



## Prevalence of Pre Diabetes in Kashmir Valley-A Cross Sectional Study

Authors

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### ABSTRACT

India carries a considerable share of the global diabetes burden. Pre-diabetics have 10 times risk of developing type 2 diabetes within 7 years compared with people whose glucose level is in the normal range. The objectives of the study were to study the prevalence of pre-diabetes in Kashmir & to suggest early preventive steps for the control of diabetes. A community based cross sectional study was carried out to measure the prevalence of pre-diabetes in men and women greater than 45 years of age. The study was purposively conducted in Central zone of Kashmir Valley which includes three districts, district Srinagar, district Budgam and district Ganderbal. The study was carried out in both rural and urban areas, with district Srinagar representing the urban population & district Budgam & district Ganderbal representing the rural population. Multi-stage sampling was adopted for selection of subjects and 5 per 1000 of total population were selected which made a total of 2800 study subjects who were taken up for the study. Fasting blood sample was sent for blood sugar. Every subject who had impaired fasting glucose was subjected to oral glucose tolerance test; after giving 75gms of oral glucose an additional blood sample was taken after 2 hours. The persons having fasting blood sugar > 100 mg/dl and <126 mg/dl or the persons having 2 hours PP glucose > 140 mg/dl and < 200 mg/dl were taken as pre-diabetics. A total of 821 study subjects were diagnosed as having Pre diabetes out of the total study population of 2800; among the subjects with pre-diabetes impaired fasting glucose was seen in 598, IGT was seen in 78, both IFG+IGT in 145. Most of the subjects were seen in 45-49 years age group i.e. 161 which is 26% of the total subjects in this age group. Pre-diabetes was present in 439 of total female studied population and 382 of total male studied population. pre-diabetes present in 528 of the total rural population and 293 of the total urban population. 285 of pre-diabetics belonged to the lower middle class whereas 250 belonged to the average middle class. Proper and requisite education about healthy behavior (dietary measures and exercise) and changing lifestyle, would keep these individuals healthy, if applied at an early stage. These measures would defer the onset of diabetes as well as its related complication.

**Key words:-** Pre-diabetes, Impaired glucose tolerance, impaired fasting glucose, Kashmir Valley.

### INTRODUCTION

Worldwide prevalence of DM has risen dramatically over the past two decades from an

estimated 30 million cases in 1985 to 285 million in 2010<sup>1</sup>. In 2014 the global prevalence of Diabetes was estimated to be 9% among adults aged above 18 years<sup>2</sup>. More than 80% of diabetes

deaths occur in low & middle income countries<sup>3</sup>. WHO projects that diabetes will be the 7<sup>th</sup> leading cause of death in 2030<sup>4</sup>. India, a country experiencing rapid socioeconomic progress and urbanization carries a considerable share of the global diabetes burden. Studies in different parts of India have demonstrated an escalating prevalence of diabetes not only in urban populations, but also in rural populations as a result of the urbanization of lifestyle parameters. The prevalence of pre-diabetes is also high. Pre-diabetes is characterized by blood glucose levels that are higher than normal but not in diabetic range and is defined by having impaired fasting glucose or impaired glucose tolerance or both. Impaired fasting glucose is defined as fasting plasma glucose level of 100-125mg/dl (5.6-6.9mmol/l) and impaired glucose tolerance is defined as a 2 hour plasma glucose level of 140-199mg/dl (7.8-11.1 mmol/l) after administration of 75g of oral glucose. These ranges of Plasma glucose levels signify the threshold at which the risk of type 2 diabetes increases sharply. It has been suggested that insulin secretion may be normal in subjects with IGT. However, substantial defects in insulin secretion have been demonstrated in people who have normal fasting glucose & normal glycosylated Hb concentration with glucose values >140mg/dl or 7.8mmol/l 2 hours after ingestion of 75g of glucose orally. Thus defects in insulin secretion can be detected before the onset of overt hyperglycaemia<sup>5</sup>. IFG correlates with insulinopaenia while IGT correlates with element of insulin resistance. While frank diagnostic for DM correlate both with micro as well as macro vascular complications, intermediate abnormalities correlate much stronger with macro vascular complications<sup>6</sup>. Pre-diabetes have 10 times risk of developing type 2 diabetes within 7 years compared with people whose glucose level is in the normal range. Pre-diabetes is also an independent risk factor for cardiovascular diseases<sup>7</sup>.

