Journal of Advanced Research in Medicine
Volume 6, Issue 2 - 2019, Pg. No. 7-12
Peer Reviewed & Open Access Journal

Research Article

Pre-Diabetes - Prevalence and Co-Variates in Rural Delhi

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DOI: https://doi.org/10.24321/2349.7181.201907

I N F O

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How to cite this article:
Gupta N, Kishore J, Kohli C et al. Pre-Diabetes - Prevalence and Co-Variates in Rural Delhi. *J Adv Res Med* 2019; 6(2): 7-12.

Date of Submission: 2019-08-26
Date of Acceptance: 2019-09-11

A B S T R A C T

Pre-diabetes is a continuum of condition where blood sugar levels lies in a range lesser than that of overt diabetes mellitus but higher than normal range. This study was done to find prevalence of pre-diabetes and its relationship with socio-demographic factors and other behavioural and metabolic risk factors of non communicable diseases in rural areas of Delhi. It was a cross-sectional study conducted in two rural areas in Delhi among 959 subjects aged above 18 years. WHO STEPS approach was used to collect data about socio demographic details. Blood pressure, Body mass index, blood sugar and lipid profile were measured. The overall prevalence of pre diabetes was 3.3%. There was significant difference ($p<0.05$) in prevalence of pre diabetes in individuals more than 35 years (5.0%) than less than 35 years (1.1%). The proportion of subjects with hypercholesterolemia and raised triglycerides having pre-diabetes were significantly higher than those having normal cholesterol and triglycerides levels ($p<0.05$).

Keywords: Pre-Diabetes, Socio Demographic Factors, BMI, Hypercholesterolemia, Triglyceride

Introduction

Pre-diabetes is an intermediate form of dysglycemia on a spectrum ranging from normal to overt diabetes.[1] It is important to diagnose pre-diabetes because microvascular and macrovascular damage starts during pre-diabetes and is associated with an increased risk of cardiovascular disease early in the progression to Type 2 diabetes mellitus.[2,3] Hyperglycemia in pre-diabetes range has been documented as an important risk factor for cardiovascular diseases.[3,4] Microalbuminuria which is considered an excellent indicator of microvascular injury, affects twice as many subjects with pre-diabetes than normoglycemic subjects.[5] A study has shown that 17.7% of subjects with pre-diabetes had chronic kidney disease, compared with 10.6% without diabetes or pre-diabetes.[6] In the MONICA (Monitoring Trends and Co-variates in Cardiovascular Disease) study, the prevalence of diabetic polyneuropathy was approximately increased twofold in those individuals with Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT) as compared with the normal subjects.[7]

A study has found that risk of death increases in people with pre-diabetes.[8] The prevalence of pre-diabetes has increased from 11.6% to 35.3% from 2003 to 2011 in England.[9] In India, the prevalence of diabetes has increased over the years steadily from 8.3% in 1989 to 18.6% in 2005 in urban areas, and during the same period a similar increase from 2.2% to 9.2% was observed in a rural Indian population.[10]

It is important to target the people with pre-diabetes because the absolute annual incidence of diabetes in individuals with pre-diabetes is upto 10%.[11] Interventions in pre-diabetes stage can reduce or delay the progression to frank diabetes mellitus which puts a significant burden on the individual, family and society.[12] There is a complex relationship of pre-diabetes with other modifiable and non-modifiable risk factors of cardiovascular diseases.[13] This study was conducted with an objective to find prevalence of pre-diabetes and its relationship with socio-demographic factors and other behavioural and metabolic risk factors of non communicable diseases in rural areas of Delhi, India.

Materials and Methods

A community based cross-sectional survey was conducted in two rural areas of Delhi among individuals aged more than 18 years. The sample size was calculated on the basis of a previous study which recorded prevalence of pre-diabetes as 8.5%.[14] Taking 95% confidence interval and 2% absolute error, the required sample size came out to be 778. A total of 959 subjects were included. Diabetes patients (both known cases and those who were diagnosed from the present study) were excluded from the study. Systematic random sampling method was used to select study subjects. A pre-designed, pre-tested, semi-structured questionnaire containing items to assess socio demographic profile like age, sex etc was used. The World Health Organization (WHO) STEPS approach was employed to study the pre-diabetes and its relationship with other behavioural and metabolic risk factors for non-communicable diseases.[15] Self-reported history of tobacco use (smoking and chewable) and alcohol consumption was obtained from the respondents. Those who reported tobacco use in any form at the time of the survey were classified as "current tobacco users".[16] Blood pressure,[15,17] Body Mass Index (BMI),[18] Blood sugar (by both Fasting Plasma Glucose (FPG) and postprandial Plasma Glucose Levels (PBS)[19] and Lipid levels were measured and valid cut offs were taken for diagnosis.[20]

Ethical Issues

Written informed consent was obtained from each subject. Prior ethical clearance for the study was obtained from the Institutional Ethical Committee.

