Prevalence of Diabetes in Urban Haryana

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RESEARCH

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Abstract

Background
Diabetes will pose a severe burden on the already fragile and under resourced health care system in India. As there is limited data available regarding prevalence of diabetes in northern India, the present study was undertaken to estimate the prevalence of diabetes mellitus and to study the association of risk factors in an urban population of Rohtak.

Method
A cross-sectional survey of 1000 eligible persons. A pre-tested semi-structured interview schedule was deployed.

Results
The prevalence of diabetes in the study population was 8.1% which was higher in females (9.8%) as compared to males (6.1%). Results of impaired fasting glucose showed prevalence of pre diabetics to be 10.3% which was again higher in females (13.3%) as against 6.7% in males. 67% of pre-diabetic and 49.4% of diabetic have family history of diabetes mellitus in first degree relationship while 1.8% of non-diabetic had a family history of diabetes. prevalence of diabetes increased with increasing age up to 70 years. Moreover the prevalence of diabetes was high in two extremes of socio economic classes, being more in low socioeconomic class.

Conclusion
We conclude that prevalence of diabetes in urban Haryana is lower than other states. Also the prevalence of diabetes is higher in females. Prevalence is influenced by age, education, occupation, socioeconomic status and marital status.

Key Words
Diabetes, prevalence, socioeconomic status, urban population

Background

Diabetes mellitus, once considered a disease of minor significance to world health is now a major threat to human health. It is the fifth leading cause of death in the developed countries. As a major non-communicable disease, diabetes mellitus alone claims on an average around 8% of total health budgets in developed countries[1].Global prevalence of diabetes is estimated to increase from 4% in 1995 to 5.4% by year 2025. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025. The major part of this numerical increase will occur in developing countries. There will be a 42% increase from 51 to 72 million in the developed countries and 170% increase from 84 to 228 million, in the developing countries. Thus, by the year 2025, more than 75% of people with diabetes will reside in developing countries, as compared with 62% in 1995. In 1995, the countries with the largest number of people with diabetes were, and are projected to be in the year 2025, India (19 and 57 million respectively), China (16 and 38 million) and the U.S.A. (14 and 22 million). The greatest increase between 1995 and 2025 is expected to occur in India (195%).[2]

According to s recent report there will be a 42% increase in diabetes cases from 51 to 72 million in the developed countries and 170% increase from 84 to 228 million, in the developing countries. Thus, by the year 2025, more than 75% of people with diabetes will reside in developing countries, as compared with 62% in 1995. In 1995, the countries with the largest number of people with diabetes were, and are projected to be in the year 2025, India (19 and 57 million respectively), China (16 and 38 million) and the U.S.A. (14 and 22 million). The greatest increase between 1995 and 2025 is expected to occur in India (195%).[3]

Studies conducted in India in the last decade have highlighted that not only is the prevalence of type 2 diabetes was high, but also it is increasing rapidly in the urban population[4,5]. Three diabetic surveys conducted in Chennai (south India) in years 1989[6], 1995[7] and 2000[8] showed a rising trend of diabetes which was statistically significant (c2 = 18.0, P < 0.001). Another study conducted by Ahuja et al, in 1991 in New Delhi (north India) in urban region showed that prevalence of diabetes has increased 2.9 times in 2 decades to 6.7 % from 2.3% in 1972.[9]

The difference could be because the North Indians are migrant Asian populations while the south Indians are the host populations. To be able to plan and allocate resources adequate background data is required. As there is limited data available regarding prevalence of diabetes in northern India, it is advisable to do some more studies in this area to assess the burden of diabetes mellitus and identify risk factors associated with it. Therefore, this study aims to establish the prevalence of diabetes mellitus and to study the association of risk factors in an urban population of Rohtak.

Method

Study Area: The study was conducted in urban field practice area attached to Dept. of Community Medicine, Pt. B. D. Sharma PGIMS, Rohtak , which are used for the purpose of teaching, training and research activities for undergraduate medical students, graduate nursing students, interns and postgraduates. The population of this area as on 31st march 2007 was 56470.

