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Prevalence of Prediabetes in Healthy Young Adults of Ahmedabad: An Observational Study

Hardini Prajapati[1], Yakshi Rajpura[2]

[1]MPT in Cardiopulmonary, Lecturer and PG Guide, Ahmedabad Institute of Medical Sciences, Nr. S P ring road, Gota-Kalol Highway, Lapkaman, Ahmedabad, Gujarat, India
drhardini[at]yahoo.co.in

[1]MPT in Cardiorespiratory, Ahmedabad Institute of Medical Sciences, Ahmedabad, Gujarat, India
Yakshirajpura[at]gmail.com

Abstract: ***Background: According to American Diabetes Association (ADA), diabetes is broadly classified into four categories: type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), gestational diabetes, and specific types of the diabetes due to other causes. However, there is a group of individuals that, inspite of having higher than normal glucose levels, they do not meet the criteria for diabetes, that condition is referred to as Pre-diabetes. Prediabetes is the term used for non-diabetic hyperglycemia associated with the simultaneous presence of the insulin resistance and β-cell dysfunction, abnormalities that start before glucose changes are detectable. People with pre-diabetes are at an increased risk of developing diabetes. Aim: The aim of the study is to find the prevalence of prediabetes in healthy young adults in the local population. Methodology: Three hundred one (n=301) subjects participated in the study. Data of Fasting Plasma Glucose was collected by the means of a glucometer. Result: The overall prevalence of prediabetes in healthy young adults was 14%. There is a positive correlation between Fasting Plasma Glucose and Prediabetes. Conclusion: It could be concluded from the study that the prediabetes is present in healthy young adults. There is a relation of obesity with prediabetes. Recognition of prediabetes is critical, given the risk of progression to diabetes mellitus.***

Keywords: Prediabetes, Impaired fasting glucose, Body Mass Index, Prevalence

1. Introduction

According to American Diabetes Association (ADA), diabetes is broadly classified into four categories: type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), gestational diabetes, and specific types of the diabetes due to other causes [8]. However, there is a group of individuals that, inspite of having higher than normal glucose levels, they do not meet the criteria for diabetes, that condition is referred to as pre-diabetes [1].Prediabetes is the term used for non-diabetic hyperglycaemia associated with the simultaneous presence of the insulin resistance and β-cell dysfunction, abnormalities that start before glucose changes are detectable [2].According to American Diabetes Association, prediabetes is defined as the HbA1c levels 5.7-6.4%(39–46 mmol/mol), Fasting Plasma Glucose (FPG) of 100- 125mg/dl (5.6–5.9 mmol/L) or an Oral Glucose Tolerance Test (OGTT) 2 hour blood glucose after 75g glucose of 140 mg/dl – 199 mg/dl(7.8–11.0 mmol/L) [8].

Table 1: Classification of Diabetes based on Fasting Plasma Glucose (FPG)

Result	Fasting Plasma Glucose (FPG)
Normal	Less than 100 mg/dl
Prediabetes	100 mg/dl to 125 mg/dl
Diabetes	126 mg/dl or higher

According to National Center for Chronic Disease Prevention and Health Promotion Division of Diabetes Translation- 2016, about 86 million US adults have prediabetes, and almost 90% of them are unaware of it. About 69 % of the pre-diabetes population lives in low or middle-income countries [2]. In India, the overall prevalence of prediabetes in all 15 states was 10·3%[3].

People with pre-diabetes are at the increased risk of developing diabetes: according to the American Diabetes Association, up to 70% of them will eventually develop overt diabetes.

Individuals with pre-diabetes are at the increased risk of cardiovascular disease (CVD) and premature mortality: a meta-analysis found that the risk of CVD is increased regardless of type of blood glucose assessment in comparison to subjects with normoglycemia [1].

Serious efforts are required to prevent this exponent rise in the diabetes cases. An important step would be to identify the burden of prediabetes in our population and then to implement steps towards reversing it or preventing the progression. So, the aim of the study is to find the prevalence of prediabetes in healthy young adults in the local population.

2. Materials and Methodology

The observational study was conducted in Ahmedabad city. The study was ethically approved by the institutional ethical committee and it was conducted in various communities of Ahmedabad City. Healthy young males and females of age 18 to 35 years, the subject should be fasting for atleast 8 hours before the test and who were willing to participate were included in the study. Subjects who were diagnosed with diabetes, renal failure, patients on medications or any other systemic illness were excluded. So, after assessing the subjects according to inclusion and exclusion criteria, total of 301 subjects qualified and were included in the study. They were examined for demographic details and Fasting Plasma Glucose test was performed after taking oral

consent. The statistical analysis was done using SPSS version 20.

Materials

1) Pen
2) Paper
3) Pencil
4) Rubber
5) Weighing scale
6) Stadiometer
7) Glucometer

Outcome Measures

Fasting Plasma Glucose test was used to diagnose the subjects with prediabetes. The subjects were asked to fast for atleast 8 hours before the subject was tested. The patient was seated comfortably. The finger was disinfected and then the test was carried out.