Statistical Analysis

Data analysis was done using SPSS version 16. The results were explained in simple proportion and mean (+Standard deviation). Differences between groups were assessed using chi square test/ fisher exact test for qualitative data and t-test for quantitative data. p-value less than 0.05 was considered statistically significant.

Result

A total of 33 participants were having pre-diabetes giving overall prevalence of pre-diabetes as 3.3%. 46 (4.6%) were having diabetes. Table 1, shows the socio-demographic characteristics such as age, sex, education, occupation and religion of study subjects.

Table 1.Socio-demographic characteristics of the study subjects

Variable	Sub-groups	Plasma Glucose Levels				χ^2, p-value
		Pre-diabetes n=33, %		Normal n=926, %		
Gender	Male (N=372)	12	3.2	360	96.8	0.8, 0.76
	Female (N=587)	21	3.6	566	96.4	
Age	Less than 35 years (N=444)	5	1.1	439	98.9	13.3, 0.01
	More than 35 years (N=515)	28	5.4	487	94.6	
Religion	Hindu (N=935)	33	3.5	902	96.5	0.8, 0.67
	Others (N=24)	0	0.0	24	100.0	
Education Level	Illiterate (N=201)	6	3.0	195	97.0	10.9, 0.12
	Primary (N=21)	2	9.5	19	90.5	
	Middle (N=190)	9	4.7	181	95.3	
	High School (N=238)	5	2.1	233	97.9	
	Junior college (N=157)	4	2.5	153	97.5	
	Graduate (N=112)	3	2.7	109	97.3	
	Post-Graduate (N=40)	4	10.0	36	90.0	
Monthly per capita income	Upto Rs.1000 (N=367)	9	2.6	343	97.4	3.6, 0.30
	Between Rs.1001 to Rs.2000 (N=263)	7	2.8	243	97.2	
	Between Rs.2001 to Rs.5000 (N=291)	12	4.3	264	95.7	

ISSN: 2349-7181
DOI: https://doi.org/10.24321/2349.7181.201907

	More than Rs.5001 (N=84)	5	6.2	76	93.8	
Occupation	Professional (N=65)	3	4.6	62	95.4	5.1, 0.74
	Semi-Professional (N=17)	1	5.9	16	94.1	
	Clerical, Shop-owners, Farm owners (N=20)	2	10.0	18	90.0	
	Skilled worker (N=36)	1	2.8	35	97.2	
	Semi-skilled worker (N=61)	1	1.6	60	98.4	
	Unskilled worker (N=135)	3	2.2	132	97.8	
	Housewife (N=466)	17	3.6	449	96.4	
	Retired (N=17)	0	0.0	17	100.0	
	Unemployed (N=142)	5	3.5	137	96.5	

Note: All figure are expressed as number (%) row wise.

Table 2.Relationship of Pre-diabetes with other risk factors of non-communicable diseases

Variable	Sub-groups	Plasma Glucose Levels				Fisher exact/ χ^2, p-value
		Pre-diabetes n=33, %		Normal n=926, %		
Alcohol use ever	Yes (N=57)	2	3.5	55	96.5	4.32, 0.07
	No (N=902)	31	3.4	871	96.6	
Alcohol use in past one year	Yes (N=43)	1	2.3	42	97.7	0.16, 0.68
	No (N=916)	32	3.5	884	96.5	
Current tobacco use	Yes (N=27)	0	0.0	27	100.0	0.99, 0.32
	No (N=932)	33	3.5	899	96.5	
Tobacco use in past	Yes (N=4)	1	25.0	3	75.0	- , 0.01
	No (N=955)	32	3.4	923	96.6	
Hypertension	Yes (N=129)	8	6.2	121	93.8	3.4, 0.05
	No (N=830)	25	3.0	805	97.0	
Total cholesterol	Raised (N=291)	18	6.2	273	93.8	9.4, 0.01
	Normal (N=668)	15	2.2	653	97.8	
High Density Lipoprotein Cholesterol (HDL)	Decreased (N=917)	31	3.4	886	96.6	0.23, 0.61
	Normal (N=42)	2	4.8	40	95.2	
Triglycerides	Raised (N=197)	15	7.6	182	92.4	12.8, 0.01
	Normal (N=762)	18	2.3	744	97.7	
Body Mass Index (BMI)	Underweight (N=103)	2	1.9	101	98.1	8.4, 0.03
	Normal (N=299)	6	2.0	293	98.0	
	Overweight (N=153)	3	2.0	150	98.0	
	Obese (N=404)	22	5.4	382	94.6	

Note: All figure are expressed as number (%) row wise.

