

# Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of a South Indian state and its practice among the patients with diabetes mellitus: A population-based study

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**Context:** Ocular complications due to diabetes mellitus (DM) were on the rise despite good literacy levels in South India. **Aims:** To assess the knowledge and attitude toward DM and diabetic retinopathy of the general population in a suburban town of South India. **Settings and Design:** Door-to-door population survey in suburban town of South India in May 2013. **Materials and Methods:** A 30-point questionnaire was prepared and the data were collected and analyzed to determine statistically the knowledge, attitude, and practice (KAP) scores of the general and diabetic population and also to determine significant demographic associations. **Results:** In this study, 6211 people (3528 [56.8%] women and 2683 [43.2%] men) with a mean age of  $55.6 \pm 11.7$  years (range 21–98 years) were included. Good knowledge and positive attitude were observed in 3457 (55.6%) and 3280 (52.8%) people. Among 1538 (25.4%) people known to have DM, only 619 (40.7%) had good knowledge, 828 (53.8%) had a positive attitude, and 886 (57.6%) had good practice patterns. Although half of them followed general diabetic care, only 9.6% had undergone screening for retinopathy. Literacy showed a significant association with good KAP ( $P < 0.001$  each) in general population and those with DM. Overall, women had significantly better knowledge ( $P < 0.001$ ). **Conclusions:** Better literacy, especially among women, is contributory to better public awareness; however, the trend for poor practice patterns needs to be radically changed with aggressive public motivation emphasizing on the necessity of retinopathy screening and periodic follow-ups.

**Key words:** Awareness, diabetes mellitus, diabetic retinopathy, knowledge, practice

Diabetic retinopathy constitutes 4.8% of the global causes for blindness<sup>[1]</sup> with reported prevalence in India ranging from 7.3% to 25%.<sup>[2-7]</sup> Diabetic retinopathy being a silent disease, early detection and timely intervention are important for its management.

Despite the high literacy levels and various diabetes mellitus (DM)-related health programs in the state of Kerala, ocular complications due to DM were found to be on the rise. This study was conducted to assess the knowledge and attitude of the general population regarding DM and diabetic retinopathy with an aim to understand the shortcomings in our present awareness programs.

## Materials and Methods

A door-to-door cross-sectional survey was carried out in May 2013 in the Chengamanad Panchayat (Ernakulam, Kerala). According to the 2001 census, Chengamanad had 7275 total households with a total population of 29,576, which includes 14,475 males and 15,101 females. Of the total population, 25,132 were literate. We were assisted by 90 Master of Social Work (MSW) students in our survey. They were divided into 45 groups of 2 students each and sent to the households for collecting the survey data.

A thorough literature search was conducted and knowledge, attitude, and practice (KAP) questionnaire was prepared in English. A pilot study was conducted at our institute to acquaint the students with the questionnaire and to assess their reliability in data collection. After incorporating some minor modifications, a final 30-point questionnaire was prepared with 18 questions aimed at assessing the knowledge and attitude of the entire population and an additional subset of 12 questions for self-proclaimed patients with DM to assess their practice in addition to knowledge and attitude.

A door-to-door survey was conducted, and all people with DM (of any age) as well as the general population above 40 years of age were included in the study [Fig. 1]. The questionnaire was read out to them slowly, and the responses of each were marked on a separate questionnaire by the MSW students. At the end of the survey, the entire data were meticulously entered into a personal computer, and the responses were analyzed using the SPSS, version 16 (SPSS Inc., Chicago, IL, USA).

The knowledge questions were assigned scores depending on the correct responses. Correct responses were denoted

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as +1 and incorrect responses as -1, and 0 if the person was unaware of the response. For multiple-choice responses, scores were assigned from 0 if the person was unaware of the response to 1 for each correct response. The response for each question was summed up and the scores were found to be ranged from 0 to 3. The sum of the scores of all the questions denoted the knowledge score of each individual, which ranged from minimum -14 to maximum score of +12. The median knowledge score was calculated, and the population was divided into two groups: those with “good knowledge” and those with “poor knowledge.”