3. Results

The present study was conducted to find the prevalence of prediabetes in healthy young adults. Three hundred one (n=301) subjects participated in the study. Before applying statistical tests, data were screened for normal distribution. In this study, the level of significance was kept at 5%. The Shapiro-Wilk test was used to check the normality and the data were not normally distributed.

The prevalence of prediabetes was analyzed by using simple percentage technique. There were 115 males and 186 females. The mean age of the study population was 26.01±6.13 years. The mean value of Fasting Plasma Glucose (FPG) was 84.25±17.02 mg/dl. The mean Body Mass Index (BMI) was 23.37±3.70 kg/m^2. There were about 97 individuals who had BMI above normal. According to WHO Classification, 90 were overweight and 7 were obese.

The mean age of prediabetics was 27.51±6.15 years. Among these 20 were male and 23 were female. There mean FPG was 110.79±14.79 mg/dl. Among prediabetic subjects, 22 individuals had the family history of Diabetes Mellitus (DM). They had mean BMI of 24.25±3.93 kg/m^2 and 18 individuals had BMI above normal and among them 17 were overweight and 1 was obese.

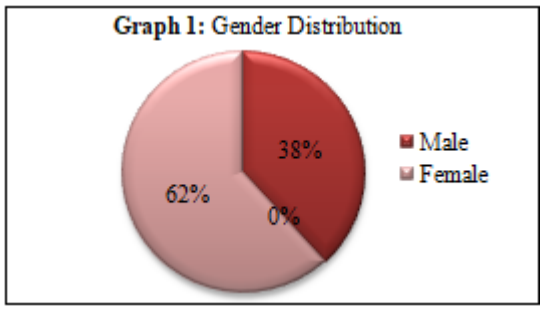


Table 2: Tests of normality

Shapiro-Wilk Test			
	statistic	df	p value
Body Mass Index	0.952	301	0.0001
Fasting Plasma Glucose	0.958	301	0.0001

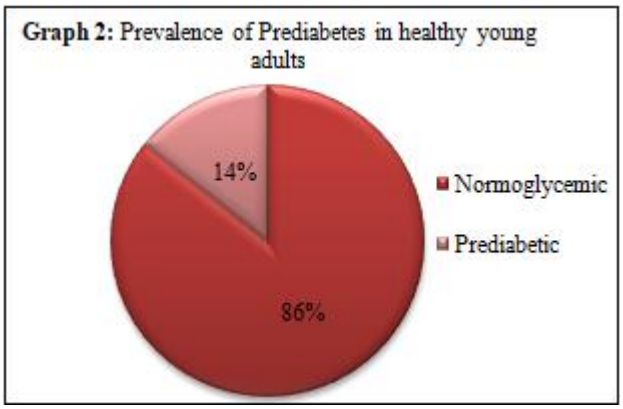
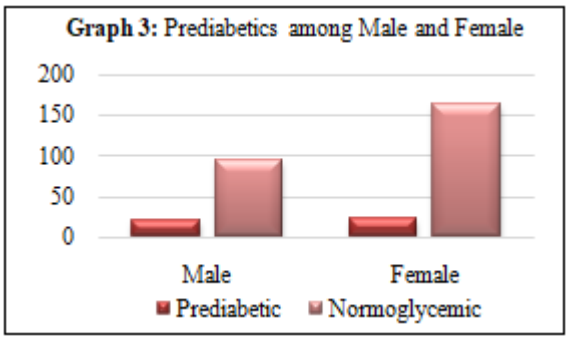


Table 3: Overall prevalence of prediabetics in healthy youngadults

Total	Normoglycemic	Prediabetic
n=301	n=258	n=43

The overall prevalence of prediabetes in healthy young adults is 14% (n=43). And the prevalence of prediabetes among male is 21% and among female is 14.1%.



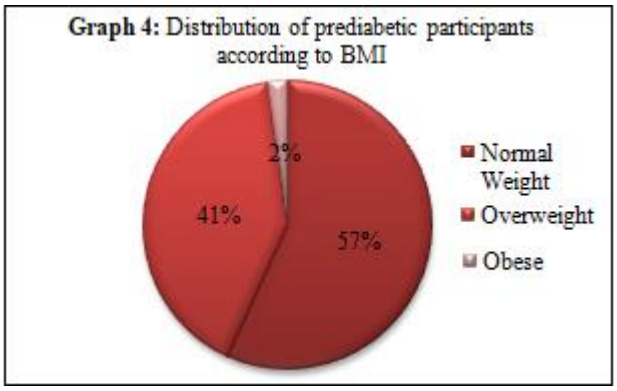
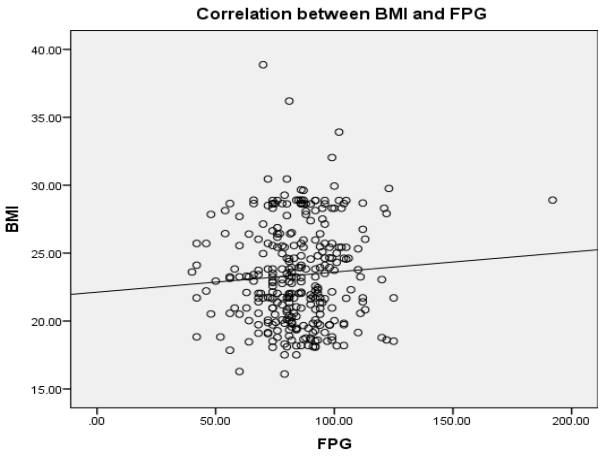


