Prevalence Of Diabetes Mellitus Type 2 In The General Population Of Ahmedabad City

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Abstract: <u>Background:</u> Diabetes mellitus type 2 is the predominant form of diabetes worldwide. The prevalence of DM type 2 is increasing rapidly. According to the IDF, 61.3 million people in India had diabetes in 2011. That figure is projected to rise to 101.2 million by 2030. However, there is dearth of data available on diabetes prevalence in Ahmedabad. <u>Method:</u> The study was carried out by means of a cross-sectional community-based screening of 300 people, aged ≥ 30 years residing in Ahmedabad city. <u>Result:</u> The prevalence of diabetes mellitus type 2 is 21% in this study. The prevalence in 30-40 years age group is 8.11%. Prevalence increases with increasing age. The prevalence of diabetes is significantly more among males (29.5%) than females (14.6%). It is highest in middle socio economic group- 25.7%. Diabetes is also significantly associated with the middle and low socio economic groups. <u>Conclusion:</u> There is a high prevalence of diabetes mellitus type 2 in the studied population. Earlier considered a disease of the elderly and affluent society, diabetes is now widely prevalent in younger ages and in the low socio economic class as well.

Key Words: diabetes, diabetes mellitus type 2, prevalence, Ahmedabad.

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Introduction: Type 2 diabetes mellitus (T2DM) is the predominant form of diabetes worldwide; accounting for 90% of cases globally.[1] The impacts of T2DM are considerable: as a lifelong disease, it increases morbidity and mortality and decreases the quality of life.2 At the same time, the disease and its complications cause a heavy economic burden for diabetic patients themselves, their families and society.[2]

Although the prevalence of both type 1 and type 2 DM is increasing worldwide, the prevalence of type 2 DM is rising much more rapidly because of increasing obesity, reduced activity levels and population aging.[3] The 2012 report of the International Diabetes Federation(IDF) says that 371 million people were living with diabetes in 2011.[4] Based on current trends, the IDF projects that 438 million individuals will have diabetes (type 2 DM) by the year 2030.3 In line with the global prevalence trends, diabetes burden is increasing as rapidly in India as the country is industrializing. According to the IDF, 61.3 million people in India had diabetes in 2011. That figure is projected to rise to 101.2 million by 2030.[5]

There is an extensive history of epidemiological studies on diabetes conducted in different parts of India. However, there is dearth of data available on diabetes prevalence in Ahmedabad. Ahmedabad is one of the fastest developing cities of the country and is increasingly adapting the western lifestyle and junk food culture, while the traditional high fiber diet and physical hard work patterns are being lost. Also, there is increasing rural to urban migration. All these factors put the people of Ahmedabad at a high risk of developing the disease. It is in the wake of this scenario that the current study was conducted.

Materials and Method: Study design, sampling technique and data collection: The study was an observational type of study carried out by means of a cross-sectional community-based screening of the people residing in Ahmedabad city. The subjects were selected by simple random sampling. The data was collected by means of a personal interview and history taking followed by physical examination. An informed consent of all the participants was taken. The study was carried out during November 2011 to May 2012.

Sample size: Rough estimate of the prevalence of diabetes mellitus, as estimated by Research Society for the Study of Diabetes in India (RSSDI), Ahmedabad chapter, was at 13.8%.[6] With this prevalence rate and 10% margin of error at 5% level of significance, the calculated sample size is 2400.[7] Due to limitation of resources, the study was carried out with 300 participants, which is 12.5% of the required sample size.

Study population/ place of study: To make the sample true representative of the population in terms of socio economic demographics and respective lifestyle and diabetes risk factors, people belonging to all the three socio economic groups were included in the study in proportion to their number in the general population at large. Due to lack of availability of such actual data with the city's municipal corporation, a rough estimate was made. The sample size was made to include about 10% people belonging to high income group, 70% middle income group and 20% low income group people. For high income group people, people residing in a high-end, posh residential area society were taken. For middle income group, common societies were identified. And for low income group, 'chali'/ slum area was chosen. This classification was taken due to its ease of use and comparable life styles in people so grouped.[8]

Inclusion criteria: Subjects of age more than or equal to thirty years were included in the study.

