Research Article

A study of prevalence of type 2 diabetes mellitus among urban adults of Ballari, India

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ABSTRACT

Background: Diabetes is a major lifestyle disorder, the prevalence of which is increasing globally. India has the unfortunate privilege of being the "Diabetes capital" of the world, more concerning is the fact that diabetes prevalence over the past 4 decades has increased fourfold. Indian studies have shown the prevalence rate of diabetes mellitus to be 2.4% in rural and 4 to 11% among urban dwellers due to industrialization and urbanization. There is a paucity of such data in the state and none in Ballari city hence this present study was undertaken to find out the prevalence of type 2 D in urban population of Ballari city.
Methods: This is a cross sectional study conducted in urban wards of Ballari city. The sample of 1412 adults aged above 20 years were included in the study. Cluster sampling technique adopted to select the wards and systematic random sampling was used to select the subjects. Ethical clearance was obtained and written informed consent from respective subjects. Data was collected using pre designed and pretested semistructured questionnaire. Questionnaire included information regarding socio-demographic profile and blood glucose level was measured by glucometer.
Results: The overall prevalence was found to be 12.7% and prevalence of diabetes mellitus was 15.6% in males and 10.1% in case of females.
Conclusions: The prevalence of diabetes mellitus in Ballari city was 12.7%.

Keywords: Diabetes mellitus, Prevalence

INTRODUCTION

The second half of the twentieth century witnessed major health transitions in the world, propelled by socio-economic and technological changes which profoundly altered life expectancy and ways of living while creating an unprecedented human capacity to use science to both prolong and enhance life. Among these health transitions, the most globally pervasive change has been the rising burden of non-communicable diseases.

Epidemics of Non-Communicable Diseases (NCD) are presently emerging or accelerating in most developing countries. Even as infections and nutritional deficiencies are receding as leading contributors to death and disability, India too illustrates this health transition, which positions NCDs as a major public health challenge of growing magnitude in the twenty-first century.

A total of 56 million deaths occurred worldwide during 2012. Of these, 38 million were due to NCDs, principally cardiovascular diseases, cancer and chronic respiratory diseases.[1] Nearly three quarters of these NCD deaths (28 million) occurred in low- and middle-income countries. The number of NCD deaths has increased worldwide and in every region since 2000, when there were 31 million NCD deaths. NCD deaths have increased the most in the WHO South-East Asia Region, from 6.7 million in 2000 to 8.5 million in 2012, and in the Western Pacific Region, from 8.6 million to 10.9 million.[2]

The leading causes of NCD deaths in 2012 were: cardiovascular diseases (17.5 million deaths, or 46.2% of NCD deaths), cancers (8.2 million, or 21.7% of NCD deaths), respiratory diseases, including asthma and chronic obstructive pulmonary disease (4.0 million, or 10.7% of NCD deaths) and diabetes (1.5 million, or 4% of NCD deaths). Thus, these four major NCDs were responsible for 82% of NCD deaths.[3]

In 2012, an estimated 1.5 million deaths were directly caused by diabetes.[2] In 2008 an estimated 1.2 million people died from consequence of high blood sugar More than 80% of diabetes deaths occur in low- and middle-income countries.[4] The second half of the twentieth century witnessed major health transitions in the world, propelled by socio-economic and technological changes which profoundly altered life expectancy and ways of living while creating an unprecedented human capacity to use science to both prolong and enhance life. Among these health transitions, the most globally pervasive change has been the rising burden of non-communicable diseases.

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The World Health Organization (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 2025.[5]

While T2D poses a huge economic burden to all nations, developing countries bear the highest burden since more than 80% of cases occur in these countries. As per the International Diabetes Federation (2013), approximately 50% of all people with diabetes live in just three countries: China (98.4 million), India (65.1 million) and the USA (24.4 million).[1]

The prevalence of diabetes, constituted chiefly by Type 2 Diabetes (T2D), is a global public health threat Prevalence estimates of diabetes and Impaired Glucose Tolerance (IGT) are high for all Asian countries and are expected to increase further in the next two decades.[10] The present trend indicates that more than 60% of the world's diabetic population will be in Asia.

India has the unfortunate privilege of being the "Diabetes capital" of the world. More concerning is the fact that diabetes prevalence over the past 4 decades has increased fourfold.[7] Another interesting phenomena is that Indians who migrate to affluent countries develop very high prevalence rates of 10 to 20%, indicating the high racial predisposition that Indians and other South Asian populations have for diabetes, and which gets expressed whenever we get affluent conditions.

The urban-rural divide in prevalence is narrowing as urbanization is spreading widely, adversely affecting the lifestyle of populations. Asians have a strong ethnic and genetic predisposition for diabetes and have lower thresholds for the environmental risk factors. As a result, they develop diabetes at a younger age and at a lower body mass index and waist circumference when compared with the Western population. The adverse effect of physical inactivity and fatty food are manifested as the increasing rate of overweightness and obesity, even among children.[8]

The first phase of the ICMR-INDIAB study reported the prevalence of diabetes ranging from 5.3% to 13.6% in different areas in this study.[9] Indian studies have shown the prevalence rate of diabetes mellitus to be 2.4% in rural and 4 to 11% among urban dwellers due to industrialization and urbanization.[7] Previously a disease of middle aged and elderly type 2 DM has escalated in all age groups and is now being seen in younger age groups including adolescents especially high risk population.[6]

There is paucity of data on prevalence of diabetes in Karnataka. It is in this background that a study to find out the prevalence of type 2 diabetes mellitus in Ballari city Corporation was planned.