Table 4: Correlation of Body Mass Index and Fasting Plasma Glucose

	Fasting Plasma Glucose	
	r value	p value
Body Mass Index	0.046	0.0001



The Spearman's rank correlation test was applied as data were not normally distributed. The value of correlation coefficient is r = 0.046. And therefore, there is a weak positive correlation between Fasting Plasma Glucose (FPG) and Body Mass Index (BMI). This suggests that with an increase in the obesity there is an increase in Fasting Plasma Glucose (FPG).

4. Discussion

In the present study, the overall prevalence of prediabetics was calculated. The result of the present study showed 14% (n=43) prevalence of prediabetes in healthy young adults.

In the study conducted by Rizwana Kitchlew et al. in 2017, the prevalence of prediabetes was 34% in Lahore and it also showed 22% prevalence of prediabetes among young (age less than 30 years). Other studies conducted in various countries in Asia report figures less than that. A study done in urban slums of Bangalore by Hemavathi Dasappa et al. reported the prevalence of 11.57%. and a study conducted in Ningbo, china showed the prevalence of prediabetes as 30.53% using Oral Glucose Tolerance Test (OGTT) [2].

In 2010, a study conducted by Laura C. Plantinga et al. on "Prevalence of Chronic Kidney Disease in US Adults with Undiagnosed Diabetes or Prediabetes" concluded the 17.7% prediabetic individuals had chronic kidney disease [4].

In the study conducted by Shamima Akter et al. in 2014 on "prevalence of diabetes and prediabetes and their risk factors among Bangladeshi adults: a nationwide survey" showed 23% prevalence of prediabetes in adult population of Bangladesh. They further added that diabetes and prediabetes are highly prevalent among individuals aged 35 years or more in Bangladesh. The risk of both diabetes and prediabetes was increased in older, wealthier and better-educated individuals [5].

In this study, the prevalence of prediabetes was seen in both gender but more among the males (21%) compared to females (14.1%).

Similar results were seen in the study conducted by Laura C. Rosella et al. in 2015, the prevalence of prediabetes was about 4.3% according to FPG-only diagnostic criterion and was significantly higher in males compared to females [6].

Similar results were seen in another study by Kirsten J Coppell et al. in 2013, the overall prevalence of prediabetes was 25.5%. Prevalence of prediabetes was higher in men than in women. In age group of 25-34 years, prevalence of prediabetes was 19.5% in men and 12.2% in women. And in age group of 35-44 years, prevalence of prediabetes was 25.2% in men and 18.6% in women [7]

In this study, there is a weak correlation between Fasting Plasma Glucose and Body Mass Index. So, with increasing obesity, there are more chances of developing prediabetes.

In 2013 Kirsten J Coppell et al. conducted a survey on "Prevalence of diagnosed and undiagnosed diabetes and prediabetes in New Zealand: findings from the 2008/09 Adult Nutrition Survey" and the findings showed the prevalence of prediabetes was 195% in normal weight individuals, 26.9% in overweight, and 32.2% in obese individuals [7].

5. Conclusion

The prevalence of prediabetes in the healthy young adults is 14%. So, thus it could be concluded from the study that the prediabetes is present in healthy young adults. There is relation of obesity with prediabetes. Recognition of prediabetes is critical, given the risk of progression to diabetes mellitus. Identifying the individuals with prediabetes offers the opportunity to modify their risk prior to development of the significant sequelae.

6. Clinical Implication

Estimation of the prevalence of prediabetes is important to identify the burden of this metabolic state in the country with limited health resources. Creating awareness through seminars, electronic media and print media on preventing or delaying of prediabetes to diabetes rather than managing the disease after it is established.

Interventions that improve insulin sensitivity can typically slow the progression to diabetes. Research shows that you can lower the risk for developing type 2 diabetes by 58% by losing 7% of your body weight and moderate exercise for 30 minutes a day, five days a week [8]. American Diabetes Association (ADA) also recommends the consideration of metformin for those with BMI >35 kg/m^2, age < 60 years or women with gestational diabetes mellitus.

7. Future Research

Further research could be done using HbA1c as the outcome measure as it is more reliable but the test is expensive compared to the Fasting Plasma Glucose.

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Author Profile

Dr. Hardini Prajapati, MPT in Cardiopulmonary, Lecturer and PG Guide, Ahmedabad Institute of Medical Sciences, Nr. S P ring road, Gota-Kalol Highway, Lapkaman, Ahmedabad, Gujarat

Dr. Yakshi Rajpura, MPT in Cardiorespiratory.