethical consideration: Study was approved by the Institutional Ethics Committee, JNMCH, AMU, Aligarh. Informed consent was taken from the subjects. Health education was provided to all the participants.

RESULTS

The age sex composition of study subjects is shown in table 1. Majority (79.1%) of study subjects were males and above 40 years of age.
Table 1: Age Sex Distribution of Study Subjects

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29 years</td>
<td>54 (12.7%)</td>
<td>18 (15.9%)</td>
<td>72 (13.3%)</td>
</tr>
<tr>
<td>30-39 years</td>
<td>91 (21.3%)</td>
<td>36 (31.9%)</td>
<td>127 (23.5%)</td>
</tr>
<tr>
<td>40-49 years</td>
<td>129 (30.2%)</td>
<td>30 (26.5%)</td>
<td>159 (29.5%)</td>
</tr>
<tr>
<td>50-59 years</td>
<td>153 (35.8%)</td>
<td>29 (26.5%)</td>
<td>182 (33.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>427 (79.1%)</td>
<td>113 (20.9%)</td>
<td>540 (100%)</td>
</tr>
</tbody>
</table>

Among the total study subjects, around 43 were found to be previously diagnosed with type 2 diabetes mellitus (diagnosed by the physician) therefore the prevalence of self-reported diabetes was 7.96% (43/540). The association of individual risk factors was analysed for diabetics and non-diabetics.

Comparison between different parameters among diabetics and non-diabetics- Table 2 shows the comparison between different parameters among diabetics and non-diabetics.

The mean systolic blood pressure among diabetics was found to be higher than among the non-diabetics (133±11 mm of Hg vs. 125±13 mm Hg), and this difference was found to be highly significant (p<0.001). The statistical difference between diastolic blood pressure among the two groups was not found to be significant (p>0.05) though it was observed to be slightly higher among the known diabetics (84±6 mm Hg vs. 82±7 mm Hg).

Self-Reported type 2 diabetes mellitus with selected NCD Risk Factors-
The association of self-reported diabetes with selected non-communicable disease risk factors is shown in table 3.

1. Smoking: The majority (31/43) of the known diabetics were found to be currently non-smokers. The proportion of current smokers was found to be lower among the known diabetics as compared to non-diabetics but this was not found to be statistically significant (p>0.05). When the past smokers were also included in the analysis and the association was looked for between ever smoking and self-reported diabetes, then again proportion of ever smokers was observed to be lower among the known diabetes, the difference also being non-significant (p>0.05).
Table 3: Self-Reported type 2 diabetes mellitus with selected NCD Risk Factors among the study population

<table>
<thead>
<tr>
<th>NCD Risk Factor</th>
<th>Diabetes Mellitus</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (43)</td>
<td>No (497)</td>
</tr>
<tr>
<td>Current Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Smokers</td>
<td>12 (27.9%)</td>
<td>151 (30.3%)</td>
</tr>
<tr>
<td>Currently Non-smokers</td>
<td>31 (72.09%)</td>
<td>346 (69.6%)</td>
</tr>
<tr>
<td>Body Mass Index (BMI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (&lt;24.9 kg/m²)</td>
<td>21 (48.8%)</td>
<td>256 (51.5%)</td>
</tr>
<tr>
<td>Overweight (25-29.99 kg/m²)</td>
<td>18 (41.8%)</td>
<td>188 (37.8%)</td>
</tr>
<tr>
<td>Obese (≥30 kg/m²)</td>
<td>04 (9.3%)</td>
<td>53 (10.6%)</td>
</tr>
<tr>
<td>Waist Circumference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥90 (Males), ≥80 (Females)</td>
<td>27 (62.7%)</td>
<td>207 (41.6%)</td>
</tr>
<tr>
<td>&lt;90 (Males), &lt; 80 (Females)</td>
<td>16 (37.2%)</td>
<td>290 (58.4%)</td>
</tr>
<tr>
<td>Hypertension*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (127)</td>
<td>20 (46.5%)</td>
<td>107 (21.5%)</td>
</tr>
<tr>
<td>No (413)</td>
<td>23 (53.5%)</td>
<td>390 (78.5%)</td>
</tr>
<tr>
<td>Hypercholesterolemia**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (39)</td>
<td>18(37.5%)</td>
<td>21(4.2%)</td>
</tr>
<tr>
<td>No (501)</td>
<td>25(58.1%)</td>
<td>476(95.8%)</td>
</tr>
</tbody>
</table>

*defined as Blood Pressure≥ 140/90 mm Hg, or taking anti-hypertensive medications.
** defined as total lipids ≥ 240 mg/dl, or taking hypo-lipidaemic drugs.

