

# A cross-sectional study on the prevalence of diabetes mellitus and its association with various sociodemographic factors in Surendranagar city, Gujarat

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## ABSTRACT


**Background:** Type 2 diabetes (formerly called non-insulin-dependent or adult-onset) results from the body's ineffective use of insulin and is responsible for 90% of people with diabetes around the world. Healthy diet, regular physical activity, maintaining a normal body weight, and avoiding tobacco use can prevent or delay the onset of Type 2 diabetes. Diabetes increases the risk of heart disease and stroke. 50% of people with diabetes die of cardiovascular disease. **Objectives:** The objectives of this study were to know the prevalence of diagnosed case of diabetes mellitus among adults and its association with various sociodemographic factors. **Materials and Methods:** A cross-sectional study was done; the total sample size was 3600. Of total 14 wards, 6 wards were selected by simple random sampling; out of each selected ward, 600 people were taken by house-to-house visit. **Results:** The prevalence of diagnosed cases of diabetes was 4.94% in the study population. The prevalence of diabetes increased significantly with increasing age. There was no significant association between gender, religion, types of family, dietary pattern, and the prevalence of diabetes. The prevalence of diabetes was higher among lower socioeconomic class and illiterate. **Conclusion:** People suffering from diabetes should be informed by the treating doctors about regular checkups, dietary modifications, exercise, foot care, regular treatment, early notice of complications, etc., which will go a long way in the management and quality of life of the patient.

**KEY WORDS:** Diabetes Mellitus; Prevalence; Diagnosed Cases; Sociodemographic Factors

## INTRODUCTION

Type 2 diabetes (formerly called non-insulin-dependent or adult-onset) results from the body's ineffective use of insulin and is responsible for 90% of people with diabetes around the world.<sup>[1]</sup> Healthy diet, regular physical activity, maintaining a normal body weight, and avoiding tobacco use can prevent or delay the onset of Type 2 diabetes. Diabetes increases the risk

of heart disease and stroke. 50% of people with diabetes die of cardiovascular disease.<sup>[2]</sup> Combined with reduced blood flow, neuropathy (nerve damage) in the feet increases the chance of foot ulcers, infection, and eventual need for limb amputation. Diabetic retinopathy is an important cause of blindness. 1% of global blindness can be attributed to diabetes.<sup>[3]</sup> Diabetes is among the leading causes of kidney failure.<sup>[4]</sup> The overall risk of dying among people with diabetes is at least double the risk of their peers without diabetes.<sup>[5]</sup> In 2012, an estimated 1.5 million deaths were directly caused by diabetes.<sup>[6]</sup> More than 80% of diabetes deaths occur in low- and middle-income countries.<sup>[7]</sup> The WHO projects that diabetes will be the 7<sup>th</sup> leading cause of death in 2030.<sup>[4]</sup> In this context, this study was conducted to determine the prevalence of diabetes mellitus (DM) in Surendranagar city, Gujarat, India.

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**MATERIALS AND METHODS**

It was a cross-sectional study conducted in Surendranagar city. The total sample size was 3600 using the formula  $z^2pq/d^2$  (Prevalence of diabetes = 10% and taking 10% non-response). The information was gathered in a pretested and predesigned questionnaire by house-to-house visit. There are 14 wards in Surendranagar city, out of which 6 wards were selected by simple random technique. From each ward, houses were selected till our desired sample size 600 people were achieved. All adult men and women in the selected houses were included for the study so as to complete a sample of 3600 population. Only people with previously diagnosed as diabetes were labeled as diabetic to know prevalence. This study was conducted from January 2015 to June 2016. Information was collected, compiled, and analyzed by applying suitable tests. The data were analyzed by Statistical Package for the Social Sciences (SPSS) and Microsoft Word and Excel have been used to generate graphs, tables, etc. Institutional Ethical clearance was obtained before initiation of the study.

**RESULTS**

Figure 1 shows that out of total 3600 study population, 178 (4.94%) study participants were found to be diabetic.

Figure 2 shows that out of total 1872 male respondents, 5.02% males were diabetic, whereas out of 1728 female respondents; 4.86% were diabetic.

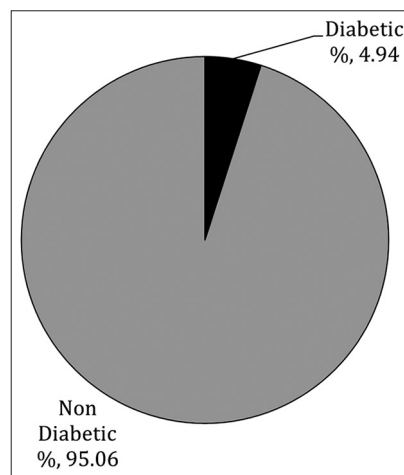
Table 1 summarizes that the prevalence of DM increases progressively from 18 to 35 years age group to >50 years age groups as shown in Table 1; the increase was seen both in males and females. This increase seen is highly significant statistically ( $P < 0.001$ ). However, the difference in prevalence in males and females was not significant statistically ( $\chi^2 = 0.049$ ,  $DF = 1$ ,  $P = 0.8248$ ).

