



Original Research Article

Study on Prevalence of Pre-Diabetes in Urban Area of Mumbai and Its Association with Various Anthropometric Variables

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ABSTRACT

Introduction: The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. Over the past 30 yr, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged people. Subjects with IGT & IFG have an increased risk of type-2 diabetes therefore form an important target group for interventions aimed at preventing diabetes. Approximately one third of the individuals with either IFG or IGT and two third of individuals with both will develop extant diabetes within six years.

Materials and methods: The study was conducted in Urban Health Centre attached to tertiary care hospital Mumbai The present study was conducted from October 2007 to December 2007. The outpatient department attendees of the Urban Health Centre, comprises the study population. Among the outpatient department attendees, study subjects age 20 yrs and above were included in the study. Fasting plasma glucose measurement was used as the screening test for the diagnosis of pre-diabetes, as recommended by the ADA 2004 guidelines.

Results: Out of 140 eligible study subjects, 118 study subjects participated in the study. This included 48.31% males and 51.69% females. The prevalence pre-diabetes was found to be 26.27%. The highest percentage of pre-diabetics among males and females was found in the weight group 51-60 kg and 41-50 kg respectively. Significant difference was found in the prevalence of pre-diabetes among subjects of age group less than 50 yrs compared to subjects of age group 50 yrs and above (p value 0.05). The mean WHR was found to be significantly higher in the pre-diabetic population (1.40) compared to the non pre-diabetic population (0.9).

Conclusion: The prevalence of pre-diabetes in urban area is high and is an under-diagnosed condition. It shows a need for greater emphasis on the early detection and timely intervention in order to effectively contain the diabetes epidemic.

Key words: pre-diabetes, prevalence, urban, anthropometric variables

INTRODUCTION

The prevalence of diabetes is rapidly rising all over the globe at an alarming rate.

Over the past 30 yr, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the

major causes of morbidity and mortality affecting the youth and middle aged people. Nowhere is the diabetes epidemic more pronounced than in India as the World Health Organization (WHO) reports show that 32 million people had diabetes in the year 2000. ⁽¹⁾ The International Diabetes Federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India in 2006 and this is further set to rise to 69.9 million by the year 2025. ⁽²⁾

The number of people suffering from type-2 diabetes and related conditions has skyrocketed over the past fifty years. And more and more peoples have blood sugar levels that, while not high enough to qualify as diabetes, are too high for good health. This condition goes by the name pre-diabetes. Pre-diabetes is either impaired fasting glucose or impaired glucose tolerance or both. Impaired glucose tolerance and impaired fasting glucose is an intermediate category between normoglycemia and overt diabetes and it can be identified by an oral glucose tolerance test. ⁽³⁾ Impaired fasting glucose is defined as the blood sugar level between 5.6 & 7.0 mmol/L (100 & 126 mg/dL). Impaired glucose tolerance is defined as plasma glucose levels between 7.8 and 11.1 mmol/L (140 and 200 mg/dL) 2 h after a 75-g oral glucose load. ⁽⁴⁾ The National Urban Diabetes Survey (NUDS), a population based study was conducted in six metropolitan cities across India and recruited 11,216 subjects aged 20 years and above representative of all socio-economic strata showed that there was a large pool of subjects with impaired glucose tolerance (IGT), 16.8 per cent in Chennai, 14.9 per cent in Bengaluru (formerly Bangalore), 29.8 per cent in Hyderabad, 10 per cent in Kolkata, 10.8 per cent in Mumbai and 8.6 per cent in New Delhi. ⁽⁵⁾

Subjects with IGT & IFG have an increased risk of type-2 diabetes therefore form an important target group for interventions aimed at preventing diabetes. ⁽⁴⁾ Approximately one third of the individuals with either IFG or IGT and two third of individuals with both will develop extant diabetes within six years. ⁽⁶⁾ Most of the studies were conducted to know the prevalence of Diabetes Mellitus & the risk factors associated with it. Present study was planned to find out the prevalence of Pre-diabetes in urban area and various anthropometric variables associated with it.

