

Original article:

Prevalence of pre-diabetes among the general population in a tertiary care hospital in north India

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Abstract

Objective: To find the prevalence of pre-diabetes among the general population in a tertiary care hospital in north India.

Methods: This was a cross-sectional study. A total of 187 patients of both sexes were enrolled consecutively in the study. Fasting plasma glucose measurement (FPG) was used as the screening test for the diagnosis of pre-diabetes. Body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR) of all the patients were recorded.

Results: The prevalence of pre-diabetes was found to be 20.3% (38/187) with 95%CI of 15-27%. The prevalence of pre-diabetes was higher among the patients of age>60 (42.9%) years. Males (22.5%) were more affected than females (18.4%). The mean BMI was found to be insignificantly ($p>0.05$) higher among the patients of pre-diabetes (24.56 ± 10.45) compared to Non pre-diabetes (21.45 ± 9.11). The mean WHR was significantly ($p=0.003$) higher among the patients of pre-diabetes than Non pre-diabetes.

Conclusion: The prevalence of pre-diabetes was comparable to the data from other parts of the country and the association was also similar as in the previous studies. Increasing age and higher BMI emerged as the risk factors for pre-diabetes in this study.

Key words: Pre-diabetes, Prevalence, Body Mass Index

INTRODUCTION

The term pre-diabetic is an intermediate stage used to describe a person with impaired blood glucose tolerance levels of fasting between 100 and 125 mg/dl of blood. A large number of such subjects will develop type 2 diabetes. Studies in India had shown that nearly 40-55% of the people with pre-diabetic stage will develop to type 2 diabetes mellitus over a period of 3-5 years (Logaraj et al, 2015).

Pre-diabetes is a metabolic state that relates to insulin resistance resulting in non-diabetic hyperglycemia

(International Diabetes Federation, 2011). Pre-diabetes is considered as a distinct entity under ICD-10 classification with diagnostic code R73-09 (WHO, 2004). Most importantly, it presents the last window of opportunity for action against impending T2DM (The Epidemiology of Diabetes Mellitus, 2008). The factors like-healthy lifestyle with changes in work profile, physical activity, dietary pattern and weight loss have been demonstrated to have significant effects in halting to the progression of T2DM (Nathan et al, 2007).

Pre-diabetes is a common disorder in most of the population. The reported prevalence of pre-diabetes appears to vary among populations with different ethnic background. 314 million people are currently affected with pre-diabetes all over the world. It is estimated that approximately 500 million people will have pre-diabetes by 2025. The estimates show that up to 70% of pre-diabetic subjects eventually get diabetes (Sahai et al, 2011).

The objective of this study was to find the prevalence of pre-diabetes among the general population in a tertiary care hospital in north India.

MATERIAL AND METHODS

This was a cross-sectional, hospital based study conducted on patients aged 20 years and above in a tertiary care hospital in north India. Written informed consent was taken from the patients in the local language. The study was approved by the Ethical Committee of the institute.

A total of 187 patients of both sexes were enrolled consecutively in the study. Fasting plasma glucose measurement (FPG) was used as the screening test for the diagnosis of pre-diabetes (ADA 2004 guidelines). The FPG was preferred because it was easier and faster to perform, convenient, acceptable to the patients and less expensive. Although the oral glucose tolerance test considered the as 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. Body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR) of all the patients were recorded.

The patients with a history of diabetes mellitus, tuberculosis, chronic asthma, acquired adrenal

insufficiency and diuretics were excluded from the study.

The total body weight was taken by a weighing machine with the patients wearing indoor clothes without shoes. The body mass index was calculated according to the formula: weight in kg/height in metre². 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.

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

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. The 95% confidence interval (CI) of the prevalence of pre-diabetes was calculated. A p value <0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

RESULTS

The prevalence of pre-diabetes was found to be 20.3% (38/187) with 95%CI of 15-27%.

The prevalence of pre-diabetes was higher among the patients of age>60 (42.9%) years than 51-60 (36.1%), 41-50 (14.5%), 31-40 (10.9%) and 20-30 (9.1%) years. There was statistically significant (p=0.001) association between age and prevalence of pre-diabetes. Males (22.5%) were more affected than

females (18.4%), however, the association was found to be statistically insignificant ($p>0.05$) (Table-1).

The prevalence of pre-diabetes was found to be higher among overweight patients (26.2%) compared to underweight (16.1%) and normal (15%) patients. The association between prevalence of pre-diabetes and BMI was nearly significant ($p=0.05$) (Table-2).