In response to this impressive evidence, the American Diabetes Association's position

statement on prevention of diabetes has recommended screening to detect people with impaired glucose tolerance or impaired fasting glucose (fasting glucose concentration 6.1-7.0 mmol/l) during healthcare office visits by people aged over 45 years particularly those with a body mass index of 25 or more. People found to have impaired glucose tolerance or impaired fasting glucose (collectively referred to as pre-diabetes) will be given counseling on weight loss as well as instruction on increasing their physical activity<sup>8</sup>. Type 2 diabetes has long been linked with behavioural, environmental, and societal factors such as overweight, physical inactivity, sedentary behaviour, and unhealthy dietary habits. Lifestyle is an effective tool for the primary prevention of diabetes in Asian Indians. The primary prevention of diabetes is urgently needed in India to curb the rising burden of diabetes<sup>9</sup>. Life style modification was highly effective for all age, sex and racial/ethnic groups<sup>7</sup>. Many people with type 2 diabetes can control their blood glucose by following a healthy meal plan and a programme of regular physical activity, losing excess weight, and taking medications<sup>10</sup>. It may be intuitive and tempting to argue that programme designed to prevent diabetes should be aimed at the underlying determinants of life styles in society and therefore should be delivered to the population at large. With this background the study was done with the objectives to study the prevalence of pre diabetes in Kashmir & to suggest early preventive steps for control of diabetes.

## MATERIAL AND METHODS

A community based cross sectional study was carried out to measure the prevalence of Pre-diabetes in men and women greater than 45 years of age. The study was purposively conducted in Central zone of Kashmir Valley which includes three districts, district Srinagar, district Budgam and district Ganderbal. The study was carried out in both rural and urban areas, with district Srinagar representing the urban population &

district Budgam & district Ganderbal representing the rural population. The multi-stage sampling was adopted for selection of subjects and 5 per 1000 of total population were selected which made a total of 2800 study population (greater than 45 years of age) was taken up for the study. The study was conducted for a period of two years. The subjects were included in the study only after obtaining their written consent. A door to door visit was made and the subjects were informed about the venue and time for blood sample collection with instructions to come fasting overnight. Every subject was administered a questionnaire with details regarding demographic and socioeconomic characteristics like age, sex, educational status, family and individual income. Fasting blood sample was sent for blood sugar, For blood sugar 2ml of blood was taken in a container containing potassium oxalate and fluoride, the samples were then analyzed on "SIEMENS' Dimension X-pand<sup>(plus)</sup> auto analyzer. Every subject was subjected to oral glucose tolerance test, after giving 75gms of oral glucose an additional blood sample was taken after 2 hours. The persons having fasting blood sugar > 100 and <126 or the persons having 2 hours PP glucose > 140 and < 200 were taken as pre-diabetics. The data was analysed in spss version 20.

### OBSERVATION & RESULTS

Studied population was between 45 to  $\geq$  80 years with mean age  $59.0 \pm 10.5$  years. Maximum

numbers of participants (22.1%) were in the age group of 45-49 years with males being 324 (22.7%) and females 295 (21.5%) The subsequent age groups were 50 to 54 years (18.2%), 55 to 59 years (17.0%), 60-64 years (14.5%). Most of the participants were from rural areas 1943 (69.4%) and least from urban areas 857 (30.6%) Among the total rural population of 1943, 989 (69.2%) were males and 954 (69.6%) were females. Among urban population there were 440 (30.8%) males and 417 (30.4%) females. Most of the studied subjects 1158 (41.4%) belonged to lower middle class followed by average middle class 774 (27.6%). Among the subjects with pre-diabetes impaired fasting glucose was seen in 598 (21.4%), IGT was seen in 78 (2.8%), both IFG+IGT in 145 (5.2%). The prevalence of pre-diabetes across the age with most of the subjects seen in 45-49 years age group i.e. 161 which is 26% of the total subjects in this age group. Pre-diabetes was present in 439 (32%) of total female studied population and 382 (26.7%) of total male studied population. Pre-diabetes was present in 528 (27.2%) of total rural population and 293 (34.2%) of the total urban population, the results were statistically significant. Pre-diabetes was present mostly in lower middle class 285 (24.6% of the same class), followed by average middle 250 (32.3% of the same class), upper middle 157 (31.6% of the same class).

