

Prevalence of Diabetes Mellitus in South India: A Retrospective Analysis

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Abstract: Studies have shown that the prevalence of diabetes in urban Indian adults is about 12.1%, the onset of which is about a decade earlier than their western counterparts and the prevalence of Type 2 diabetes is 4-6 times higher in urban than in rural areas. The risk factors peculiar for developing diabetes among Indians include high familial aggregation, central obesity, insulin resistance and life style changes due to urbanization. The present study has shown the prevalence of diabetes in the year 2009 & 2010 is (12.4% & 12.11%) and of prediabetic in year 2009 & 2010 is (13.5 & 14.3%) respectively which is quiet correspondent with urban prevalence of diabetes in India. Therefore, there is an need for a large well planned national study to know the prevalence of diabetes and prediabetes and the complications of diabetes in India. It will help in proper policy making & take action against diabetes in India.

Key Words- Diabetes, Prevalence, India

INTRODUCTION

Diabetes is an Iceberg disease; the incidence of each type of diabetes varies widely throughout the world. Type II diabetes is the predominant form of diabetes world wide accounting for 90% of cases globally. Diabetes represents a spectrum of metabolic disorders, which has become a major health challenge worldwide^{1,2}. The unprecedented economic development and rapid urbanization in Asian countries, particularly in India has led to a shift in health problems from communicable to non-communicable diseases. Of all the non-communicable diseases, diabetes and cardiovascular diseases lead the list. The prevalence of diabetes is rapidly rising all over the globe at a alarming rate³ over the past 30 yrs, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality in type 2 diabetes.

Nowhere is the diabetes epidemic more pronounced than in India as the world health organisation (WHO) reports show that 32 million people had diabetes in the year 2000⁴. The international diabetes federation (IDF) estimates the total no of diabetes subjects to be around 40.9 million in India and this is further set to rise 69.9 million by the year 2025⁵. Urban rural differences in the prevalence of diabetes have been consistently reported from India. The ICMR study reported that the prevalence was 2.1 per cent in urban and 1.5 percent in rural areas⁶, and later study showed that the prevalence was 3 times higher among the urban (8.2%), compared to rural population (2.4%)⁷. WHO estimated that there were 135 million diabetic individuals in the year 1995 and it has been projected that this number will increase to 300 million by the year 2025⁸. WHO has projected that the maximum increase in the number of diabetes would occur in India. Considering the large population and increasing prevalence of diabetes mellitus in India could be enormous⁹ with a high genetic predisposition and high susceptibility of insults, the Indian population faces a higher risk of diabetes and its associated complications¹⁰.

MATERIAL AND METHOD

The present study of diabetes was carried out in department of pathology Sree Balaji Medical College, Chromepet, Chennai. The samples were taken from the patients (outdoor patients as well as admitted patients), who have been advised by clinicians for blood sugar investigations. Patients have been advised for blood sugar investigations on the basis of symptoms and signs. The total numbers of samples in the year 2009 & year 2010 are & 2350 respectively. These samples are tested for fasting, post prandial & random blood sugar according to requisition.

Sample Collection

1. For fasting blood sugar - 2ml blood sample has been taken in fluoride

vial after overnight fasting.

- For postprandial blood sugar - 2 ml of blood sample has been taken in fluoride vial after 2hrs of intake of 75gms of glucose.
- For random blood sugar - 2 ml of blood sample has been taken in fluoride vial any time in a day.

Procedure

Glucose oxidase/ Peroxidase(GOD/POD) method is used for estimation of blood glucose level.

In which Glucose is oxidized by glucose oxidase to gluconic acid and hydrogen peroxide. In a subsequent peroxidase catalyze a reaction, the oxygen liberated is accepted by the chromogen system to give a red coloured quinoneimine compound. The red color so developed is measured at 505 nm & is directly proportional to glucose concentration.

The enzymatic reaction is as follows:

- Glucose + O₂ $\xrightarrow[\text{H}_2\text{O Gluconate} + \text{H}_2\text{O}_2]{\text{Glucose} + \text{Oxidase}}$
- H₂O₂ + phenolic compound + 4 - aminoantipyrene (coloured compound) + H₂O

Absorbance is measured at 490-550nm.

Diagnostic Criteria

Table -1: Criteria for Diagnosis of Diabetes Mellitus

Normoglycemia	Impaired fasting glucose or impaired glucose tolerance	Diabetes mellitus
FPG < 110 mg/dl	FPG ≥ 110 and < 126 mg/dl (IFG)	FPG ≥ 126 mg/dl 2hr. PG > 200 mg/dl
2 hrs. PG < 140 mg/dl	2 hrs PG > 140 And ≤ 200 mg/dl (IGT)	Symptoms of diabetes & Random PG ≥ 200 mg/dl

PG - Plasma Glucose, IFG - Impaired fasting glucose; IFG - Impaired fasting glucose; IGT - Impaired glucose tolerance; FPG - Fasting plasma glucose, fasting is defined as no calories intake for atleast 8hrs.

RESULTS

Authors have analysed 4450 cases in 2009 and 4712 cases in 2010. Following results were obtained (Table 2).