Study Design: The study was a descriptive type of community based epidemiological study with cross-sectional design. All males and females of age group of 18 years or above, who are permanent resident of the area for at least last 1 year, were included in the study. The study spanned over a period of 11 months, beginning from Oct 2007 to Sep 2008. Assuming a prevalence of diabetes mellitus in adults in urban area as 10% and allowable errors of 20% at level of significance of 95%, a sample of 1000 eligible persons was selected taking into consideration of operational feasibility[10].

Methodology: List of anganwadis (these are the actual field areas divided according to the population and these specific areas are under the control of one aganwadi worker) in the study area was obtained from Child Development Project officer (CDPO) office under ICDS scheme. Out of 32 anganwadis currently functioning in the urban field practice area, 10 anganwadis were selected by random sampling technique. The investigator then met the anganwadi workers of the selected anganwadis to explain the purpose of study and seek their co-operation. Anganwadi wise list of all persons in the age group of 18 years and above was prepared from the household survey registers. In the next stage, 100 persons were selected by simple random sampling method using random number table from each list.

Inclusion Criteria
1.   Persons having age ≥ 18 yrs

2.   Persons residing in respective area for last 1 year or more.

Exclusion Criteria
1.   Those not able to give informed consent.
2.   Adults suffering from obvious psychiatric illness leading to inability to give informed consent.
3.   Adults suffering from diseases causing ascites, oedema or severe illness.
4.   Pregnant women
5.   Women who had given birth in the two months preceding the study.

Data Collection: A pre-tested semi-structured interview schedule was used for interviewing the study subjects. The interview schedule included information on various socio demographic variables. The study was conducted by carrying out house to house visits. All the subjects were fully informed about the purpose of the study. The confidentiality of the information was assured. Interview was started with general discussion to build up a rapport with the respondents and to gain confidence. If the individual is not contacted on three consecutive visits, the individual was excluded from the study and next individual from the list was selected. The visit for interview was made at a time convenient to the person. Informed consent was taken from the individual before conducting the interview.

Each individual was advised & motivated to maintain overnight fasting of 12 hours and was instructed to report at respective health station in the morning and quantitative estimation of fasting plasma glucose level was done by finger prick blood analysis with Accu Chek Sensor glucometer using glucose oxidase dehydrogenase enzymatic reaction method[11]. Overall response rate was approximately 92%. Statistical analysis: data was compiled, tabulated and analyzed using SPSS 10 software. The statistical tests applied for analysis were percentages, proportions and chi-square test.

Results

The aim of study was to assess the prevalence of diabetes mellitus in the urban population and to study the association of various risk factors with diabetes mellitus. Data was collected from 1003 study subject selected by random sampling. The interview schedule included information on various socio demographic variables and family history of diabetes mellitus.

Table 1 shows that out of total 1003 subjects recruited in the study, 23% were 18-29 year old, 19% were 30-39 year, 21% were 40-49 year old, 20% were 50-59 year, 13% were 60-69 year old, 4% were 70-79 year olds and 0.7% were 80 year and above. Out of the total sample, females constituted a slightly higher percentage of 54% and males were 46%.

The prevalence of diabetes in the study population was 8.1% which was higher in females (9.8%) as compared to males (6.1%). Results of impaired fasting glucose showed prevalence of pre diabetics to be 10.3% which was again higher in females (13.3%) as against 6.7% in males. The difference was statistically significant, p value being <0.001

(Table 2). Out of 81 diabetics examined in this study, 26 (32.1%) subjects were aware of diabetic status. Table 3 also shows that 67% of pre-diabetic and 49.4% of diabetic have family history of diabetes mellitus in first degree relationship while 1.8% of non-diabetic had a family history of diabetes. The association was found to be significant (p<0.001)