**Table-1 Age and Gender Distribution of the Studied Population**

Age (years)	Male		Female		Total		p value
	N	%	N	%	N	%	
45 to 49	324	22.7	295	21.5	619	22.1	0.084 (NS)
50 to 54	262	18.3	248	18.1	510	18.2	
55 to 59	250	17.5	226	16.5	476	17.0	
60 to 64	213	14.9	193	14.1	406	14.5	
65 to 69	151	10.6	142	10.4	293	10.5	
70 to 74	105	7.3	110	8.0	215	7.7	
75 to 79	54	3.8	56	4.1	110	3.9	
$\geq$ 80	70	4.9	101	7.4	171	6.1	
Total	1429	51.0	1371	49.0	2800	100.0	
mean $\pm$ SD	$58.8 \pm 10.4$ (45, 89)		$59.6 \pm 10.9$ (45, 89)		$59.0 \pm 10.5$ (45, 89)		

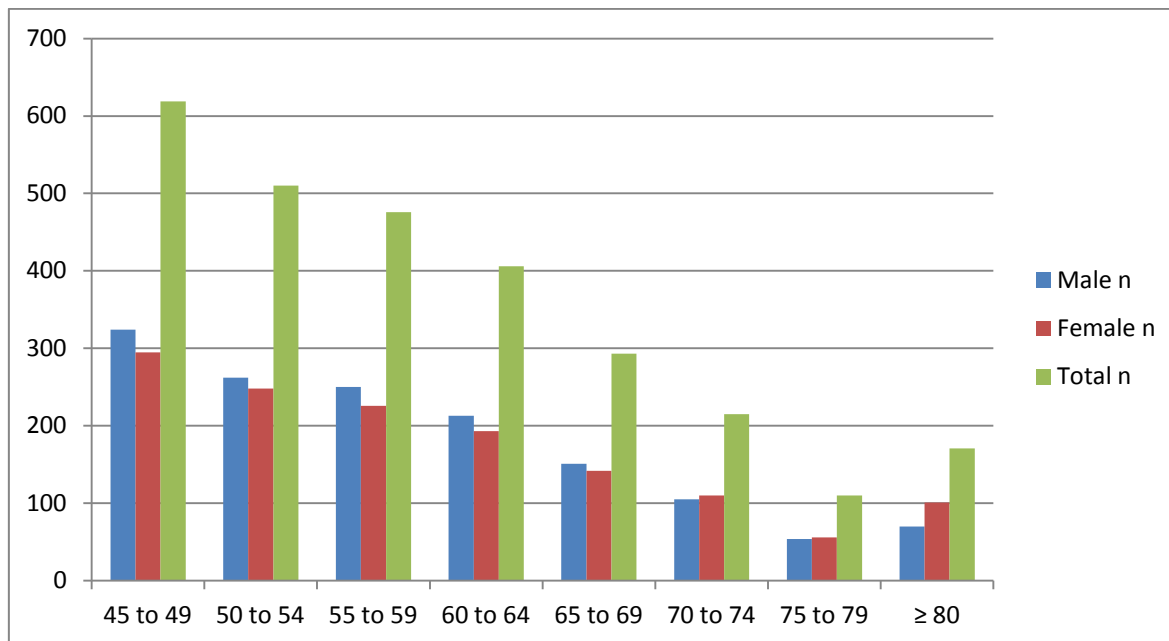


Table 1 and graph demonstrated the age and gender wise distribution of studied population. Studied population was between 45 to ≥ 80 years with mean age 59.0±10.5 years. Maximum numbers of participants (22.1%) were in the age group of 45-49 years with males being 324 (22.7%) and females 295 (21.5%) The subsequent ages groups were 50 to 54 years (18.2%), 55 to 59 years (17.0%), 60-64 years (14.5%) were in the gender proportion which was almost similar.