Table 2, shows relationship of pre-diabetes with other behavioural and metabolic risk factors for non-communicable diseases. The prevalence of pre-diabetes was different statistically significantly among alcohol users than non-users ($p<0.05$). Among those with raised cholesterol levels, 6.2% were having pre-diabetes against 2.2% in normal cholesterol levels which was significantly different ($p<0.05$).

Table 3, shows results of multivariate analysis for pre-diabetes and its associated factors which showed that age, tobacco use and post education was independently associated with pre-diabetes. Odds Ratios for tobacco and triglycerides were also high but not reached to significantly level.

ISSN: 2349-7181
DOI: https://doi.org/10.24321/2349.7181.201907

Table 3.Multivariate analysis for risk factors of pre-diabetes

Variable	Sub-groups	Odds ratio (95% Confidence Interval)	p-value
Age	Less than 35 years	Reference	0.01
	More than 35 years	3.72 (1.31-10.56)	
Alcohol use ever	Yes	Reference	0.39
	No	0.35 (0.02-1.34)	
Education Level	Illiterate	Reference	
	Primary	3.89 (0.67-22.52)	0.12
	Middle	2.09 (0.70-6.27)	0.18
	High School	1.03 (0.29-3.96)	0.96
	Junior college	1.17 (0.31-4.40)	0.81
	Graduate	2.10 (0.47-9.35)	0.33
	Post-Graduate	6.45 (1.57-26.51)	0.01
Tobacco use in past	Yes	Reference	0.04
	No	0.09 (0.01-1.12)	
Total cholesterol	Normal	Reference	0.16
	Raised	1.71 (0.80-3.66)	
Triglycerides	Normal	Reference	
	Raised	1.97 (0.91-4.21)	0.08
Body Mass Index	Underweight	Reference	
	Normal	1.08 (0.21-5.62)	0.92
	Overweight	1.98 (0.30-12.95)	0.47
	Obese	0.75 (0.16-3.44)	0.71

Discussion

The present study was conducted in rural villages of Delhi to find prevalence and socio-demographic co-variates of pre-diabetes. The prevalence of pre-diabetes was 3.3%. This figure is lower as compared to that reported by other studies.[21,22] However, this is consistent with the previous research findings that prevalence is declining in rural population.[10] There was no association seen with gender, education, occupation or income with pre-diabetes in the present study. These findings were consistent with a previous study.[23] Association of increased age with pre-diabetes has also been reported by Dasappa H et al.[24] The present study did not find any association between the alcohol and pre-diabetes.[25,26] Findings of tobacco and pre-diabetes were similar to a previous study.[24] Highest proportion of pre-diabetes subjects was seen among obese subjects. This has been reported by Khambalia A et al in a study published in 2011.[27] This showed that obesity is an important risk for pre-diabetes. Reducing weight with diet and exercise has been found to cause significant risk reduction in progression to overt diabetes.[28]

This present study focuses on importance of recognition of pre-diabetes. Identifying individuals with pre-diabetes offers the opportunity to modify their risk prior to development of significant sequelae.

Conclusion and Recommendation

It can be concluded that prevalence of pre-diabetes in rural Delhi was 3.3%. Increasing age, dyslipidemia and tobacco use were significant co-variates of pre-diabetes. Urgent interventions are required to identify individuals with pre-diabetes in order to avert the metabolic syndrome and cardiovascular diseases along with frank Type2 Diabetes Mellitus. The above evidence shows that Indian population is at risk of hyperglycemia and thus its related consequences should be addressed because they are likely to have serious implications in the future. It is recommended that future strategies should be planned for prevention and control of pre-diabetes.

Funding: Indian Council for Medical Research provided grant for rural diabetes study.

Conflict of Interest: None

ISSN: 2349-7181
DOI: https://doi.org/10.24321/2349.7181.201907

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ISSN: 2349-7181
DOI: https://doi.org/10.24321/2349.7181.201907

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ISSN: 2349-7181
DOI: https://doi.org/10.24321/2349.7181.201907