Almost a quarter of the study subjects were illiterate, majority of them were females. No female had received education beyond graduation while 0.7% males were post graduate. Among remaining maximum were educated up to 10th standard (21.6%) and 16.3% were graduate. 65.3% of the females were literate which is higher than the national average of 56.72% (Census 2001) for females. Similarly, 88.9% males in the study were literate which was higher than the national average of 70.36% for males (Census 2001). In the study group, majority of the females were housewives (90.8%). Majority of the males in the study population were skilled workers (37.4%). 18.5 % of males were involved in office jobs. 8.2% of study subjects were unemployed or retired personnel. Also 84.3% of the study subjects were married, 0.4% were divorcees and 8.2% were widowed (Table 1).

Table 3 shows that prevalence of diabetes increased with increasing age up to 70 years, with prevalence decreasing in higher age groups above 70 years. The highest prevalence (21.6%) was observed in 60-69 year age group. A high prevalence of impaired fasting glucose (IFG), a pre diabetic state, in younger population was an area of concern. The prevalence of IFG in18-29 year old was 6.1%, 13% in 30-39 year old and 7.9% in 40-49 year age group. The prevalence of diabetes was highest in illiterates at 13%, with decreasing trend of prevalence observed with better education beyond 8th standard. However, no such trend was observed in the prevalence of impaired fasting glucose. Also the prevalence of diabetes was highest in housewives (9.9%) and unemployed/retired personnel (9.6%). The prevalence was lowest in unskilled workers. IFG was also higher in housewives (14.4%). The association was statistically very significant. Moreover the prevalence of diabetes was high in two extremes of socio economic classes, being 16.7% in lower and 14.3% in upper class as compared to nearly 7-8% in upper middle, lower middle and upper lower classes, each. However, the prevalence of impaired fasting glucose was found to be highest in lower middle class (13.9%). Table 3 also shows that prevalence of diabetes was highest in widows (14.6%) as compared to 8.2% in married subjects. Prevalence of impaired fasting glucose was 15.9% in widows, 10.2% in married and 25% in divorcees. Prevalence of diabetes was higher in nuclear families (9.0%) as compared to 6.6% in joint families. However, prevalence of impaired fasting glucose was nearly the same with 10% in nuclear families and 10.8% in joint families. The results were non significant (p=0.381).

Discussion

Diabetes mellitus may not be called disease of millennium but it is surely a disease of millions. It is of major public health importance on account of its long term effect leading to serious conditions like coronary heart disease, nephropathy and neuropathy, so it is very important to detect such cases as early as possible and treat them before the occurrence of any complications. Diabetes mellitus is influenced by environmental factors operating within genetic limits. Out of total 1003 subjects recruited in the study, majority (23%) were in the age group of 18-29 year. Out of the total study subjects examined, females constituted a slightly higher percentage (54%) than males (46 %.). It may be explained due to more availability of females at homes.

Prevalence of diabetes mellitus: The prevalence of diabetes in the study population was 8.1% which was higher in females (9.8%) as compared to males (6.1%), the difference being statistically significant (p value <0.001). Results of impaired fasting glucose showed prevalence of pre diabetics to be 10.3% which was again higher in females (13.3%) as against 6.7% in males. The difference was statistically significant. A community based study by Misra et al in urban slums of Delhi taking ADA criteria into consideration in 2001; diabetes mellitus was recorded in 11.2% of males and 9.9% of females, the overall prevalence being 10.3%. Impaired fasting glucose (IFG) was observed more in females (14.1) as compared to males (15.7%), although the difference was not statistically significant[11]. The prevalence reported is higher than the present study. It may be attributable to difference in population characteristics or study design. A community based study, done in Kashmir, in 2000 by Zarger et al, estimated prevalence of diabetes in urban area as 6.1 per cent[12]. It also revealed that the prevalence in the southern part of India to be higher-13.5 per cent in Chennai, 12.4 per cent in Bangalore and 16.6 per cent in Hyderabad; compared to eastern India (Kolkatta), 11.7 per cent; northern India (New Delhi), 11.6 per cent; and western India (Mumbai), 9.3 per cent[13].