Dwelling	Male		Female		Total		p value
	N	%	n	%	n	%	
Rural	989	69.2	954	69.6	1943	69.4	0.830 (NS)
Urban	440	30.8	417	30.4	857	30.6	

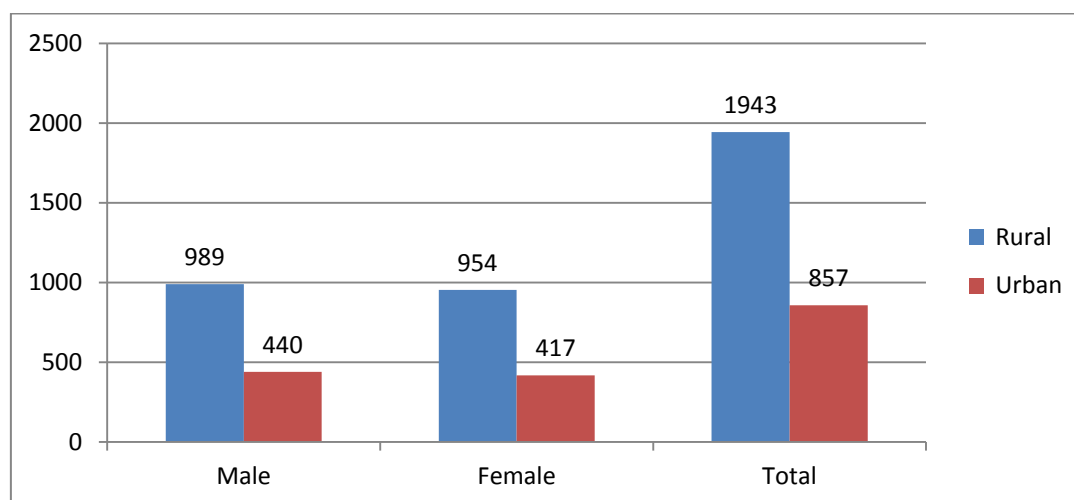
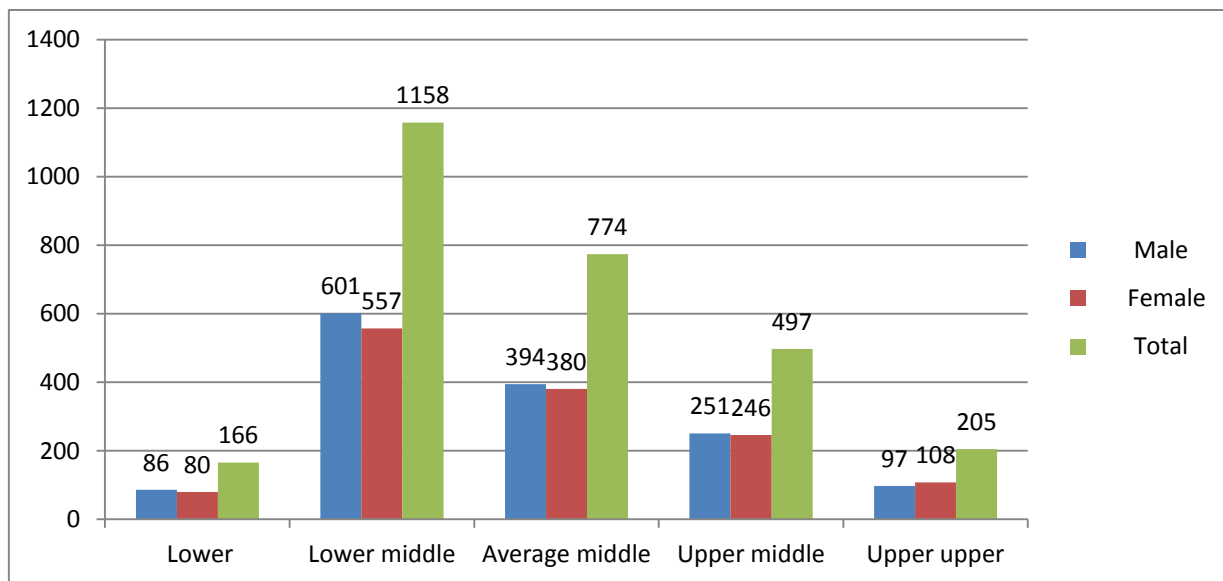


Table and graph demonstrates area wise distribution showing that most of the participants were from rural areas 1943 (69.4%) and least from urban areas 857 (30.6%) Among the total rural population of 1943, 989

(69.2%) were males and 954 (69.6%) were females. Among urban population there were 440 (30.8%) males and 417 (30.4%) females.

