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A STUDY ON PREVALENCE OF IMPAIRED GLUCOSE TOLERANCE IN ADULTS ≥ 30 YEARS IN URBAN POPULATION OF CHIDAMBARAM

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ABSTRACT

The prevalence of diabetes is rising all over the world due to population growth, ageing, urbanisation and an increase obesity and physical inactivity. People with IGT are at high risk of developing type 2 diabetes mellitus. The present study was undertaken to determine the prevalence of impaired glucose tolerance in the urban population and to find out the association between impaired glucose tolerance and select socio demographic variables. A study population comprising of 340 individuals in the urban area of Chidambaram, age >30 years were selected for investigation. These individuals were analyzed for their biochemical parameters by Erba v2 analyzer. Both fasting blood glucose and post 2-hour glucose after 75 gm of powdered glucose intake were analyzed. Baseline clinical data like height, weight and blood pressure as well as family history were recorded by the standard methods. The prevalence of impaired glucose tolerance was found to be was 8.8% in the study. Prevalence of impaired fasting glucose and diabetes was 5.6% and 9.4% respectively. Significant association was observed between prediabetes and positive family history of diabetes, increasing age, smoking and alcohol intake. High prevalence of IGT validates that there are chances of IGT to get converted into Diabetes in near future. These results need urgent attention to develop a public awareness programme.

Key words: Impaired glucose tolerance, Diabetes Mellitus, Risk Factors.

INTRODUCTION

Diabetes in all its forms imposes unacceptably high human, social and economic costs on countries at all income levels.Disorders of carbohydrate metabolism such as type 2 diabetes mellitus and pre diabetic state are examples of the most common endocrine abnormalities. People whose blood glucose levels are high but not as high as those in people with diabetes are said to have impaired glucose tolerance (commonly referred to as IGT) or impaired fasting glucose (IFG). IGT is defined as high blood glucose levels after eating; whereas IFG is defined as high blood glucose after a period of fasting. The term 'pre diabetes' is also used to describe people with these conditions – a 'grey area' between normal glucose levels and diabetes [1].

This group is defined as having fasting plasma glucose (FPG) levels 110 mg/dl (5.6 mmol/l) but less than125 mg/dl (7.0 mmol/l) or 2-h values in the oral glucose tolerance test (OGTT) of 140 mg/dl (7.8 mmol /l) but less than 199 mg/dl [2].

People with IGT are at high risk of developing type 2diabetes. Unsurprisingly, IGT shares many characteristics with type 2 diabetes and is associated with obesity, advancing age and the inability of the body to use the insulin it produces. Not everyone with IGT goes on to develop type 2 diabetes: a large bank of evidence supports the effectiveness of lifestyle interventions – healthy diet and physical exercise to prevent the progression to diabetes [3].

Some 316 million people worldwide, or 6.9% of adults, are estimated to have IGT. The vast majority(70%) of these people live in low- and middle income countries. By 2035, the number of people with IGT is projected to increase to 471 million, or 8.0% of the adult population. The majority of adults with IGT are under the age of 50 (153 million) and, if left untreated, are at high risk of progressing to type 2 diabetes later in life. This age group will continue to have the highest number of people with

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IGT rising to 198 million in 2035 [4].

India has been called "the diabetes capital of the world," and it is estimated that 65 million Indians have the disease and "every fifth diabetic in the world is an Indian" [5]. The prevalence of impaired glucose tolerance test (GTT) ranges from 3.6–9.1 per cent, which indicates a potential of further increase in the prevalence. Currently about 21 million pre diabetes in India, it is projected to increase to 33 million by 2025 [6].

Due to these sheer numbers, the socio-economic burden due to diabetes in India is among the highest in the world. In order to prevent diabetes-related chronic complications there is a paramount importance to identify pre diabetic conditions early [7].

In this context a study was undertaken to assess the frequency of both IFG and IGT in our urban population in the urban field practice area Chidambaram.

MATERIALS AND METHODS

The community based cross sectional study was conducted in urban area of Chidambaram during September 2013 to June 2014.A total of 340 individuals aged more than 30 years of age were selected by simple random sampling and screened for their biochemical parameters. Data collection was done using a pre-tested structured interview schedule. Proforma was prepared in English and local language was used during interview to make it convenient for the population.