Since Rohtak is not a metropolitan city and the urbanization, industrialization and western life style is not fully adopted by the population, it may justify the low prevalence rate in Rohtak in comparison to big metropolitan cities. Moreover most of study subjects were in middle class income group and the study area does not depict a complete picture of urban life style trends prevalent in affluent cities. These issues may also be taken into consideration.

Published studies[14-23] vary in methodologies adopted and sampling frames and hence comparison of prevalence rates is, strictly speaking, not meaningful. However, despite all methodological issues, there is no doubt that the prevalence rates are rising in India at an alarming rate. There is dearth of studies in northern states about diabetes in contrast to the qualitative research work done in south India in the field of assessing the burden of diabetes in the community. Moreover prevalence of impaired fasting glucose and impaired glucose tolerance which are at high risk into developing in full blown diabetes mellitus is also increasing which hints that prevalence of diabetes mellitus will further rise in the near future.

Sex wise distribution of Diabetes mellitus: This study suggests that the prevalence is little higher in females (9.8%) than males (6.1%). Results of impaired fasting glucose showed prevalence of pre diabetics to be 10.3% which was again higher in females (13.3%) as against 6.7% in males. The difference was statistically significant, p value being <0.001. Similar pattern of distribution of cases is revealed in other studies also[14-16, 19-21]. These results were in contrast to the study done by Misra et al [11] in Delhi which suggested a little higher prevalence in males. Most probable reason may be attributed to sedentary life style as most of women are usually house wives and stay at home. Other factors which may be responsible are genetic predisposition, pregnancy & dietary habits etc.

Age wise distribution of Diabetes mellitus: The present study shows that prevalence of diabetes increased with increasing age up to 70 years, with prevalence decreasing in higher age groups above 70 years. The highest prevalence (21.6%) was observed in 60-69 year age group. A high prevalence of impaired fasting glucose (IFG), a pre diabetic state, in younger population was an area of concern. The prevalence of IFG in18-29 year old was 6.1%, 13% in 30-39 year old and 7.9% in 40-49 year age group. The results were highly significant. Our study implies that these subjects developed diabetes in the most productive years of their life and had a greater chance of developing the chronic complications of diabetes. A younger age at onset of diabetes had been noted in Asian Indians in several studies. The National Urban Diabetes Survey (NUDS)[13] conducted in six major cities in India in the year 2000 revealed that onset of diabetes occurred before the age of 50 years in 54.1% of cases. It suggested that the prevalence of diabetes was more in patient between 60 and 69 years of age. The prevalence of impaired glucose tolerance (pre-diabetes) was significantly higher than that of diabetes in subjects under 40 years of age. Similarly, in a study by Deo et al, conducted in rural population of Sindhuburg, Maharashtra, in 2006, it was observed that as the age increases the number of individuals showing signs of diabetes also increases and hence the percentage of individuals showing diabetes thus increases[18]. The famous DECODA, Diabetes Epidemiology: Collaborative Analysis of Diagnostic study, 2002, revealed that both fasting plasma glucose (FPG) and 2 hour plasma glucose (2hPG) concentrations increased with age and reached a peak at 60–69 years of age then started to decline in Indian subjects[17]. Indians had the highest prevalence of diabetes among Asian countries. The age at which the peak prevalence of diabetes was reached was 10 years younger in Indian compared with Chinese and Japanese subjects. Urbanization, obesity and unhealthy dietary practices may be the reason for increase in pre-diabetic population in young individual.

Marital status: There was significant relation between marital status and prevalence of diabetes. It was highest in widows (14.6%) as compared to 8.2% in married subjects. Prevalence of impaired fasting glucose was 15.9% in widowed 10.2% in married and 25% in divorcees. However the mean age of widow and married subject were 64 and 43

years respectively. It is predicted that other factors might play a minor role along with the age factor. There was no study available to support this evidence.