Socio Economic Status	Male		Female		Total		p value
	n	%	n	%	n	%	
Lower	86	60.0	80	5.8	166	5.9	0.302 (NS)
Lower middle	601	42.1	557	40.6	1158	41.4	
Average middle	394	27.6	380	27.7	774	27.6	
Upper middle	251	17.6	246	17.9	497	17.8	
Upper upper	97	6.8	108	7.9	205	7.3	



Above table and graph shows the distribution of studied population with respect to socio-economic status. Most of the studied subjects 1158 (41.4%) belonged to lower middle followed by average middle 774 (27.6%).

	n	%
IFG	598	21.4
IGT	78	2.8
IFG + IGT	145	5.2

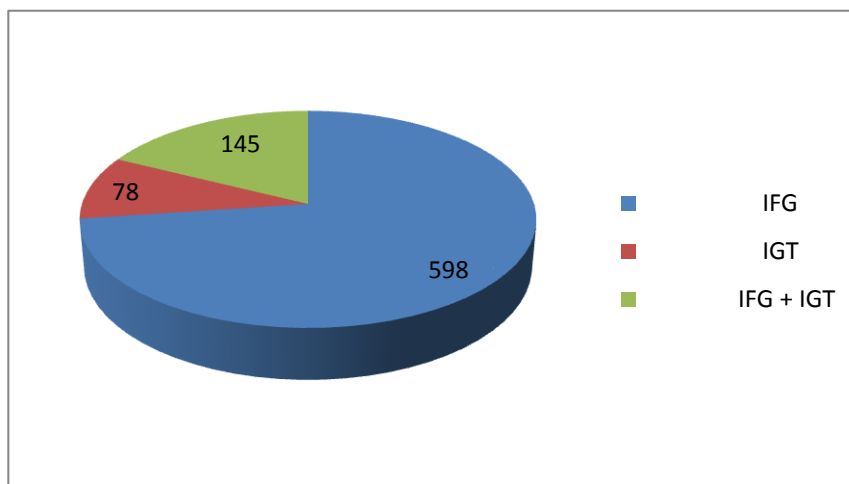


Table 4 shows among the subjects with pre-diabetes impaired fasting glucose was seen in 598 (21.4%), IGT was seen in 78(2.8%), both IFG+IGT in 145 (5.2%).

Age (years)	Yes		No		p value
	n	%	n	%	
45 to 49	161	26.0	458	74.0	0.000
50 to 54	139	27.3	371	72.7	
55 to 59	118	24.8	358	75.2	
60 to 64	114	28.1	292	71.9	
65 to 69	111	37.9	182	62.1	
70 to 74	67	31.2	148	68.8	
75 to 79	44	40.0	66	60.0	
≥ 80	67	39.1	104	60.8	

