# **Original Research Article**

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# Assessment of cardiovascular risk among diabetic patients in an urban area of Kancheepuram district, India: a cross sectional study

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#### **ABSTRACT**

**Background:** Diabetes mellitus is a major public health problem. Non communicable diseases like coronary artery disease (CAD), stroke, obesity are increasing in number and overtakes the communicable diseases with respect to morbidity and mortality. Diabetic populations have a higher risk of developing CAD than the general population. The aim of this study was to assess the risk of developing cardiovascular diseases among diabetic patients.

**Methods:** This is a cross sectional study done among the urban adult population in Kancheepuram district. Sample size of 400 diabetic patients was studied by using consecutive sampling method. Data was collected by administering a pre tested structured questionnaire. Cardiovascular risk was assessed based on PROCAM scoring, a 10 years risk assessment score. The study was done for a period of three months from January to March 2018. Data analysis was done in SPSS software version 22.

**Results:** Among the diabetic patients, 53.5% of them are in high risk category based on PROCAM score for developing cardiovascular disease. A statistical significant association was found between cardiovascular risk and factors like socioeconomic status and overweight/obesity.

**Conclusions:** This study reveals that the diabetic populations are at higher risk of developing cardiovascular diseases. Hence awareness about the risk should be created and appropriate intervention at early stages should be implemented at primary health care level.

**Keywords:** Obesity, PROCAM, Socioeconomic status, Type 2 diabetes mellitus

## INTRODUCTION

Diabetes mellitus is a chronic disease that occurs when the pancreas is no longer able to produce insulin or when the body is unable to make use of the insulin produced. Based on a multi centric survey done by Indian Council of Medical Research (ICMR) thirty years ago, the prevalence of diabetes mellitus was around 2% in urban and 1% in rural India. Within a span of three decades the prevalence rates have raised to 12-16% in Urban and 3-8% in Rural India.

Diabetes mellitus is an "Iceberg disease" which is characterized by a state of chronic hyperglycemia,

resulting from a multifactorial etiology which includes genetic factors and environmental factors like obesity, low living standard, steady urbanization and life style changes.<sup>3</sup> There are two major types of diabetes mellitus namely type 1 and type 2. Type 1 diabetes mellitus results from the destruction of insulin producing cells in the pancreas. This is an autoimmune process usually, but not always associated with detectable auto antibodies to the components of beta cells. Type 2 diabetes mellitus accounts to about 85-95% of all diabetes, which results from the combination of insufficient production of insulin and increased resistance to the action of insulin. Gestational diabetes is the other common type of diabetes that is detected for the first time during pregnancy.

Gestational diabetes is associated with obesity and sedentary lifestyle. It typically resolves after delivery.<sup>4</sup>

Globally 422 million adults were living with diabetes in 2014. Around half of the prevalence is from the South East and Pacific regions. It is the eighth leading cause of death among both sex and the fifth leading cause of death in women in 2012.5 The total burden of death from high blood glucose in 2012 has been estimated to be 3.1 million in which 1.5 million deaths were due to diabetes and its complications only and 2.2 million deaths were due to co morbidities of diabetes such as cardiovascular diseases, chronic kidney disease and tuberculosis<sup>5</sup>. Fortythree percent of all the deaths are due to high blood sugar after the age of 70. Globally, the diabetic prevalence among adults over 18 years of age had a rapid increase from 4.7% in 1980 to 8.5% in 2014.6 According to Wild et al statement in 2006, the global prevalence of diabetes is 171 million and will reach 366 million by the next 25 years, but we had reached 422 million within a span of eight years from 2006.<sup>7</sup>

India has the highest proportion of more than 62 million people living with diabetes and had become the "Diabetes Capital of the World".<sup>6</sup> Indian Council of Medical Research preliminary results on a large community based study shows that a smaller proportion of the population is affected from North-Indian states like Jharkhand and Manipur when compared to Maharashtra and Tamilnadu.<sup>7</sup>

In Tamil Nadu, the prevalence rates of diabetes mellitus is 10.4% which is the second highest in India and stands next to Chandigarh which is 13.4%. Chennai had the prevalence of around 2.9% and the prevalence rates tends to be higher when the age was standardized, which shows 10% prevalence when age is more than 40 years. 9