Table 2 summarizes that the prevalence of diabetes among Hindus and Muslims was 4.83% and 6.34%, respectively. This difference was found to be statistically insignificant.

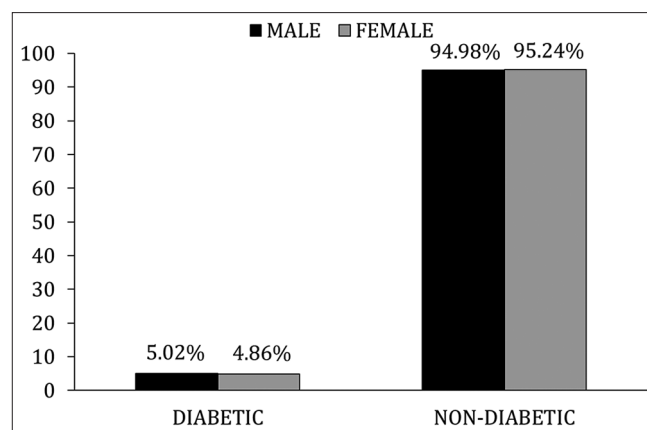
Prevalence of diabetes was 7.92% among Class V followed by 5.06% in Class IV and 4.79% in Class III. The prevalence of DM was found more among lower socioeconomic class, which was found to be statistically significant [Table 3].

Table 4 summarizes that the prevalence of diabetes was found to be more among three generation family (5.29%) compared to 4.90% and 3.98% among nuclear and joint family, respectively. This difference between the type of family and diabetes was found to be statistically insignificant.

Table 5 summarizes that the prevalence of diabetes was 10.84% among illiterates, which gradually and steadily



**Figure 1:** Distribution of study population according to their diabetes status ( $n = 3600$ )



**Figure 2:** Distribution of study population according to sex and their diabetes status ( $n = 3600$ )

decreased to 3.92%, 4.84%, 4.55%, and 1.95% in primary educated, secondary, higher secondary, and graduates. This difference was found to be statistically significant.

Table 6 summarizes that out of 3083 respondent who were taking vegetarian diet about 5% were diabetic; whereas out of total 517 respondents who were taking mixed diet 6% were diagnosed as diabetic. This difference between dietary intake and prevalence of diabetes was not found to be statistically significant.

**DISCUSSION**

The prevalence of known case of diabetes in our study population was 4.94%. There is a large heterogeneity of diabetes prevalence within urban populations. Studies from various parts of urban India show that the prevalence of diabetes varies from 5.9% to 19.5%.<sup>[8]</sup> Bharti K *et al.*<sup>[9]</sup> in their study, found 7.33% prevalence of known case of diabetes in Ahmedabad City. Another study conducted by Javid A *et al.*<sup>[10]</sup> showed that prevalence of Diabetes in their study population was 6.05%, out of which 4.03% were known diabetic and

**Table 1:** Distribution of study population according to their age, sex, and their diabetes status (*n*=3600)

Variables	Diabetic <i>n</i> (%)	Non-diabetic <i>n</i> (%)	Total <i>n</i> (%)	$\chi^2$ , <i>P</i> value
Age (in years)				
Male				$\chi^2=145.48$ DF=2 <i>P</i> <0.001
18–35	5 (5.32) (0.61)	817 (45.95) (99.39)	822 (43.91) (100)	
35–49	11 (11.70) (2.13)	505 (28.40) (97.87)	516 (27.56) (100)	
>50	78 (82.98) (14.61)	456 (25.65) (85.93)	534 (28.53) (100)	
Total <i>n</i> (%)	94 (100) (5.02)	1778 (100) (94.98)	1872 (100.00) (100)	
Female				$\chi^2=103.90$ DF=2 <i>P</i> <0.001
18–35	6 (7.14) (0.78)	768 (46.72) (99.22)	774 (44.79) (100)	
35–49	15 (17.86) (3.13)	465 (28.28) (96.88)	480 (27.78) (100)	
>50	63 (75) (13.29)	411 (25) (86.71)	474 (27.43) (100)	
Total <i>n</i> (%)	84 (100) (4.84)	1644 (100) (95.14)	1728 (100.00) (100)	