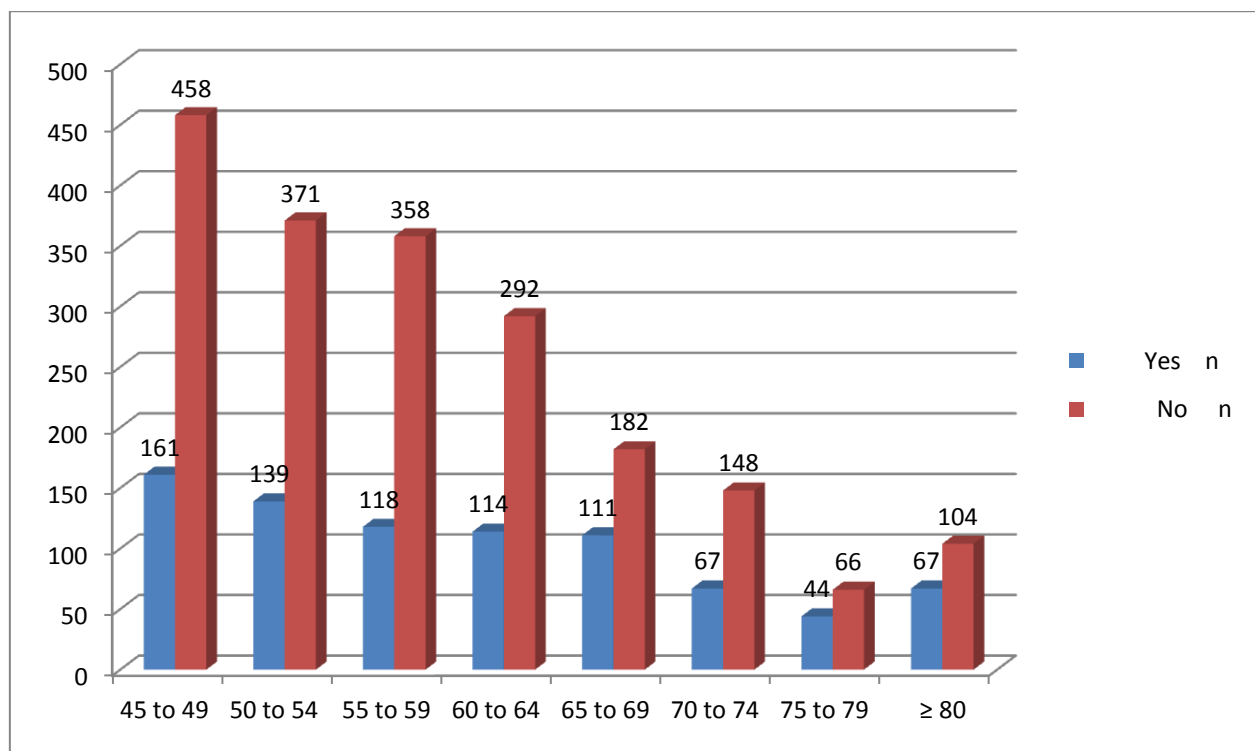


Table and graph shows the prevalence of pre-diabetes across the age with most of the subjects seen in 45-49 years age group i.e. 161 which is 26% of the total subjects in this age group. However percentage prevalence increases with age which is maximum in 75-79 years age group (40%)

Gender	Yes		No		p value
	n	%	n	%	
Male	382	26.7	1047	73.3	0.002
Female	439	32.0	932	68.0	

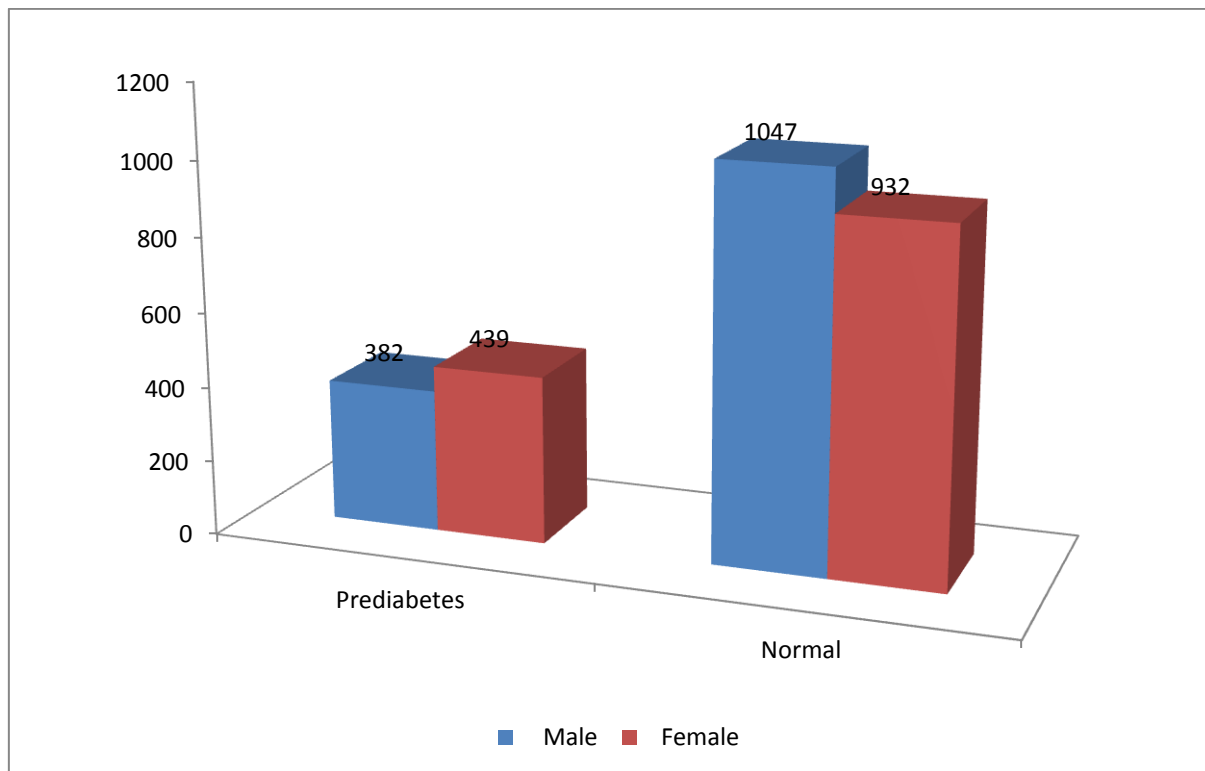


Table and graph shows pre-diabetes was present in 439 (32%) of total female studied population and 382 (26.7%) of total male studied population. The results were statistically significant.

