PREVALENCE OF IMPAIRED FASTING GLUCOSE IN ADULT POPULATION ATTENDING MEDICINE OUTPATIENT DEPARTMENT AT GVMCH

S. P. Kumaresan¹, D. Anbarasu², B. Gowrishankar³, P. S. Ramesh⁴, R. Aswinth⁵, S. Aravinda Kumar⁶

¹Associate Professor, Department of Medicine, Government Vellore Medical College. ²Associate Professor, Department of Medicine, Government Vellore Medical College. ³Assistant Professor, Department of Medicine, Government Vellore Medical College. ⁴Assistant Professor, Department of Medicine, Government Vellore Medical College. ⁵Postgraduate, Department of Medicine, Government Vellore Medical College. ⁶Postgraduate, Department of Medicine, Government Vellore Medical College.

BACKGROUND

ABSTRACT

To determine the prevalence of impaired fasting glucose in adult population attending medicine outpatient clinic at Government Vellore Medical College, Vellore and correlate with risk factors.

MATERIALS AND METHODS

Adult population aged more than 30 years attending outpatient clinic at medicine department were randomly assessed for presence of impaired fasting glucose according to ADA criteria 2016 and related for presence of risk factors like age, weight, body mass index, waist circumference, and waist-hip ratio.

RESULTS

Totally, 985 subjects were studied. This included 496 (50.3%) males and 489 (49.6%) females. The prevalence of impaired fasting glucose in the Vellore population attending medicine OPD was found to be 15%. The prevalence of impaired fasting glucose among male subjects were found to be 17% and among female subjects were 13%. The prevalence of impaired fasting glucose was higher among both the male and female subjects with higher waist-hip ratio and BMI >25. Only female subjects with increased waist circumference had increased prevalence of impaired fasting glucose and not male subjects.

CONCLUSION

This study revealed that the prevalence of impaired fasting glucose in Vellore population is high (15%) and is an under-diagnosed condition. The traditional risk factors like body mass index, waist-hip ratio are good predictors for development of diabetes mellitus in the Vellore district. But waist circumference can only predict among female population.

KEYWORDS

Type 2 Diabetes Mellitus, Impaired Fasting Glucose.

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BACKGROUND

Pre-diabetes is a state which is considered as an important risk factor and precursor for development of diabetes mellitus.¹ Pre-diabetes state includes presence of either impaired fasting glucose or impaired glucose tolerance singly or in combination.^{1,2} In the statement released by ADA 2012, they were reclassified as "categories of increased risk for diabetes".³

The prevalence of impaired fasting glucose is common and underdiagnosed in most population.⁴ There is increase in prevalence due to modern lifestyle and food habits.⁵ The reported prevalence varies among population with different ethnic background.^{5,6} Currently, 314 million population were affected by impaired fasting glucose which would reach 500 million by 2025.⁷

Financial or Other, Competing Interest: None. Submission 06-10-2016, Peer Review 18-10-2016, Acceptance 21-10-2016, Published 27-10-2016. Corresponding Author: Dr. S. P. Kumaresan, #17, Chandrasekaran Street, Shenbakkam, Vellore-8. E-mail: drspk1962@gmail.com, aswinth.r@gmail.com DOI: 10.14260/jemds/2016/1450 It is estimated that 70% of impaired fasting glucose population would develop diabetes any time in life.⁸ The rate of development of diabetes was twice, when both impaired fasting glucose and impaired glucose tolerance is present.⁸

Many studies show occurrence of cardiovascular events is higher among pre-diabetic population.^{9,10} So by studying prevalence of impaired fasting glucose among Vellore population, early intervention can be planned for prevention of those cardiovascular complications among pre-diabetics.¹¹

Impaired fasting glucose is a state where fasting blood glucose ranges above normal but below the range to be labelled as diabetes. According to American Diabetes Association 2016, impaired fasting glucose can be diagnosed when fasting plasma glucose value is between 100-125 mg/dL [5.6-6.9 mmol/L].¹²

Many studies shows progression of prediabetes to type II diabetes occurs at rate of 2 % to 22% per year depending on the population studied.⁸ Among those, 50% remain prediabetic and 25% revert to normal.⁸ In an 11-year followup study among adults with prediabetes in Mauritius, 46% developed diabetes, 28% remained unchanged, and 26% reverted to normal.^{8,13} Hence, this group is an important

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target for vigorous intervention for primary prevention of diabetes.

Importance of Pre-diabetes in India

The prevalence of impaired fasting glucose and progression to diabetes continues to increase in Indian population. The diabetes related morbidity and mortality have already emerged as major public health problem in India.14 Diabetes related damage in microvascular circulation can lead to retinopathy, nephropathy, neuropathy and amputation. Damage to macrovascular circulation can result in heart disease, high blood pressure, and stroke. The development of diabetes among Indians occurs decade earlier than western population.¹⁵ In developing countries like India, the treatment cost of diabetes in an economically backward family may consume as much as 25% of the entire income for each person with diabetes.^{15,16} This above information clearly indicates that clinicians must intervene at the pre-diabetic stage to prevent development of diabetes and a host of complications rather than ignoring pre-diabetes.

Insufficient studies on impaired fasting glucose in South Indian population for planning early intervention is the rationale behind this research.

MATERIALS AND METHODS

The study was cross-sectional in design, conducted on subjects attending medicine outpatient department at Government Vellore Medical College from Vellore, Thiruvannamalai, and Kanchipuram districts. This is done over period of 6 months from April 2016 to September 2016. Totally, 1000 eligible subjects aged above 19 years of both genders were enrolled for the study. Fasting plasma glucose measurement was used as the screening test for the diagnosis of impaired fasting glucose, as recommended by the American Diabetes Association 2016 guidelines.¹² The fasting plasma glucose was preferred because it was easier to perform, convenient, acceptable to patients and less expensive. Weight, body mass index (BMI), waist circumference (WC), and waist-hip ratio (WHR) of all the participants were recorded.