The complications of diabetes mellitus are classified into microvascular and macrovascular. Microvascular complications include diabetic retinopathy, neuropathy, nephropathy and diabetic foot disorders. Macrovascular complications includes cardiovascular diseases (CVD) and stroke. There is increased risk of CVD mortality in diabetic patients in both sexes. 10 There is evidence suggestive of 1 to 3 times and 2 to 5 times higher risk for CVD mortality and morbidity in men and women with known diabetes respectively. 10 Chennai Urban population study shows the prevalence of cardiovascular diseases in Chennai is around 11% in 2010, which is 10 times higher when compared to 1970, this may be due to the grouping of risk factors like hyperglycemia, central obesity, dyslipidemia and systemic hypertension.11

Hence this study was conducted to assess the cardiovascular risk among diabetic population. There are many standard scorings to assess the cardiovascular risk namely Framingham score, PROCAM score, SCORE, QRISK score. Among these, the PROCAM score was used to assess the cardiovascular risk among the diabetic people.

# PROCAM (Prospective Cardiovascular Munster) risk score

This scoring helps to assess the risk among individuals in developing cardiovascular diseases in a span of 10 years. The calibrated risk score includes age, history of diabetes, LDL cholesterol, smoking, HDL cholesterol, systolic blood pressure, family history of premature myocardial infarction and triglycerides which are considered in calculating the risk.

A score below 10% is considered as low risk, 10%-20% as intermediate risk and more than 20% is considered as high risk for developing cardiovascular diseases (Table 1).<sup>12</sup>

Table 1: Scoring to assess cardiovascular risk among study participants.

Category	PROCAM score	Risk (%)	Risk for CVD	
1	Less than 20	Less than 1	Low	
2	21-28	1-2		
3	29-37	2-5		
4	38-44	5-10		
5	45-53	10-20	Intermediate	
6	54-61	20-40		
7	More than 62	More than 40	High	

#### **METHODS**

# Study design

This study is a hospital based cross sectional descriptive study.

# Study area

This study was carried out in the diabetic outpatient department attached to a medical college and hospital in Kancheepuram district, Tamil Nadu.

#### Study population

All patients attending diabetic outpatient department of the medical college and hospital for two months from January to February 2018.

#### Study period

The study was carried out for three months from January to March 2018.

#### Sample size

Based on a study done by Mohan, the prevalence of diabetes mellitus in Chennai is 12%. <sup>11</sup> Using the formula N=4PQ/L<sup>2</sup>, at 95% confidence limits with absolute

precision of 3.5% and with 10% non-response rate, the sample size was calculated as 378. The final sample size was rounded off to 400. The sampling method used to select the study participants was consecutive sampling. Every successive diabetic patient attending the outpatient department was interviewed until the desired sample size achieved.

#### Data collection

Data was collected using a pre tested structured questionnaire consisting of socio-demographic profile and PROCAM scoring indicators which includes risk factors such as tobacco use, family history of diabetes, family history of premature myocardial infarction, systolic blood pressure and lipid profile. All the blood parameters were recorded from recently taken investigation reports available with the study participants.

#### Informed consent

Informed consent was obtained from the participants in the local language (Tamil) after explaining to them the objective of the study in detail.

#### Inclusion criteria

The inclusion criteria for including participants in the study were known patients of type 2 diabetes mellitus who attended the diabetic out-patient and who consented to participate in the study.

#### Exclusion criteria

The exclusion criteria for not including the individuals in the study were those patients who were not willing to give consent to participate in the study and patients with known case of cardiovascular diseases.

#### Statistical analysis

Data analysis was done using the software SPSS version 22. The data analysis was done using descriptive and analytical statistics. The descriptive statistics analyzed were presented as frequency distribution and percentage. The analytical statistics used were Chi–square and P value <0.05 was considered as statistically significant value.

#### **RESULTS**

Table 2 shows the socio demographic profile of the study population. In this study, 50.5% (202) males and 49.5% (198) females were included. Almost 83.5% (334) of the study participants belong to middle class (upper middle, middle, lower middle). Around 66% (264) of the participants were overweight and 22% (88) of them were obese as per their body mass index.

Table 3 shows the association between the determinants like gender, socio-economic status and BMI (Body Mass Index) with the cardiovascular risk based on PROCAM scoring. Among 400 study participants, 73.2% (145) females were at high risk for cardiovascular diseases when compared to males as per PROCAM score. But this association was not statistically significant. Almost 45% (180) participants belong to upper socio-economic class and are at high risk for cardiovascular diseases, when compared to participants who belong to lower socio economic status. ( $x^2=25.2$ , p=0.001). Among the study participants, 52% (210) were overweight/ obese and are at high for developing cardiovascular diseases when compared to individuals with normal BMI as per PROCAM scoring. ( $x^2=35.7$ , p=0.001).