Dwelling	Yes		No		p value
	n	%	n	%	
Rural	528	27.2	1415	72.8	0.000
Urban	293	34.2	564	65.8	

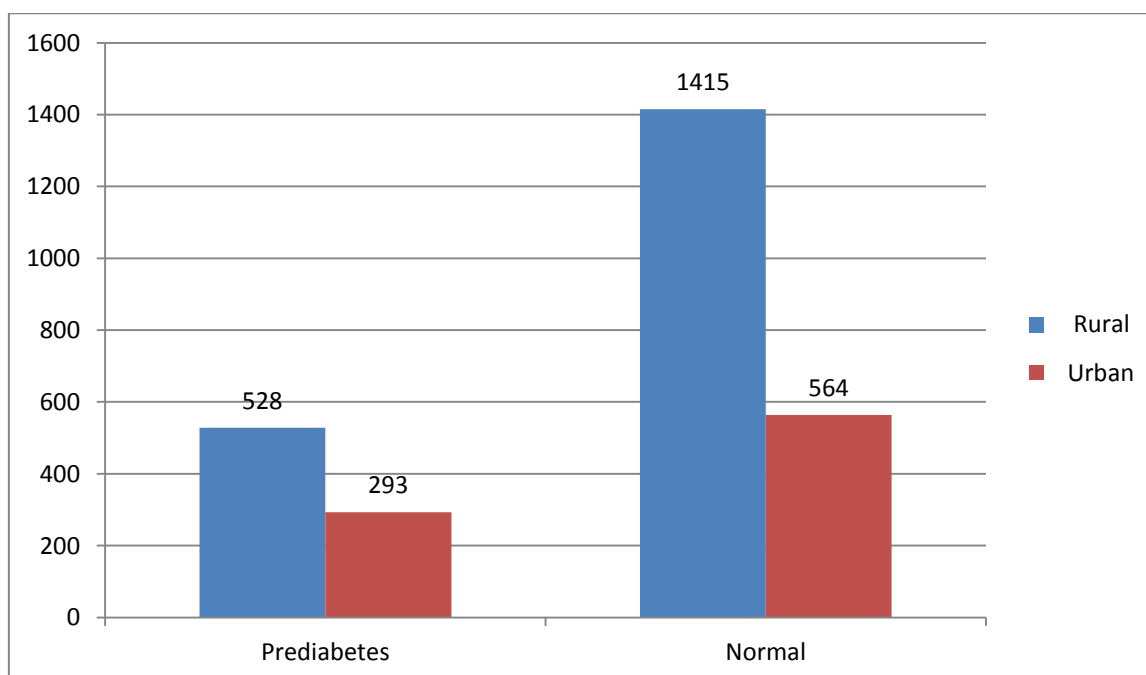


Table and graph shows pre-diabetes present in 528 (27.2%) of total rural population and 293 (34.2%) of the total urban population. The results were statistically significant.

Socio Economic Status	Yes		No		p value
	n	%	n	%	
Lower	45	27.1	121	72.9	0.000
Lower middle	285	24.6	873	75.4	
Average middle	250	32.3	524	67.7	
Upper middle	157	31.6	340	68.4	
Upper upper	84	41.0	121	59.0	