Details on socio-demographic variables and information regarding family history of Diabetes mellitus, exercise pattern, smoking habit, alcohol consumption were collected. Further they were screened for biochemical parameters after obtaining informed consent from the study subjects. After 10–12 hr of an overnight fast, fasting blood sample was collected.

A 75 gm anhydrous glucose dissolved in 250 ml of water was given orally over the course of 5 min and a second blood sample was drawn exactly 2 hour later for glucose estimation. Blood sample were collected under aseptic precaution in 2 tubes for fasting blood sugar and post load glucose. Blood for glucose determination was collected into tubes containing sodium fluoride. Blood samples were sent to Laboratory within 30 minutes of blood drawing. The sample was analyzed using ERBA CHEM 5V2 PLUS ANALYZER.

Data analysis

Data collected was entered in Microsoft 2007 excel spread sheet, compiled and analysed using IBM SPSS version 18 statistical package. Statistical analysis includes Descriptive Statistics and Pearson Chi-square test were performed to identify the risk factors associated with pre diabetes.

RESULTS

Out of total population surveyed (846) from 176 households, 51.0 % were more than 30 years. Among 340 study subjects, 48.2% were male and 51.8% were females. 88.8 % of the study population was between 30-59 years and 11.2 % of the population above 60 years. Females were slightly higher than males in distribution (females 51.8% and males 48.2%).Among the study subjects 6.5% had positive family history of diabetes. Out of the 340 study subjects 16.8 % were smokers, 12.9 % were alcoholics. Using WHO classification of BMI 20.4% of the study subjects come under obese categories.3.2% falls in underweight category. (Table no 1).

The estimated prevalence of impaired glucose tolerance was found to be 8.8% in this study, with the estimated prevalence of diabetes 9.4% (Table no:2).

As age increases the prevalence of pre diabetes and diabetes also increases and this difference is statistically significant.(P value= 0.001) This study revealed higher prevalence of pre diabetes in males(12.8%) compared to females(9.1%). This study also observed no statistically significant association between pre diabetes and sex, though higher prevalence was seen in males.(P value=0.189) The present study revealed that 18.2% % of pre diabetes cases having positive family history, Statistically it was found that pre diabetes was significantly higher among people having positive family history in comparison to person having negative family history (P value=0.004) In this study significant association between pre diabetes and smoking habit was observed. The prevalence of pre diabetes was more in smokers compared to non smokers.(P value=0.000) The present study revealed significant association between obese (BMI ≥ 30) subjects and pre diabetes.(P value=0.0001)This study found that the prevalence of pre diabetes and diabetes was more in alcoholics compared to non alcoholics and the results were statically significant.(P value=0.000) (Table no 3).

Table 1. Socio-Demographic Characteristics of study subjects

Socio-Demographic characteristics		Total (n=340)	
		No	%
Age	30-39	92	27.1
	40-49	133	39.1
	50-59	77	22.6
	≥ 60	38	11.2
Sex	Male	164	48.2
	Female	176	51.8
Family H/O diabetes	Present	22	6.5
	Absent	318	93.5

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Smoking	Smoker	57	16.8
	Non-smoker	283	83.2
BMI	Under weight	11	3.2
	Normal	139	40.9
	Over weight	121	35.5
	Obese	69	20.4
Alcoholic intake	Alcoholic	44	12.9
	Non alcoholic	296	87.1

Table 2. Characteristics of study subjects with normoglycemic, IGT and newly diagnosed diabetes

Category	No	%
Normal	278	81.8
IGT	30	8.8
Diabetes	32	9.4

Table 3. Prevalence of pre-diabetics according to socio-demographic characteristics

Socio-demographic characteristics		Category			Chi-square	P value
		Normal	Pre diabetes	Diabetes		
Age	30-39	84 (91.3)	7(7.6)	1(1.1)	21.83	0.001
	40-49	104(78.2)	16(12)	13(9.8)		
	50-59	54 (70.1)	13(16.9)	10(13.0)		
	≥ 60	29 (76.3)	1(2.6)	8(21.1)		
Sex	Male	124(75.6)	21(12.8)	19(11.6)	3.33	0.189
	Female	147(83.5)	16(9.1)	13(7.4)		
Family H/O diabetes	Present	12 (54.5)	4(18.2)	6(27.3)	10.99	0.004
	Absent	259(81.4)	33(10.4)	26(8.2)		
Smoking	Smoker	29 (50.8)	14(24.6)	14(24.6)	35.61	0.000
	Non-smoker	242(85.5)	23(8.1)	18(6.4)		
BMI	Under weight	5 (45.5)	4(36.4)	2(18.1)	19.35	0.001
	Normal	110(79.2)	12(8.6)	17(12.2)		
	Over weight	105(86.8)	8(6.6)	8(6.6)		
	Obese	51 (73.9)	13(18.9)	5(7.2)		
Alcoholic intake	Alcoholic	18 (41.0)	13(29.5)	13(29.5)	47.48	0.000
	Non alcoholic	253(85.5)	24(8.1)	19(6.4)		