Exclusion criteria: Known cases of diabetes mellitus type 1, pregnant women, people suffering from chronic auto immune diseases, people taking steroidal drugs, people who were acutely ill, and people less than 30 years of age were excluded from the study.[3]

Instruments used: (a) Glucometer used and test strips used: Accu-Chek Sensor (Roche pharmaceuticals, Germany) (b) For recording blood pressure: mercury-in-glass sphygmomanometer (Diamond make) calibrated in mmHg (0–300).

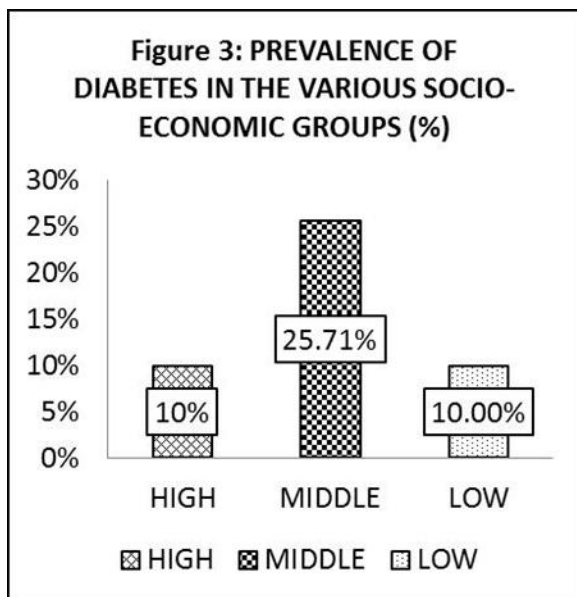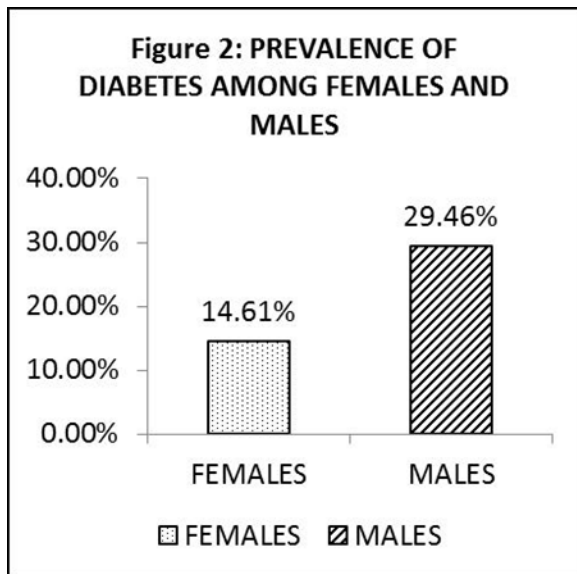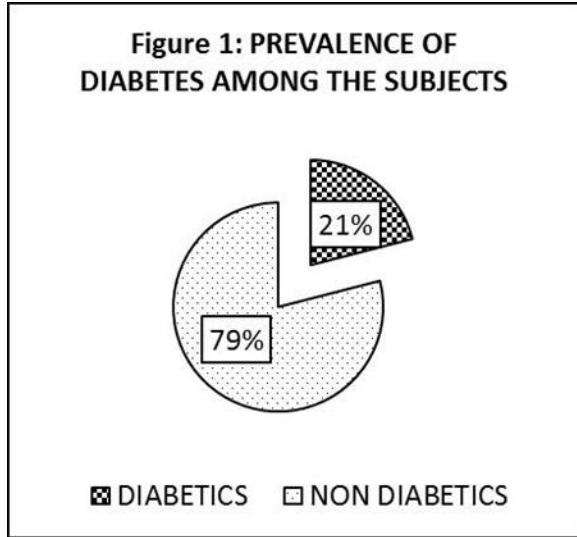**Classifications and cut-offs of parameters: (a)Random blood sugar: Diabetics:** Subjects with a random blood sugar more than or equal to 200 mg/dl with symptoms of diabetes (polyuria/ polydipsia/ polyphagia/ recent unexplained weight loss or weight gain/blurring of vision/fatigue/frequent superficial infections and slow healing of wounds) and known cases of diabetes, irrespective of their current treatment status and glycemic control status. All others were considered as non-diabetics.[3] **(b) Blood Pressure: Hypertensives:** those subjects whose systolic blood pressure SBP was ≥140 mmHg and / or diastolic blood pressure DBP ≥90 mmHg and known cases of