Socio-economic status: The present study shows that the prevalence of diabetes was high in two extremes of socio economic classes, being 16.7% in lower and 14.3% in upper class as compared to nearly 7-8% in upper middle, lower middle and upper lower classes, each. However, the prevalence of impaired fasting glucose was found to be highest in lower middle class (13.9%). However the results were not significant (p =0.228). There have been different presumptions about relationship of diabetes with socio economic factors. From ancient time, diabetes is being considered as a disease of riches but recent data suggests that diabetes is also prevalent in lower socio economic sections. A study by Misra et al in 2001 in urban slums in Delhi supports this evidence[11]. A study from the UK in 2000 records that type 2 diabetes mellitus is inversely related to socio-economic strata. In this study, the prevalence of diabetes in the least deprived quintile was 13.4 per thousand persons compared to 17.22 in the most deprived[24]. In contrast, a study done by Dutt et al in tertiary hospital, Kolkata in 2004, income, upper middle or more, had significantly increased risk for type 2 diabetes[25]. High prevalence of malnutrition in people belonging to low socio-economic strata in developing countries led to the assumption that obesity and diabetes will not be a crucial problem in them. Whereas a rural population usually has low risk of development of diabetes and obesity in India, their migration to metropolitan cities exposes them to several adverse lifestyle and environmental influences. Several lifestyle alterations result from this transition: changes from their traditional penurious eating habits; exposure to severe stress; decreased physical activity; and increase in smoking, tobacco chewing and alcohol intake. These entire factors may lead to rise in diabetes mellitus prevalence in underprivileged section of the society.

Occupation: It was observed 90.8% of women under study were involved in household work.
Highest prevalence of diabetes was observed in housewives (9.9%) followed by unemployed and retired personnel (9.6%). The similar trend was observed in case of IFG.
As household activities are considered under sedentary to moderate life style, lack of exercise and physical activity may be held responsible for this. Various studies support these results[11, 13,19,22,23].

Conclusion

Prevalance of diabetes in urban Haryana is less as compared to other states. Also the prevalence of diabetes is more in females as compared to males. Prevalence is influenced by factors like age, education, occupation, socioeconomic status and marital status.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare they have no conflict of interest

Tables

Table 1: Distribution of study subjects according to various socio-demographic profiles.

	Male N= 460 (%)	Female N=543 (%)	Total N=1003 (%)	Chi square value
Age Group (Yrs)				
18 – 29	125 (12.5%)	104 (10.4%)	229 (22.8%)	Chi square = 19.760
30 – 39	85 (8.5%)	108 (10.8%)	193 (19.2%)	df = 6
40 - 49	97 (9.7%)	105 (10.5%)	202 (20.81%)	p value = .003
50 - 59	87 (8.7%)	110 (11.0%)	197 (19.6%)	
60 - 69	42 (4.2%)	92 (9.2%)	134 (13.4%)	
70-79	21 (2.0%)	20 (2.1%)	41 (4.1%)	
80 years & above	4 (0.4%)	3 (0.3%)	7 (0.7%)	
Education				
Post Graduate	7 (0.7%)	0	7 (0.7%)	Chi square = 159.50
Graduate	129 (12.9%)	34(3.4%)	163 (16.3%)	df = 6
Upto 12th	75 (7.5%)	44 (4.4%)	119 (11.9%)	p <0.001
Upto 10th	100 (10.0%)	117 (11.7%)	217 (21.6%)	
Upto 8th	54 (5.4%)	91 (9.1%)	134 (13.4%)	
Upto 5th	44 (4.4%)	69 (6.9%)	113 (11.3%)	
Illiterate	51 (5.1%)	188 (18.7%)	239 (23.8%)	
Occupation				
Housewife	0	493 (90.8%)	493 (49.1%)	Chi square = 832.01
Office job	85 (18.5%)	26 (4.8%)	111(11%)	df = 4
Skilled	172 (37.4%)	12 (2.2%)	184 (18.4%)	p <0.001
Unemployed/ Retd	78 (17%)	5 (0.9%)	83(8.2%)	
Unskilled	125 (27.2%)	7 (1.3%)	132 (13.2%)	
Marital Status				
Married	378 (37.7%)	468 (46.7%)	846 (84.3%)	Chi square = 15.739
Unmarried	48 (4.8%)	23 (2.3%)	71 (7.1%)	df = 3
Divorcee	1(0.1%)	3 (0.3%)	4 (0.4%)	p <0 .001
Widow	33 (3.3%)	49 (4.9%)	82 (8.2%)	
Total	460 (45.9%)	543 (54.1%)	1003 (100%)	