MATERIALS AND METHODS

The study was conducted in Urban Health Centre, Bandra, Mumbai which is attached to the Sir J.J. Group of Hospitals, Byculla, Mumbai. The present study was conducted from October 2007 to December 2007. Convenient sampling method was used. The outpatient department attendees of the Urban Health Centre, Bandra comprises the study population. Permission was taken from College Ethical Committee before the start of the study. Among the outpatient department attendees, study subjects age 20 yrs and above were included in the study. So the total sample size for the study was 140. Fasting plasma glucose measurement was used as the screening test for the diagnosis of pre-diabetes, as recommended by the ADA 2004 guidelines. The FPG was preferred because it was easier and faster to perform, convenient, acceptable to patients and less expensive. The oral glucose tolerance test although considered the 'gold standard,' was more costly and time consuming than the FPG test and was less reproducible. The prevalence of pre-diabetes was determined using the American Diabetes Association guidelines. Weight, body mass index (BMI), waist circumference (WC), and waist-hip ratio (WHR) of all the participants were recorded.

Exclusion criteria

The subjects with a history of diabetes mellitus, tuberculosis, chronic asthma, acquired hypopituitarism, patients on long-term corticosteroid therapy, diuretics were excluded from the study.

The total body weight was taken by a weighing machine with the participants wearing indoor clothes without shoes. The body mass index was calculated according to the formula: weight in kg/ (height in metre)². The waist circumference was measured at the level of the last rib after expiration. Hip circumference was taken at the level of maximum diameter of the hips as viewed from the side. The waist-hip ratio was calculated as waist circumference/hip circumference. After this, the subjects were motivated to come the next day to the central pathology laboratory of the hospital after overnight fasting for blood sample collection.

Laboratory analysis

Laboratory measurement of fasting plasma glucose was performed on venous samples using glucose oxidase peroxidase test with fully automated analyser. The registered patients were informed of their fasting sugar values and those found pre-diabetic were taken care of by appropriate consultation and treatment.

Data processing and statistical analysis

Data was entered, compiled in the computer and analysed using Pearson's Chi-square test and students unpaired 't' test to assess if the inter-group difference was significant or not. A p value of < 0.05 was considered significant.

RESULTS

Out of 140 eligible study subjects, 118 study subjects participated in the study. This included 48.31% males and 51.69% females. The prevalence pre-diabetes was found to be 26.27%. 28.078% pre-diabetics were found among males and 24.59%

among females. Among males, the highest percentage of pre-diabetics was found in the above 70 years age group and lowest among 51-60 age group, whereas in females the highest percentage was found in the above 70 age group and lowest among the 41-50 age group (Table 1). Similarly, the highest percentage of pre-diabetics among males and females was found in the weight group 51-60 kg and 41-50 kg respectively. The lowest percentage among males was in the weight group above 70 kg and females were in the weight group between 31-40 kg (Table 2). Significant difference was found in the prevalence of pre-diabetes among subjects of age group less than 50 yrs compared to subjects of age group 50 yrs and above (p value 0.05) (Table 3). No significant difference was found in the prevalence of pre-diabetics among men and women (p value > 0.05)

The mean BMI and mean WC were not found to be significantly different between the pre-diabetes and the normal populations. The mean WHR was found to be significantly higher in the prediabetic population (1.40) compared to the non prediabetic population (0.9) (Table 4).

Table 1: Prevalence of pre-diabetes according to age and sex (n=118)

| Age group | Males | No of pre-diabetes | Females | No of pre-diabetes |
|--------------|-----------|--------------------|-----------|--------------------|
| 21-30 | 7 | 1(14.29%) | 5 | 1(20.80%) |
| 31-40 | 5 | 1(20.00%) | 11 | 2(18.18%) |
| 41-50 | 11 | 3(27.27%) | 15 | 1(6.67%) |
| 51-60 | 15 | 2(13.33%) | 8 | 5(62.5%) |
| 61-70 | 11 | 3(27.27%) | 14 | 2(14.29%) |
| > 70 | 8 | 6(75.00%) | 8 | 4(50.00%) |
| Total | 57 | 16(28.07%) | 61 | 15(24.59%) |