hypertension, irrespective of treatment being taken or not and blood pressure being controlled or uncontrolled, were taken as Hypertensives. Rest all were taken as Non Hypertensives (pre hypertensives and normotensives). (JNC 7 report on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, U. S. Department of Health and Human Services)[9] (c) Body Mass Index: obese: subjects with BMI ≥ 30 kg/m² were classified as being Obese and those with BMI ≥25 kg/m² but ⬚ 30 kg/m² were identified as being Overweight. (Global database on BMI, WHO 2005)[10]

Statistical analysis: The data was analyzed using Microsoft excel by applying unpaired t-test for quantitative data and using Epi Info 7 version 7.0.8.3 by applying chi- square test for qualitative data. Correlation coefficients and Odds ratio were calculated for the different variables. Significance level was taken as p less than 0.05.

Result: The 300 respondents in the study included 171 females and 129 males. 10% of the subjects were taken from high socio economic group – they included 19 females and 11 males. 20% of the subjects were taken from low socio economic group, which included 34 females and 26 males. Among the respondents/ subjects belonging to the middle socio economic group (70%), there were 118 females and 92 males. Figure 1, figure 2 and figure 3 depict the prevalence of diabetes among the subjects. Table 1 shows the prevalence of diabetes in different age groups. Table 2 shows the comparison of characteristics of diabetic and non-diabetic subjects. Table 3 shows the significance of association of gender and socio-economic group with diabetes prevalence.

Discussion: Prevalence of Diabetes: A very high prevalence - 21% of diabetes mellitus type 2 has been recorded in this study. Gupta R et al had reported a prevalence of 20.1% in Jaipur in 2006[11] while Menon et al[12] reported a 19.5% prevalence in Kochi in 2006. Ramachandran A et al reported a prevalence of 18.6% in Tamil Nadu in 2008.[13] The ICMR study conducted in the early 1970s reported a prevalence of 2.1%in India and in the same study approximately 3.7% prevalence was quoted for

Figure 1: PREVALENCE OF DIABETES AMONG THE SUBJECTS

21%

79%

⊠ DIABETICS   ▧ NON DIABETICS

Figure 2: PREVALENCE OF DIABETES AMONG FEMALES AND MALES

29.46%

14.61%

40.00%
30.00%
20.00%
10.00%
0.00%

FEMALES   MALES

▣ FEMALES ▨ MALES

Figure 3: PREVALENCE OF DIABETES IN THE VARIOUS SOCIO-ECONOMIC GROUPS (%)

30%
25%
20%
15%
10%
5%
0%

25.71%

10%   10.00%

HIGH   MIDDLE   LOW

⊠ HIGH ⊠ MIDDLE ▤ LOW

Ahmedabad.[14] In 1991, Ahuja reported a prevalence of 3.9% in Ahmedabad.[15] Thereafter, the National Urban Diabetes Survey (NUDS), conducted in six large cities from different regions of India in 2001 revealed a prevalence of 12.1%.[16] The prevalence rate in this study indicates the continuation of the rising trend in prevalence of diabetes over all these years with a four-fold increase since 1991.