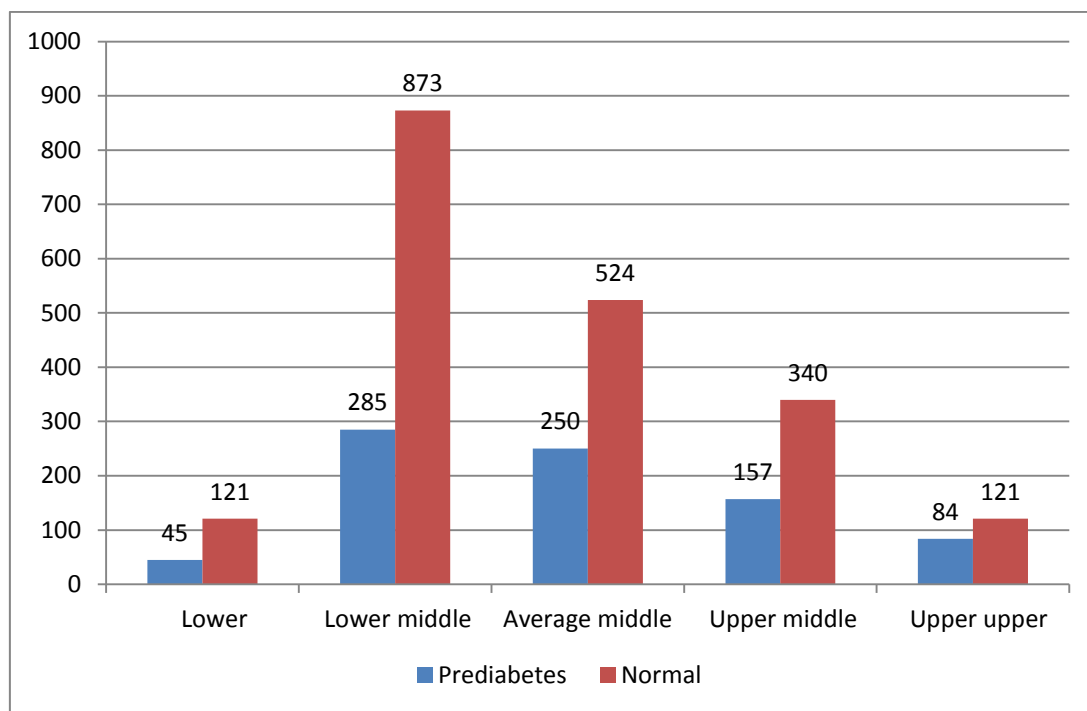


Table and graph shows pre-diabetes was present mostly in lower middle 285 (24.6% of the same class), followed by average middle 250 (32.3% of the same class), upper middle 157 (31.6% of the same class).

**DISCUSSION**

The present study was carried out on 2800 subjects aged more than 45 years in both rural and urban population and screened for pre diabetes. Our study shows the prevalence of pre-diabetes is 29.3% with more in urban than rural areas with significant increase in the prevalence of pre-diabetes with advancing age. The prevalence of pre-diabetes is more in females than males. Our study is consistent with the study done by Zargar AH et al in 2000<sup>11</sup> who conducted a study in Kashmir valley in the age group more than 40 years in which it was found that the prevalence of pre-diabetes is 27% more in females than males. The present study also displays similarity with the study done by Akiko S. Hosler et al. (2009)<sup>7</sup> who found in their study, the overall crude prevalence

of pre-diabetes in American Indians (22.4%) and Hispanic whites (7.3%). The study done by Akiko S. Hosler et al. (2009)<sup>7</sup> shows results similar with American Indians and disproportionate with Hispanic whites revealing racial factors in the predisposition of the pre-diabetes.

Among the pre-diabetics in the studied population, impaired fasting glucose was found in (26.8%), impaired glucose tolerance was found in (8.0%), both IFG and IGT was found in (5.2%) of the subjects. Our study shows similarity with the study done by Zargar AH et al. (2000)<sup>11</sup> in which they found prevalence of IGT was 8.09% of the subjects had IGT. Our study is consistent with the studies done by Ramachandran A, Snehalatha et al (2000)<sup>12</sup> who conducted a cross- sectional study in Delhi in the age >20 years in which prevalence of



IGT was found (8.6%) and Mohan V, Deepa M. et al (2004)<sup>13</sup> in their study in the rural population found the prevalence of IGT (10.0%).

## CONCLUSION

The study was conducted on 2800 subjects with 1429 males and 1371 females. Out of them, pre-diabetes was found in 821 subjects (29.3%). The revelation of pre diabetes should give an impetus to take remedial measures at the very outset; thereby playing a distinctive role in prevention.

Proper and requisite education about the healthy behaviour (dietary and exercise) measures and changing lifestyle, would keep these individuals healthy, if applied at an early stage. These measures would defer the onset of diabetes, as well as its related complications

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