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METHODS

The study was approved by the human ethical committee, Vijaynagara Institute of Medical Sciences, Ballari, Karnataka. This is a cross sectional study conducted in urban wards of Ballari city during the period May 2008 to April 2009. There are 35 wards in Ballari city. Each ward is considered as a cluster, so totally there were 35 clusters. The total population of Ballari according to 2001

census was 315876. The sampling interval was calculated by dividing the above population with 20 clusters. Then the first cluster is selected for the study by randomly choosing a number less than the sampling interval, the next cluster is selected by adding sampling interval to the randomly chosen number. In this way 20 clusters were selected for this study. The required number of study subjects in each cluster was selected by systematic random sampling technique i.e. 71 subjects per cluster, particular area is selected by using spinning the bottle method, then every fifth house is visited till the required number of subjects are covered. All the members of age group above 20 years of household were included for the study.

The National Urban Diabetes Survey (NUDS), a population based study was conducted in six metropolitan cities across India in 2001 including Bangalore, the study included,[11] 216 subjects aged 20 year and above representative of all socio-economic strata, According to this study prevalence of diabetes mellitus was found to be 12.4%.[10] This prevalence is considered to find out the sample size. The sample size estimated using above formula i.e. 706 is doubled to make the sample more representative and compensate for the design effect. So the sample size required for the study was found to be 1412.

The data was collected using a pretested semi structured questionnaire. This questionnaire was tested for appropriateness by conducting a pilot study. Before collection the data consent was taken from the study subjects after explaining the importance of the study in detail. The data was collected by interview method. Questionnaire included information regarding age, sex, education, occupation, religion, socioeconomic status. Blood glucose estimation was done using glucometer under aseptic precautions. Normal: <200 mg/dl, Diabetes: Signs and symptoms of diabetes mellitus Plus RBS ≥200 mg/dl. Data was compiled using Microsoft excel software and analyzed using SPSS. Proportion, Chi-square test, Odds ratio was applied wherever necessary.

RESULTS

A total of 1412 subjects were included in the study formed the study subjects, which included both males (46.9%) and females (53%). Among the 179 subjects with diabetes mellitus, the age of the subjects ranged from 21 to >70 years. Majority of them were in the age group of >51 years (63.26%) (Table 1).

The prevalence of diabetes mellitus is 15.6% in males and 10.1% in case of females (Table 2). The prevalence of diabetes was highest in 41-60 years age group i.e. 45.2% and lowest in the age group 21-30 years i.e. 0.5%. There was a rise in number of diabetic cases from fourth decade of life to fifth decade and then a gradual decline as the age increases.

Among the study subjects the prevalence of diabetes mellitus was more in males 103 (15.6%) and 76 (10.1%) in females. The present study reveals the prevalence of diabetes among different educational groups and it was observed that the prevalence diabetes mellitus is highest in subjects of SSLC/PUC 34.1% and lowest in post graduates and above i.e. 4.4%.

Majority of diabetic cases are unemployed i.e. 808 (57.2%) and only 59 (4.2%) were semiskilled. The present study shows the prevalence of diabetes mellitus is highest in diabetic cases of upper socioeconomic class i.e. 36.3% and lowest i.e. 2.8% in lower class.

Majority of cases are literate (86%). Majority of the diabetic cases are unemployed (49.2%).69.3% diabetic cases belonged to upper socioeconomic lass.

Table 1: Socio-demographic profile of the study subjects.

Variables	Male (n=662) N (%)	Female (n=750) N (%)	Total (n=1412) N (%)
Age group (years)			
21-30	188 (45.4)	226 (54.6)	414 (29.3)
31-40	120 (43.8)	154 (56.2)	274 (19.4)
41-50	155 (45.3)	187 (54.7)	342 (24.2)
51-60	120 (55.6)	96 (44.4)	216 (15.3)
61-70	50 (46.7)	57 (53.3)	107 (7.6)
>70	29 (49.2)	30 (50.8)	59 (4.2)
Education			
Post graduate and above	45 (77.6)	17 (29.3)	62 (4.4)
Graduate	271 (64.1)	152 (35.9)	423 (29.9)
SSLC/PUC	225 (46.8)	257(53.2)	481 (34.1)
Below SSLC	88 (36.4)	154 (63.6)	242 (17.1)
Illiterate	33 (16.2)	170 (83.8)	204 (14.5)
Occupation			
Unemployed	144 (21.8)	665 (88.7)	809 (57.3)
Unskilled	51 (7.7)	10 (1.2)	61 (4.3)
Semiskilled	48 (7.3)	10 (1.3)	58 (4)
Skilled	340 (51.4)	50 (6.7)	390 (27.6)
Professional	78 (11.8)	16 (2.1)	94 (6.7)

Table 2: Prevalence of diabetes mellitus among study population.