Table 2: Prevalence of pre-diabetes according to total body weight

| Weight in kg | Males | No of pre-diabetes | Females | No of pre-diabetes |
|--------------|-----------|--------------------|-----------|--------------------|
| 31-40 | 3 | 1(33.33%) | 10 | 1(10%) |
| 41-50 | 8 | 3(37.5%) | 12 | 4(33.33%) |
| 51-60 | 15 | 6(40%) | 18 | 5(27.78%) |
| 61-70 | 18 | 4(22.22%) | 14 | 3(21.43%) |
| Above 70 | 13 | 2(15.38%) | 7 | 2(28.57%) |
| Total | 57 | 16 | 61 | 15 |

Table 3: Prevalence of pre-diabetes according to various variables

| Variables | Pre-diabetic | Non pre-diabetic | P value |
|---------------------|--------------|------------------|---------------|
| Weight group | | | |
| Less than 50 kg | 9 | 24 | > 0.05 |
| 50 kg and above | 22 | 63 | |
| Sex | | | |
| Males | 16 | 41 | > 0.05 |
| Females | 15 | 46 | |
| Age group | | | |
| Less than 50 yrs | 9 | 45 | < 0.05 Signi. |
| 50 yrs and above | 22 | 42 | |

Table 4: Prevalence of pre-diabetes according to anthropometric variables

| Anthropometric variables | Pre-diabetic | Non pre-diabetic | P value |
|--------------------------|--------------|------------------|----------------------|
| Mean B.M.I. | 26.86+ 1.2 | 21.2 + 2.1 | 0.1791 Not signi. |
| Mean W.C. | 92 + 1.4 | 91 + 1.3 | 0.9559 Not signi. |
| Mean W.H.R. | 1.40 +0.06 | 0.90 + 0.06 | 0.0062 Signi. |

DISCUSSION

The prevalence of pre-diabetes varies from study to study throughout the world. A study from the USA indicated that the prevalence of pre-diabetes in an adult population was nearly 26%. (7) This was similar to our study (26.27%). The Australian Diabetes Obesity and Lifestyle Study (8) reported the prevalence of pre-diabetes to be 16.4%, which is lower than the prevalence found in our study. As compared to our study, a lower prevalence of 11.2% was found in the Amrita Diabetes and Endocrine Population Survey (ADEPS) (9), which was a community-based cross-sectional survey done in urban areas of Ernakulam district in Kerala. A study in a developing rural area of Andhra Pradesh reported the prevalence of pre-diabetes to be 15.5% which was lower as compared to our results. (10)

The USA study (7) also showed that the prevalence of pre-diabetes was significantly higher in males, whereas in our study we have found no significant difference in prevalence of pre-diabetes among males and females which is in agreement with the study of Shaw *et al*, (11)

who also reported that prevalence of pre-diabetes was similar among males and females.

The anthropometric findings in study carried out in rural area of Tamilnadu were quite similar to ours. (12) The overall body mass index was within the normal range, though there was significant rise in the prevalence of impaired fasting glucose with increasing body mass index. The waist circumference in most of the subjects was in the normal range, but waist-hip ratio was strongly correlated with rising prevalence of pre-diabetes, just like in our study. The findings of our study were at variance from 'The Kolkata Policeman Study'. (13) The authors had found a prevalence of impaired fasting glucose to be only 6.2%. There was a strong correlation with waist circumference and waist-hip ratio but no significant correlation with body mass index, just like in our study. The variation in the results of different studies on pre-diabetes is probably due to difference in cultural factors, genetic factors, lifestyle habits, ethnic variations, rural urban variations, selection of different age groups.

Various studies have demonstrated that diabetes in the Indian population has several unique features. (14) These include a younger age of onset (almost a decade earlier than other populations), a relatively low body mass index, higher intra-abdominal fat, high rates of insulin resistance and a high prevalence of insulin deficiency as evidenced by more patients requiring insulin therapy and at a younger age.

CONCLUSION

To conclude, this study revealed that the prevalence of pre-diabetes in urban area is high and is an under-diagnosed condition. It shows a need for greater emphasis on the early detection and timely intervention in order to effectively contain the diabetes

epidemic. The traditional risk factors like total body weight and body mass index are not very good predictors for development of diabetes mellitus in the rural/semi-urban populations. In fact, low total body weight might prove to be a strong predictor of impaired fasting glucose along with high waist-hip ratio.

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