DISCUSSION

The WHO considers IFG and IGT as being pre-diabetic states. IGT and IFG individuals are believed to progress into full blown diabetes years after diagnosis. The period within which this is likely to occur cannot be ascertained. Such studies will not only estimate the period within which IGT subjects can progress to diabetes, but will also provide a guide on which intervention measures can be implemented to prevent progress of such individuals to full blown diabetes.

Among 340 subjects surveyed males and females were equally distributed (48.2% males and 51.8% females). 88.8 % of population belonged to above 30-59 years of age and11.2 % were above 60 years.15.8 % of the population were illiterate and 39.2% of the study subjects were educated up to primary school. 38.7 % of subjects were homemakers and 11.5 % of total population were unengaged in any occupation. Among the houses surveyed 39.7 % of the families earn a yearly income < Rs.25,000.

The prevalence of impaired glucose tolerance was found to be 8.8 % among this study population. Similar findings were observed in studies done by Shah *et al.*,, and Zargar AH *et al.*, as 6.2 % and 8.1 % respectively.[8,9] In contrast to this Shweta S *et al.*,, found prevalence of impaired fasting glucose in population reporting to tertiary care centre as 18% [10].

As age increases the prevalence of pre diabetes and diabetes also increases and this difference is statistically significant. This was in accordance with study conducted by Cherie
James *et al.*, [11].

This study revealed higher prevalence of pre diabetes in males(12.8%) compared to females(9.1%). Similar finding were seen in the study done by F Abtahi, *et al.*, [12]. In contrast to this, study Zargar AH *et al.*, in their study found that the prevalence of IGT was significantly more in females as compared to males [9]. Studies done by Snehalatha *et al.*, [13] and Shah *et al.*, [8] found that there was no significant gender difference in the prevalence of diabetes or IGT. This study also observed no statistically significant association between pre diabetes and sex, though higher prevalence was seen in males.

The present study revealed that 18.2 % of pre diabetes cases are having positive family history,

Statistically it was found that pre diabetes was significantly higher among people having positive family history in comparison to person having negative family history. Similar study done by ramachandran *et al.,* [13] found that family history of diabetes, were found to be associated with increased risk of   impaired glucose tolerance and diabetes.

This study reported significant association between pre diabetes and smoking habit. The prevalence of pre diabetes was more in smokers compared to non smokers. Similar results were obtained by Frati AC *et al.,* [14] and Lisa Rafalson *et al.,* [15] in their respective studies. Their studies found out that there is a significant association between smoking and impaired glucose tolerance.

The present study revealed significant association between obese (BMI ≥ 30) subjects and pre diabetes. The prevalence of pre diabetes was more in obese subjects compared to normal people. Similar study done by Zafar *et al.,* [16] has shown an increased association of high BMI with diabetes and impaired fasting glucose. In contrast to

this study, Bharati *et al.,* [17] in their study found BMI was not significant factor diabetes.

This study found that the prevalence of pre diabetes and diabetes was more among alcoholics compared to non alcoholics and the results were statically significant. Similar study conducted by Carlsson S *et al.,* [18] reported that high alcohol consumption was shown to be associated with increased risk of diabetes and not with pre diabetes. In contrast to that, Ronald P. Stolk *et al.,* [19] in his study found that alcohol consumption was not associated with glucose intolerance.

CONCLUSION

Thus the findings of present study have important public health implications. Both IFG and IGT is not a clinical entity but rather a risk factor for future diabetes and cardiovascular disease. The results of the study indicates that, public attention is required to curb the conversion of diabetes. This study also indicate a need for greater emphasis on the early detection and timely intervention.

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