**Table 2:** Distribution of study population according to religion and their diabetes status (*n*=3600)

Religion	Diabetic <i>n</i> (%)	Non-diabetic <i>n</i> (%)	Total <i>n</i> (%)	$\chi^2$ , <i>P</i> value
Hindu	161 (90.44) (4.83)	3171 (92.66) (95.17)	3332 (92.55) (100)	$\chi^2=1.206$ DF=1 <i>P</i> =0.272
Muslim	17 (9.55) (6.34)	251 (7.33) (93.66)	268 (7.44) (100)	
Total <i>n</i> (%)	178 (100) (4.94)	3422 (100) (95.06)	3600 (100) (100)	

**Table 3:** Distribution of the study population according to socioeconomic status and diabetes status (*n*=3600)

Socioeconomic status	Diabetic <i>n</i> (%)	Non-diabetic <i>n</i> (%)	Total <i>n</i> (%)	$\chi^2$ , <i>P</i> value
Class I	15 (8.43) (3.85)	375 (10.96) (96.15)	390 (10.83) (100)	$\chi^2=10.63$ DF=4 <i>P</i> =0.030
Class II	13 (7.30) (3.27)	384 (11.22) (96.73)	397 (11.03) (100)	
Class III	55 (30.89) (4.79)	1094 (31.97) (95.21)	1149 (31.92) (100)	
Class IV	65 (36.51) (5.06)	1220 (35.65) (94.94)	1285 (35.69) (100)	
Class V	30 (16.85) (7.92)	349 (10.20) (92.08)	379 (10.53) (100)	
Total <i>n</i> (%)	178 (100) (4.94)	3422 (100) (95.06)	3600 (100) (100)	

2.02% undiagnosed diabetic subjects. Reshma SP *et al.*<sup>[11]</sup> in their study found 4.6% prevalence in Pune.

Present study revealed that prevalence of diabetes was almost same both in males and females. Similar result was found in

the study of Bharti K *et al.*,<sup>[9]</sup> Reshma SP *et al.*<sup>[11]</sup> and Shah SK *et al.*<sup>[12]</sup>. However Krentz *et al.*,<sup>[13]</sup> Solanki N *et al.*,<sup>[14]</sup> Arora Vet *et al.*,<sup>[15]</sup> Acemoglu H *et al.*,<sup>[16]</sup> Anand K *et al.*,<sup>[17]</sup> and Bener A *et al.*,<sup>[18]</sup> in their study found that the prevalence of Diabetes Mellitus was more in females than males. Ramchandran *et*

**Table 4:** Distribution of study population according to the type of family and their diabetes status ( $n=3600$ )

Type of family	Diabetic $n$ (%)	Non-diabetic $n$ (%)	Total $n$ (%)	$\chi^2$ , $P$ value
Nuclear	90 (50.56) (4.90)	1746 (51.02) (95.10)	1836 (51.00) (100.00)	$\chi^2=0.761$ DF=2 $P=0.68$
Joint	16 (8.98) (3.98)	386 (11.28) (96.02)	402 (11.17) (100.00)	
Three generation	72 (40.45) (5.29)	1290 (37.70) (94.71)	1362 (37.83) (100.00)	
Total $n$ (%)	178 (100) (4.94)	3422 (100) (95.06)	3600 (100.00)	

**Table 5:** Distribution of study population according to literacy status and prevalence of diabetes ( $n=3600$ )

Literacy level	Diabetic $n=178$ (%)	Non-diabetic $n=3422$ (%)	Total $n=3600$ (%)	$\chi^2$ , $P$ value
Illiterate	75 (10.84)	617 (89.16)	692 (100)	$\chi^2=70.139$ DF=4 $P<0.001$
Primary	60 (3.92)	1470 (96.08)	1530 (100)	
Secondary	21 (4.84)	407 (95.16)	428 (100)	
Higher secondary	6 (4.55)	126 (95.45)	132 (100)	
> Graduate	16 (1.95)	802 (97.98)	819 (100)	
Total $n$ (%)	178 (4.94)	3422 (95.05)	3600 (100)	

**Table 6:** Distribution of study population according to dietary pattern and prevalence of diabetes ( $n=3600$ )

Dietary pattern	Diabetic $n$ (%)	Non-diabetic $n$ (%)	Total $n$ (%)	$\chi^2$ , $P$ value
Vegetarian	147 (82.58) (4.77)	2936 (85.80) (95.23)	3083 (85.64) (100)	$\chi^2=1.42$ DF=1 $P=0.233$
Mixed	31 (17.42) (6.00)	486 (14.20) (94.00)	517 (14.36) (100)	
Total $n$ (%)	178 (100) (4.94)	3422 (100) (95.06)	3600 (100) (100)	

*al.*,<sup>[19]</sup> Shrestha UK *et al.*,<sup>[20]</sup> found higher prevalence in males than females.