Table 2: Prevalence of diabetes mellitus in study population

Diabetic status	Male N= 460 (%)	Female N=543 (%)	Total N=1003 (%)	Chi square value
Non diabetic	401 (87.2)	418 (77.0)	819 (81.7)	Chi square = 17.64
Pre diabetic	31 (6.7)	72 (13.3)	103 (10.3)	df = 2
Diabetic	28 (6.1)	53 (9.8)	81 (8.1)	p value < 0.001
Total	460 (45.9%)	543 (54.1%)	1003 (100%)	

Table 3: Distribution of non-diabetic, pre-diabetic and diabetics according to the socio-demographic profile.

	Non diabetic n (%)	Pre diabetic (IFG) n (%)	Diabetic n (%)	Total n (%)	Chi square value
Age Group (Years)					
18 – 29	213 (93.0)	14 (6.1)	2 (0.9)	229 (100)	Chi square = 80.92
30 – 39	163 (84.5)	25 (13.0)	5 (2.6)	193 (100)	df =12
40 - 49	172 (85.1)	16 (7.9)	14 (6.9)	202 (100)	p value < 0.001
50 - 59	151 (76.6)	24 (12.2)	22 (11.2)	197 (100)	
60 - 69	87 (64.9)	18 (13.4)	29 (21.6)	134 (100)	
70-79	28 (68.3)	5 (12.2)	8 (19.5)	41 (100)	
80 years & above	5 (71.4)	1 (14.3)	1 (14.3)	7 (100)	
Occupation					
Housewife	373(75.7%)	71(14.4%)	49(9.9%)	493 (100%)	Chi square = 28.61
Office job	96(86.5%)	7(6.3%)	8(7.2%)	111 (100%)	df = 8
Skilled	162(88%)	10(5.4%)	12(6.5%)	184 (100%)	p <0.001
Unemployed/ Retd.	68(81.9%)	7(8.4%)	8(9.6%)	83 (100%)	
Unskilled	120(90.9%)	8(6.1%)	4(3%)	132 (100%)	
Socio economic status					
Upper	40(81.6)	2(4.1)	7(14.3)	49(100)	Chi square = 10.56
Upper middle	201(83.1)	21(8.7)	20(8.3)	242(100)	df = 8
Lower middle	220(78.3)	39(13.9)	22(7.8)	281(100)	p =0.228
Upper lower	353(83.1)	41(9.6)	31(7.3)	425(100)	
Lower	5(83.3)	0(0.0)	1(16.7)	6(100)	
Marital status					
Married	691(81.7)	86(10.2)	69(8.2)	846(100)	Chi square = 19.54
Unmarried	68(95.8)	3(4.2)	0(0.0)	71(100)	df = 6
Divorcee	3(75.0)	1(25.0)	0(0.0)	4(100)	p =0.003
Widow	57(69.5)	13(15.90)	12(14.6)	82(100)	
Family structure					
Nuclear	505(81.1)	62(10.0)	56(9.0)	623(100)	Chi square = 1.930
Joint	314(82.6)	41(10.8)	25(6.6)	380(100)	df = 2
					p =0.381