Type here.	equation	Reference range	No. of case		Percentage	
			2009	2010	2009	2010
Normal		<110mg/dl for fasting cases, <140 mg/dl for pp cases and <200 mg/dl for random	3833	3724	86.134%	82.74%
Fasting impaired		110-126 mg/dl	359	345	7.104%	6.869%
Fasting diabetic		>126 mg/dl	241	224	4.769%	4.46%
PP impaired		140-200 mg/dl	355	337	7.025%	6.7104%
PP diabetic		>200 mg/dl	222	235	4.393%	4.679%
Random		>200 mg/dl	149	157	2.948%	3.126%
Total			5053	5022		

Following interpretation are further obtained based on the table –2.

- 1.) Cases with confirmed diabetes are 612 (112.11%) and 616 (12.4%) in the year 2009 & 2010 respectively.
- 2.) Cases with impaired glucose level are 714(14.13%) &682 (13.5%) in the year 2008 & 2009 respectively.

In our study 5053 cases in the year 2009 & 5022 cases in the year 2010 have been investigated in the department of pathology .Total no of cases in the year 2009 which are either at risk or confirmed diabetic are 1326 & in 2010 are 813 1298. Out of these 617 cases 1326 cases in 2009,612 cases (12.11%) have been diagnosed as diabetic & 714 cases (14.13%) have been diagnosed as prediabetic (impaired blood sugar level), Likewise in the year 2010, out of 1298 cases 616 cases(12.4%)have been diagnosed as diabetic & 682 cases (13.5%) have been diagnosed as prediabetic (impaired blood sugar level).

DISCUSSTION

India has nearly 33 millions diabetic subjects today, which is mainly contributed by the Urban population. The scenario is changing rapidly due to socio – economic transition occurring in rural area also. Availability of improved mode of transport & less strenuously as in the vicinity have resulted in decreased physical activity. Better economic conditions have produced changes in diet habits. Prediabetic conditions like impaired glucose tolerance and impaired fasting glucose are also on the rise¹⁰ indicating the possibility of further rise in the prevalence of diabetes. Several studies have shown that these prediabetic states are also high risk stages for cardiovascular disease^{12,13}. One study was to assess the prevalence of diabetes & impaired glucose tolerance in six major cities shows prevalence of diabetes & impaired glucose tolerance were 12.1% and 14% respectively¹⁴. The prevalence of impaired glucose tolerance which is a fore runner of diabetes, is also increasing especially among the younger populations. There is also a wide Urban – Rural difference in the prevalence of diabetes pointing to the major role of urbanisation may be playing in the causation of disease. The global figure of people with diabetes is projected to rise from the current estimates of 150 million to 220 million in 2010 and 300 million in 2015. Most cases will be of type 2 diabetes, which is characterised by insulin resistance and / or abnormal Insulin secretion. People with type II diabetes are not dependent on exogenous Insulin, but may require it for control of blood glucose levels if this is not achieved with diet alone or along with oral hypoglycaemic agent.

Chennai is perhaps the only city in India where a series of population basedstudies have been done which have enabled the investigators to compare theprevalence rates. A study done in the same urban area after five years showed thatthe prevalence had risen to 11.6%¹⁵. The CURES investigators had a uniqueopportunity to compare prevalence rates of diabetes in Chennai city with three earlier epidemiological studies carried out in the same city using similar methods¹⁵⁻¹⁷. The overall crude prevalence of diabetes using WHO criteria in CURES was 15.5 per cent .Studies conducted in India in the last decade revealing that prevalence of type 2 diabetes is high & it is increasing rapidly in urban particular population. Of Particular interest are the result of three diabetic surveys conducted in Chennai in 1989, 1995 and 2000. They show a rising trend from diabetes mellitus & glucose intolerance,

the between 1989 and 1995 show a 40% rise in the prevalence, between 1995 to 2000 by 16.3 percent (11.6 to 13.5%) and between 2000 to 2004, by 6.0 per cent (13.5 to 14.3%). Thuswithin a span of 14 years, the prevalence of diabetes increased significantly by 72.3.

Mohan et al has presented 8 year follow up data among 476 subjects who had normal glucose tolerance at the baseline 13.4% (n=64) developed diabetes and 10.1% (n=48) prediabetes .Of the 37 individuals with Impaired glucose tolerance at baseline 40.5% (n=15) developed diabetes during the same period¹⁷. The onset of diabetes among Indians is about a decade earlier than their western counterparts & this has been noted in Asian Indian in several studies¹⁹.

A multicentric study was carried out in different regions of India by Ahuja et al²⁰ shown has that in rural areas from different parts of country near Ahmedabad, Calcutta, Delhi and Trivandrum reported prevalence rate of 3.9%, 0.8% and 1.5% and 1.3% respectively. In 1994 Wander etal²¹ reported 5% prevalence of diabetes among rural population in Ludhiana and Punjab. For these data, it appears that there is a rising pattern in the prevalence of type II diabetes in India both in Urban as well as Rural area.

The Chennai urban population study (CUPS) which worked at the prevalence of type II diabetes has 12% in the populations aged above 20 yr.Chennai is perhaps the only city a series of population based studies have been done which has enabled the investigators to compare the prevalence rates.

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