The subjects with a history of diabetes mellitus, other endocrine abnormalities, patients on long-term corticosteroid therapy, diuretics, and pregnant patients were excluded from the study.

The total body weight was taken by a weighing machine with subjects wearing 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 measured at the level of maximum diameter of the hip as viewed from the side. The waist-hip ratio was calculated as waist circumference/hip circumference. Data processed and statistically analysed using SPSS trial version software.

A p value of <0.05 was considered significant.

RESULTS

Totally, 985 subjects were studied. This included 496 (50.3%) males and 489 (49.6%) females. The prevalence of impaired fasting glucose in the Vellore population attending medicine OPD found to be 15%. Among male subjects, prediabetics were found to be 17% and among females it was 13%. Among males, the highest percentage of pre-diabetics was found in age group between 60 to 70 years and lowest in age group 20 to 30 years, whereas in females the highest percentage was found in age group above 70 years and lowest in age group of 20 to 30 years (Table I and Fig. 1). Significant difference was found in the prevalence of prediabetics among male and female subjects. Similarly, the prevalence of impaired fasting glucose were higher among both the male and female subjects with BMI >25. There is significant difference found in the prevalence of impaired fasting glucose among subjects with BMI above 25 and below 25. The mean WC among male subjects were 92 and female subjects were 86 and among them only female subjects with increased WC were statistically significant for impaired fasting glucose. The higher WHR in male subjects [1.02] and female subjects [0.9] were significantly related for presence of impaired fasting glucose.

Age Group	Total Population		No. of Persons with IFG			Percentage of IFG			
	Male	Female	Total	Male	Female	Total	Male	Female	Total
20 - 30 years	19	13	32	2	1	3	11%	7%	9%
30 - 40 years	63	62	125	8	5	21	13%	8%	17%
40 - 50 years	124	119	243	20	14	30	16%	12%	12%
50 - 60 years	152	143	295	24	16	37	16%	11%	13%
60 - 70 years	106	116	222	21	18	38	20%	16%	17%
> 70 years	32	36	68	11	9	20	34%	25%	29%
Total	496	489	985	86	63	149	17%	13%	15%
Table 1. Distribution of Impaired Fasting Glucose among Different Age and Sex of our Study Population									

Sex	IFG	Normal	P value	
Male	86	410	<0.05	
Female	63	426	<0.05	

WC-Female	IFG	Normal	P value
<86	56	187	<0.0F
>86	93	153	<0.05

BMI	IFG	Normal	P value	
< 25	48	437	<0.05	
>25	101	399	<0.05	

WC-Male	IFG	Normal	P value	
<92	68	182	>0.05	
>92	81	165	>0.05	

WHR-Male	IFG	Normal	P value	WHR-Female	IFG	Normal	P value	
<1.02	46	206	<0.05	<0.05	<0.9	54	193	>0.0F
>1.02	103	141		>0.9	95	147	20.05	

BMI = Body mass index; WC = Waist circumference; WHR = Waist-hip ratio.



DISCUSSION

The prevalence of impaired fasting glucose varies among population with different ethnic background.⁴ A study which is conducted in United States shows prevalence of impaired fasting glucose were 26% in adult population which is much higher when compared with our study [15%].¹¹ The prevalence of impaired fasting glucose was significantly higher in males, which is similar to our study. In another study done in urban population of Ernakulum district in Kerala by Amrita Diabetes and Endocrine Population Survey [ADEPS] shows prevalence of impaired fasting glucose as 11.2% which is lower when compared with our study.¹⁷ In another south Indian study on rural populations of Andhra Pradesh showed prevalence of impaired fasting glucose to be 15.5% which is similar to our study.¹⁸

The anthropometric findings in this study were quite similar to our study, there was significant rise in the prevalence of impaired fasting glucose with increasing body mass index. Waist-hip ratio was strongly correlated with prevalence of impaired fasting glucose, just like in our study. The findings of our study were different from 'The Kolkata Policeman Study' in which prevalence of impaired fasting glucose was found to be 6.2% which is much lower on comparing our study.¹⁹ There was a strong correlation with waist circumference and waist-hip ratio but no significant correlation with body mass index which is also different from our study.

The variation in the results of different studies on impaired fasting glucose is probably due to diversity in culture, lifestyle, ethnic and genetic factors among different population and also rural-urban variations. The notable finding in our study was increase in prevalence of impaired fasting glucose with raising BMI, maybe due to raising the possibility of a higher prevalence of insulin deficient state than previously suspected.

Various studies have demonstrated that diabetes in the Indian population has several unique features. These include a younger age of onset (almost a decade earlier than other populations), a relatively low body mass index, higher intraabdominal fat, high rates of insulin resistance and a high prevalence of insulin deficiency as evidenced by more patients requiring insulin therapy at younger age. The major limitation of the present study is that it was a hospital-based study and therefore may not represent the true status of the prevalence of impaired fasting glucose (IFG) in the general population.

CONCLUSION

To conclude, this study revealed that the prevalence of impaired fasting glucose in Vellore population is high (15%) and is an under-diagnosed condition.

15 out of 100 individuals attending the out-patient department at medicine outpatient clinics have impaired fasting glucose, indicating a need for early detection and intervention in order to effectively prevent the development of diabetes and cardiovascular complications. The traditional risk factors like body mass index, waist-hip ratio are good predictors for development of diabetes mellitus in Vellore and its allied populations but waist circumference alone did not predict the impaired fasting state especially in male populations.

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