Status	Number	Prevalence (%)
Diabetics	179	12.7
Non diabetics	1233	87.3
Total	1412	100

Table 3: Prevalence of diabetes mellitus among the study subjects.

Variable	n (%)	95%CI	p value
Age (years)			
21-30	2 (0.5)	0.08 -1.58	p<0.001
31-40	14 (5.1)	2.94-8.23	
41-50	50 (14.6)	11.17-18.67	
51-60	66 (30.6)	24.69-36.94	
61-70	36 (33.6)	25.18-42.99	
>70	11 (18.6)	10.21-30.09	
Gender			
Male	103 (15.6)	12.95-18.47	p<0.01
Female	76 (10.1)	8.12-12.45	
Education			
Post graduate and above	10 (16.1)	8.49-26.87	p>0.05
Graduate	45 (10.6)	7.96-13.85	
SSLC/PUC	66 (13.7)	10.84-16.98	
Below SSLC	32 (13.2)	9.38-17.94	
Illiterate	26 (12.8)	8.72-17.95	
Occupation			
Professional	18 (19.1)	12.13-28.04	p<0.05
Skilled	57 (14.6)	11.37-18.39	
Semiskilled	12 (20.3)	11.51-32.02	
Unskilled	4 (6.6)	2.19-15.06	
Unemployed	88 (10.9)	8.88-13.18	
Socio economic status	Non diabetics		
Upper	65 (36.3)	15.92-24.61	p<0.001
Upper middle	60 (33.5)	9.31-14.98	
Lower middle	24 (13.4)	6.39-13.74	
Upper lower	25 (14)	5.78-12.28	
Lower	5 (2.8)	4.28-23.4	

DISCUSSION

The present study is a community based cross sectional study carried out in Ballari city, aimed at identifying the prevalence of type 2 DM. The present study revealed that the prevalence of type 2 diabetes mellitus is 12.7%. Comparing the results of this study with other studies in India revealed that the prevalence of type 2 diabetes mellitus is consistent high with other studies. The Chennai Urban Population Study (CUPS) which looked at the prevalence of diabetes in two socioeconomic classes in Chennai revealed the overall prevalence of type 2 diabetes was 12% in the population aged above 20 year.[11] Another population based study conducted in six large cities from different regions of India, (NUDS) showed that the age standardized prevalence of type 2 diabetes was 12.1%. The prevalence was the highest in Hyderabad (16.6%), followed by Chennai (13.5%), Bengaluru (12.4%), Kolkata (11.7%), New Delhi (11.6%) and Mumbai (9.3%). The recent cures study conducted in urban south India reported prevalence of diabetes as 15.5% which is comparable to our study finding.[10]

In this study, the age of the study subjects ranged from 20 to above 70 years. The prevalence of diabetes mellitus is found to be high in the age group 61-70 years i.e. 33.6% and is least in the age group 21-30 i.e. 0.5% years. It is also observed that the prevalence of diabetes increases as the age increases. There was a rise in number of diabetic cases from fourth decade of life to fifth decade and then a gradual decline as the age increases. It is also observed that there is an increase in the prevalence of diabetes beyond 7th decade of life, which further confirms that as the age increases the prevalence of diabetes raises.[10]

The prevalence of diabetes mellitus is found to be high in males i.e. 15.6% and 10.1% in case of females, with a male to female ratio of 1.4:1. Singh TP, Singh AD, Singh TB in their study on prevalence of diabetes mellitus in Manipur reported a higher prevalence of diabetes mellitus in males than in females[12]. Wild S et al.[13] in their study also reported higher prevalence of diabetes mellitus in males than females. There was inadequate representation of males in the study sample as most of them were employed and were not available during the survey.

The prevalence of diabetes mellitus was more among post graduate and above i.e. 16.1%, 12.8% among illiterate, 13.7% in those who had studied up to SSLC/PUC, 13.2% who had studied below SSLC and 10.6% in graduate. However level of education is not showing any significant association in our study, this is contradictory to the results of studies by Maty SC et al. and Pan XR et al. which report low level of education as a risk factor of type 2 DM.[14]

In the present study majority are unemployed i.e. 49.2%. This may be due to the fact that lack of physical activity among them leading to development of the disease.

The socio-economic status influences occupation, life style and nutrition of social classes which in turn would influence the prevalence and profile of glucose intolerance and diabetic complications. The prevalence of diabetes mellitus in the present study is more among higher socioeconomic class than lower class. The results of this study is supported by study of Ramchandran et al. which reported prevalence of diabetes mellitus to be more among high income group.[10]

Studies in India had revealed that prevalence of diabetes in urban areas was found to be lower in the low socio-economic groups as compared with higher socio-economic groups.[7]

Contrast to this in another study Bhatti et al.[15] had found that the prevalence of diabetes among higher, middle and lower SES group was 21.49%, 66.7% and 12.25% respectively. A study conducted by V. Connolly et al. had described a significant inverse relation between the prevalence of type 2 DM and socioeconomic status, which is most marked between the ages of 40-69 years.[16]

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