2. **Body Mass Index:** The subjects were classified based on their body mass index (BMI), according to WHO classification for over-weight and obesity. Although the proportion of overweight was observed to be higher among known diabetics as compared to non-diabetics but the association of diabetes with higher BMI was not found to be statistically significant (p>0.05).

3. **Abdominal Obesity:** Abdominal obesity was assessed by Waist circumference to be more than 90 cm for males and 80 cm in females as per Adult Treatment Panel III classification modified for south Asians for defining abdominal obesity. The proportion of subjects with abdominal obesity was found to be higher among known diabetic subjects as compared to non-diabetics. The association between diabetes and abdominal obesity was found to be statistical significant (p<0.05).

4. **Hypertension:** The proportion of hypertensive subjects was observed to be higher among the known diabetics as compared to non-diabetics. The association between self-reported diabetes and hypertension was found to be highly significant (p<0.01).

5. **Hypercholesterolemia:** Hypercholesterolemia was defined as total serum cholesterol ≥ 240 mg/dl or under the treatment of hypo-lipidaemic drugs. Higher proportion of the diabetic subjects were also observed to be suffering from the hypercholesterolemia. Its association with self-reported diabetes was found to be highly significant (p<0.01).

**DISCUSSION**

This study was conducted among the employees of a university in North India to analyse the risk factors associated with self-reported Diabetes.

In the present study, type 2 diabetes was found to be significantly associated with higher waist circumference. In a study among Mexican American families, waist circumference was found to be independent predictor of type 2 diabetes mellitus. Moreover they have argued it to be strongest anthropometric index associated with type 2 diabetes and insulin resistance among their study population. (12) It has also been reported by another study that there is more than two fold increased risk of diabetes with raised abdominal obesity. (13)

The association of type 2 diabetes with hypertension and raised total cholesterol was found to be highly
significant in our study (p<0.001). Several studies have demonstrated that raised blood pressure occurs more frequently along with diabetes as compared to general population. (14-16) Similarly, significant relationship between diabetes and the different components of a lipid panel has been reported by many studies. (17)

In our study the association between diabetes and smoking was not found to be significant (p>0.05). However, as per US Surgeon General’s report, smoking has been argued as a cause of type 2 diabetes mellitus and the risk of developing diabetes has been estimated to be 30-40% higher for active smokers than non-smokers. (18) Also the association of smoking with diabetes is an established finding as reported by several studies from different parts of world. (19-21)

This non-association in our study may be because of the reason that only self-reported diabetics are included in the study and there is possibility that many of the smokers might be unaware of their diabetes status. For instance, as per International Diabetes Federation, 1 in 2 people with diabetes do not know that they have it. (4)

In our study, the association between type 2 diabetes and higher BMI was also not found to be significant. This has also been reported by many studies, for instance, in a study conducted among the patients of type 2 diabetes in the adult population in Iran the association of diabetes with BMI was found to be non-significant among both males and females. (22) Similarly in a study conducted among industrial population in south India, the association between diabetes and BMI was also not found to be significant. (23)

This non-association between BMI and type 2 diabetes in the present study supports the notion that the development of diabetes is observed at lesser degree of obesity in Asian populations. (24) However, the lifetime risk of diabetes has been reported to be substantially increased by the presence of overweight and especially obesity, particularly at younger ages among adults in United States. (25) Also in a study conducted in a secondary care centre in United Kingdom, the prevalence of overweight/obesity has been found to 86%, while 52% were obese, among type 2 diabetes patients by using the Body Mass Index (BMI) to define obesity. (26)

CONCLUSION

Type 2 diabetes mellitus is an important public health concern world-wide. In the present study which was conducted in an urban area, the self-reported type 2 diabetes was found to be significantly associated with abdominal obesity, hypertension and hypercholesterolemia. The non-association between diabetes and higher BMI indicates that waist circumference or abdominal obesity is more important marker for diabetes than BMI.

Limitations: As the study was conducted on a specific population the results cannot be generalized. There remains a possibility of under reporting by the study participants, so the actual burden may be more than that reported among the study population in the present study.

REFERENCES

4. International Diabetes Federation. IDF Diabetes Atlas Poster Update. 6th Ed