Table 2: Socio - demographic characteristics of the study participants.

S. No	Characteristics	Frequency	Percentage (%)		
1	Gender				
	Male	202	50.5		
	Female	198	49.5		
2	Socio-economic status (modified Kuppusamy scale- 2017)				
	Upper class	44	11		
	Upper-middle class	120	30		
	Middle class	130	32.5		
	Lower middle class	84	21		
	Lower class	22	5.5		
3	Body mass index (BMI)				
	Normal	66	16.5		
	Overweight	264	66		
	Obese	88	22		

Table 3: Association between the determinants and cardiovascular risk of the study participants

S. No	Determinants	Cardiovascular risk Low risk (Category 1 to 4) (%)	High risk (Category 5 to 7) (%)	Chi-square test	P value
1	Gender				
	Female	53 (26.8)	145 (73.2)	1.264	0.261
	Male	133 (66)	69 (34)		
2	Socio-economic Status				
	Upper	114 (28.5)	180 (45)	25.257	0.0003
	Lower	72 (18)	34 (8.5)		
3	Body mass index				
	Normal	62 (15.5)	4 (1)	35.752	0.00052
	Overweight/Obese	124 (31.25)	210 (52)		

P value less than 0.05 is significant.

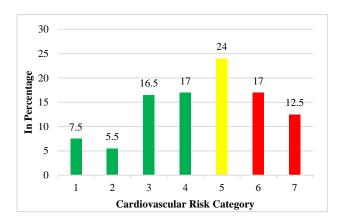


Figure 1: Distribution of study participants into cardiovascular risk categories as per PROCAM score.

Figure 1 shows the distribution of study participants into various categories of cardiovascular risk as per PROCAM score. Almost all the study participants who were diabetic are at risk of developing cardiovascular complications. This figure shows nearly 29.5% of study populations are at high risk (Category 6, 7) and 24% of the study populations are at an intermediate (Category 5) risk of developing cardiovascular complications.

### **DISCUSSION**

This study was conducted to assess the cardiovascular risk among diabetic patients visiting a medical college hospital. There are many standard scorings to assess the risk and in this study, PROCAM scoring was used. Based on the scoring the study participants who were known diabetic patients were categorized to be of low, intermediate and high risk of developing cardiovascular complications. This study shows around 29.5% of the study population are at high risk of developing cardiovascular complications.

This study shows that females have higher chance of developing cardiovascular complications. Though there was no statistically significant association, it is similar to the findings of the study done by Leon and Maddox and Möller-Leimkühler. The former study shows that there is three to five fold increased risk of developing cardiovascular risk among the female population.

In this study there is a statistically significant association between body mass index and cardiovascular risk. The overweight population in this study was around 81% which is comparable with the findings of another study done by Tripathi et al that shows around 73.3% of them were overweight.<sup>14</sup> Such similar association between BMI and diabetes was found in other studies done by Tripathy et al and Ravikumar et al. 14,15 Obesity is a co morbid condition and itself is a modifiable risk factor for developing non communicable diseases like hypertension, cardiovascular diseases and diabetes mellitus due to poor lifestyle conditions.

This study shows that participants who belong to upper socio-economic status had higher risk of developing cardiovascular complications. The results of this study are consistent with other studies done by Corsi and Subramanian which shows that people belonging to upper socio economic class in India appear to be at greatest risk for type 2 diabetes. <sup>16</sup> The probable reason could be the lifestyle changes that include sedentary lifestyle, unhealthy food habits, cigarette smoking and consumption of alcohol which is more common among the higher socio economic group having such lifestyle.

This study shows that 53.5% of the study participants are on high and intermediate risk categories for developing cardiovascular disease which is similar to the study done by Garg et al who used Framingham risk score and showed that 51.9% were on high risk of developing the same.<sup>17</sup>

# CONCLUSION

This study done among 400 diabetic patients in an urban area in Kancheepuram district shows that 29.5% of them are at high risk of developing cardiovascular complications based on PROCAM scoring. Non communicable diseases are at constant rise due to the

epidemiological transition and though national health programs are implemented to combat the burden through various interventions, more emphasis on awareness creation for early detection and periodical follow up is vital to prevent the complications.

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