The mean BMI was found to be insignificantly ($p>0.05$) higher among the patients of pre-diabetes

(24.56 ± 10.45) compared to Non pre-diabetes (21.45 ± 9.11). The mean WC was also found to be insignificantly ($p>0.05$) higher among the patients of pre-diabetes (87.23 ± 19.13) compared to Non pre-diabetes (83.45 ± 18.67). However, the mean WHR was significantly ($p=0.003$) higher among the patients of pre-diabetes than Non pre-diabetes (Table-3).

Table-1: Prevalence of pre-diabetes according to age and gender of patients

Age in years	No. of patients	%	No. with pre-diabetes	% with pre-diabetes	p-value ¹
Age in years					
20-30	22	11.8	2	9.1	0.001*
31-40	46	24.6	5	10.9	
41-50	62	33.2	9	14.5	
51-60	36	19.3	13	36.1	
>60	21	11.2	9	42.9	
Gender					
Male	89	47.6	20	22.5	0.74
Female	98	52.4	18	18.4	

¹Chi-square test, *Significant

Table-2: Prevalence of pre-diabetes according to BMI of patients

BMI	No. of patients	%	No. with pre-diabetes	% with pre-diabetes	
Underweight	31	16.6	5	16.1	0.05*
Normal	107	57.2	16	15.0	
Overweight	49	26.2	17	34.7	

¹Chi-square test, *Nearly significant

Table-3: Comparison of prevalence of pre-diabetes with anthropometric parameters

Anthropometric parameters	Pre-diabetes	Non pre-diabetes	p-value¹
BMI (kg/mtr ²)	24.56±10.45	21.45±9.11	0.07
WC (cmtrs)	87.23±19.13	83.45±18.67	0.26
WHR	1.11±0.56	0.93±0.25	0.003*

¹Unpaired t-test, *Significant

DISCUSSION

Studies from India have reported the prevalence of pre-diabetes to be between 2-29%, which is similar to the findings in this study (Ramachandran et al, 2001; Anjana et al, 2011). The results of this study showed a higher prevalence of pre-diabetes among males. This is in agreement with a earlier report from Chennai which had shown a male preponderance in the prevalence of pre-diabetes which in subsequent years had shifted slightly towards a female excess (Ramachandran et al, 2001). The finding of this study is in contradiction to the study by Dasappa et al (2015) in which a higher prevalence of pre-diabetes among females was reported.

The prevalence of pre-diabetes increased with the increasing age in this study. Similar findings were reported by the Chandigarh Urban Diabetes Study (Walia et al, 2014). Studies have shown that the genetic factor plays an important role in the causation of diabetes (Ahuja, 1979; Jali and Kambar, 2006). However, genetic factors have not been assessed in this study.

In the present study, patients with overweight were 26.2%, which was lower than in previous studies (Tiwari et al, 2009; Sidhu and Tatla, 2002). The prevalence of pre-diabetes among overweight

patients was 34.7%. This is higher than the study by Dasappa et al (2015). Patients with increased BMI showed increased prevalence of pre-diabetes and the association was nearly significant. This was comparable with other studies (Ramachandran et al, 2001; Walia et al, 2014).

In the present study, increased BMI, HC and WC were observed among the patients of pre-diabetes than without pre-diabetes. Ramachandran et al (2001) had shown susceptibility of urban Indians to central obesity in National urban diabetes survey. Studies in India had shown that central obesity was more strongly associated with pre-diabetes than general obesity (Ramachandran et al, 1992; Ramachandran et al, 1997; Shelgikar et al, 1997). Lean Asian Indians had WHR values similar to the Mexicans with higher rates of BMI (Ramachandran, 1997). This could indicate that Asian Indians have a predisposition to deposit abdominal fat which could be one of the risk factors contributing to the high prevalence of diabetes. Studies in UK and in the USA have shown that Asian Indians were insulin resistant despite having BMIs in the non-obese range, an observation which could probably be related to a high percentage of visceral fat (McKeigue et al, 1991; Baner 1999). The higher prevalence of diabetes in Asian

Indians than in the white population might be partly related to the above feature (Ramachandran et al, 2001).

CONCLUSION

The prevalence of pre-diabetes was comparable to the data from other parts of the country and the association was also similar as in the previous studies. Increasing age and higher BMI emerged as the risk factors for pre-diabetes in this study.

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