The result indicates that prevalence of diabetes >10 times amongst population age >50 compared to the population between 18-35 years, this difference was found to be significant statistically. Similar results was found by another studies carried out by Bharti K *et al.*<sup>[9]</sup> Solanki N *et al.*,<sup>[14]</sup> and Mohan *et al.*,<sup>[21]</sup> Reshma SP *et al.*,<sup>[11]</sup> Shah SK *et al.*,<sup>[12]</sup> Arora Vet *et al.*,<sup>[15]</sup> Acemoglu H *et al.*,<sup>[16]</sup> Anand K *et al.*,<sup>[17]</sup> Ramchandran *et al.*,<sup>[8]</sup> Shrestha UK *et al.*,<sup>[20]</sup> Rao CR *et al.*,<sup>[22]</sup> Ravikumar P *et al.*<sup>[23]</sup>. The studies done outside the Indian subcontinent like in USA<sup>[24]</sup> also shows the same result. The most likely reason for high prevalence is less work, less exercise, physiological changes causes impaired carbohydrate tolerance.

It was seen that prevalence of diabetes was almost the same amongst Hindus (5%) and Muslims (6%). There was similar result found by Bharti K *et al.*<sup>[9]</sup> in their study. However Aswar NR *et al.*<sup>[18]</sup>, Vijayakumar G *et al.*<sup>[25]</sup> and Rao CR *et al.*<sup>[22]</sup> in their study, found higher prevalence of diabetes amongst Muslims.

Prevalence of diabetes was found to be inversely related to socio-economic condition of the individual, which was also found to be significant statistically. Study conducted by Supriya Krishnan *et al.*<sup>[26]</sup> also supports finding. However Aswar NR *et al.*<sup>[27]</sup> in their study found significant association between higher/middle socio-economic class and prevalence of diabetes. Solanki N *et al.*<sup>[14]</sup> in their study found positive association between higher/middle socio-economic class and prevalence of diabetes; however their association was not significant statistically. This difference amongst study may be due to individuals with less education or wealth generally showing a higher prevalence of several Non-Communicable Risk Factors (NCD-RFs).

Present study revealed that there was no any statistical significant difference between type of family and prevalence of diabetes. Similar result was found by Aswar NR *et al.*<sup>[27]</sup> in their study.

The present study showed a very significant inverse relation to literacy status and prevalence of diabetes; the prevalence being 10.84% in illiterates, 4.44% in those individuals with education up to schooling and 1.95% in Graduates. Bharti K

*et al.*<sup>[9]</sup> in their study also found higher prevalence amongst population who were illiterates or educated up to primary only. However the study conducted by Aswar NR *et al.*<sup>[27]</sup> and Bharati DR *et al.*<sup>[28]</sup> found no statistical association between educational status and type 2 DM. The reason behind low prevalence of diabetes among educated individuals could be; 1) families knew about disease, 2) knew about the regular check-up, diagnosis and follow up.

On analyzing data, the prevalence of diabetes mellitus was around 5% among population with vegetarian diet and 6% in mixed diet. There was no statistical significant difference among prevalence of diabetes and different dietary pattern. Similar findings were reported by Vijayakumar G *et al.*<sup>[25]</sup> and Aswar NR *et al.*<sup>[27]</sup> in their study.

### Limitations of the Study

Since our study was a cross-sectional study, and we had gone for house to house visit for only single time; so, we couldn't include whole family members of house.

### CONCLUSION

The present study revealed that the prevalence of diagnosed cases of diabetes was 4.94% in the study population. The prevalence of diabetes increased significantly with increasing age; it was found nearly 14% prevalence among age more than 50 years compared to only 1% among age 18–35 years. The prevalence of diabetes was found to be directly proportional to age. There was no significant association between gender, religion, types of family, dietary pattern, and the prevalence of diabetes. The prevalence of diabetes was found to be higher among lower socioeconomic class (7.92%) compared to higher socioeconomic class (3.84%). There was inverse association found between socioeconomic class and prevalence of diabetes. Literacy status of an individual influences the occurrence of diabetes. Literacy status shows an inverse relationship with the prevalence of diabetes. The prevalence of diabetes was 10.84% among illiterates which was higher compared to 3.82% only among literates. Early identification of at-risk individuals and encouraging them to for healthy dietary habits, lifestyle modification could greatly help prevent or at least delay the onset of diabetes. People suffering from diabetes should be informed by the treating doctors about regular checkups, dietary modifications, exercise, foot care, regular treatment, early notice of complications, etc., which will go a long way in the management and quality of life of the patient.

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