Age and Diabetes: Prevalence of diabetes increases with increasing age. Diabetes is most prevalent in the age group 70 − 80 years (44%). Both females and males show similar trend in the prevalence of diabetes in the different age groups. West et al (1978)[17], Gupta et al (1982)[18] and Ramachandran et al (1988)[19] have reported the same trend of very high prevalence of diabetes with increasing age in their respective works. The prevalence of diabetes is high in the younger age group of 30-40 years – 8.11%. This underscores the penetration of diabetes and its risk factors in younger ages.[20, 21]

Table 1: Prevalence of Diabetes in the Different Age Groups -%

Age group (years)	Females	Males	Females + Males
30-40	2.44%	15.15%	8.11%
40-50	2.78%	10%	5.36%
50-60	16.67%	43.33%	26.92%
60-70	32.14%	44.44%	38.18%
70-80	40%	50%	44%
80-90	0	11.11%	8.33%
Total	14.62%	29.46%	21%

Gender and Diabetes: The prevalence of diabetes is significantly more among males (29.5%) compared to females (14.6%). Kutty et al (2000)[22], Gupta et al (2004)[23], Mohan et al (2005)[24] and Reddy et al (2006)[25] have reported higher prevalence of diabetes among males too. The WHO also quotes a higher prevalence of diabetes among males in its non-communicable disease report of 2010.[26] However, some studies evidence the opposite.[1, 17] How gender relates to diabetes, is not conclusively known.

Table 2: Characteristics of the Diabetic and Non-Diabetic Subjects

	Non Diabetics		Diabetics		T Test	Result p<0.05
	Mean	SD	Mean	SD		
Age (years)	49.70	14.09	58.83	11.06	2.43×10^{-07}	S
Weight (kg)	63.39	15.31	70.35	14.87	0.001	S
Height (m)	1.57	0.1	1.6	0.1	0.12	NS
BMI (kg/m^2)	25.53	5.46	27.66	5.72	0.009	S
SBP (mmHg)	132.07	22.91	139.62	22.07	0.02	S
DBP (mmHg)	83.14	10.69	83.62	11.01	0.76	NS
RBS (md/dl)	121.12	27.30	210.97	102.25	2.62×10^{-09}	S

Table 3: Significance of Association

Male Gender with Diabetes					
Gender	Odds Ratio	Lower Limit	Upper Limit	Chi Square Test	Result ($\chi^2 \geq 3.84$)
Male	2.4387	1.3811	4.3061	8.8836	S
Female	0.4101	0.2322	0.7241	8.8836	S
SE Group with Diabetes					
SE Group	Odds Ratio	Lower Limit	Upper Limit	Chi Square Test	Result ($\chi^2 \geq 3.84$)
High	0.3056	0.0894	1.0442	3.1076	NS
Middle	6.0000	2.7782	12.9581	22.6420	S
Low	0.2105	0.0854	0.5191	11.9600	S

Socio economic group and Diabetes: The prevalence of diabetes is found to be highest in middle socio economic group- [25].7%. At 5% significance level, diabetes prevalence is found to be significantly associated with this SE group. V Mohan et al. in 2001 concluded a higher prevalence of diabetes among the people of middle socioeconomic group than those of low socio economic group.[27] Diabetes is also significantly associated with the lower socio economic group. Connolly V et al had suggested the same in their study.[28] But the odds ratios for a person belonging to high socio economic group and for a person of low socio economic group of developing diabetes are comparable. This suggests that the low SE group too has high prevalence of diabetes and its associated risk factors. The better education, knowledge about disease, access to better health amenities and healthier dietary habits probably accounts for the relatively less prevalence of diabetes among the high SE group subjects. However, Ramachandran A et al observed a lower prevalence among the people of lower socio-economic group people.[29]

Conclusion: There is a high prevalence of diabetes mellitus type 2 among the present study participants- 21% in age ≥30 years. The prevalence of the disease is significantly more among males compared to females. The prevalence of diabetes is highest among the subjects belonging to the middle socio economic group and the association is statistically significant. The prevalence is also significantly more in low socio economic group subjects, emphasizing the penetration of the disease and its etiologic factors in them too. But the prevalence in higher socio economic group subjects is less. The prevalence of diabetes is high in the younger age group- 30-40 years, which highlights the increasingly younger age of onset of diabetes now, and the prevalence increases with age. It is therefore recommended that bigger agencies and government conduct large scale studies to get the exact figures, to bring to light the responsible factors and implement measures to arrest the increase in diabetes prevalence.

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