The attitude questions were mainly designed to study the prevailing attitudes and the misconceptions among the population. The responses of the people were recorded regarding the extent of agreement to a particular statement on the five-point Likert-type scale (strongly disagree, moderately disagree, undecided, moderately agree, and strongly agree). The responses were assigned scores with 0 for the undecided value and positive and negative scores for the values around it, depending on the accuracy of the response. Thus, all the scores were summed up to derive the attitude score of the population. The attitude scores ranged from minimum -20 to maximum score +20. Similar to the knowledge score, the population was divided into those with “positive attitude” and “negative attitude” based on the median score.

Patients with DM were given an additional subsection to determine their practice in addition to their knowledge and attitude. Each question under each category was assigned scores, and the maximum score of each patient with DM was calculated. The range of scores for KAP of the patients with DM was -2 to 5, -2 to 10, and -1 to 11, respectively. The patients were also classified into groups based on their median KAP scores.

The study adhered to the principles of Declaration of Helsinki and was approved by the Ethics Committee of our institute.

## Results

A total of 6211 people (3528 [56.7%] women and 2683 [43.2%] men) with a mean age of 55.6 ± 11.7 years (range 21–98 years) were included in this study. Among them, 5665 (91.2%) were literate with 4564 (73.5%) having minimum school education, and the remaining 546 (8.8%) were illiterate [Table 1]. Among the literate population, women (3147) outnumbered the men (2518).

Of the interviewed people, only 2910 (46.86%) had some source of income, and 2225 (35.8%) had availed health insurance facility. 3604 (58.02%) had sought previous eye consultations, with 3264 (52.5%) among them being spectacle users.

Although media such as television (*n* = 1312 [21%]) and newspapers (*n* = 1522 [24%]) contributed to public awareness, family members and friends (3047 [49%]) followed by doctors (2117 [34%]) were the major source of information about the disease.

The average knowledge score of the general population was 6.69 (range 4–15). A total of 1647 (26.5%) people were totally unaware of the symptoms of DM. However, 4944 (79.6%) people were aware of the fact that DM could be identified by blood and urine tests and 5291 (85.2%) had the knowledge regarding the treatment methods for controlling DM. Although only 745 (12%) people knew about the location of a structure called retina, retinopathy as a consequence of DM was surprisingly known to 4431 (71.3%) people. Approximately 2898 (46%) of the people knew that retinopathy was related to the duration of DM. The median knowledge score was 7. The people in “good” and “poor” knowledge groups were then analyzed statistically using the  $\chi^2$ -test for association with variables such as sex, literacy, history of eye treatment, and presence

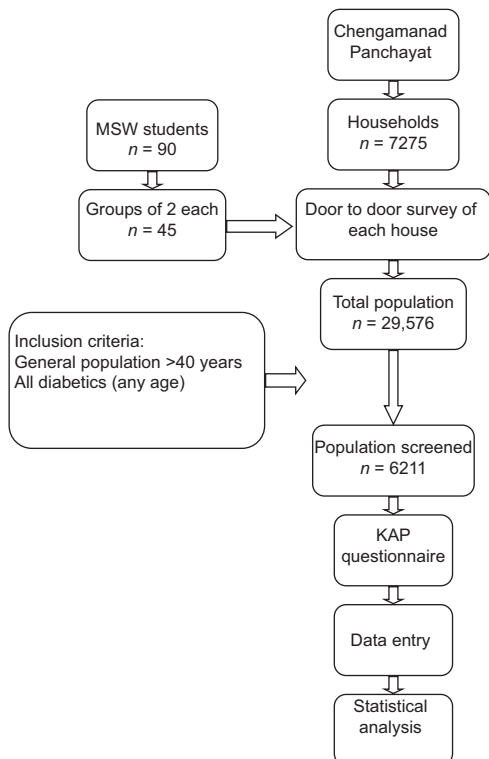


Figure 1: Flow chart depicting the recruitment for the survey

Table 1: Demographic characteristics of general population and diabetics

Variables	General population (%)	Diabetics (%)
Number of participants	6211	1538
Mean age	55.75	58.79
Sex		
Males	2683 (43.1)	728 (47.3)
Females	3528 (56.7)	810 (52.6)
Education		
School	4564 (73.4)	1173 (76.2)
College	953 (15.3)	196 (12.7)
Professional	148 (2.3)	35 (2.2)
Illiterate	546 (8.7)	134 (8.7)
Health insurance		
Yes	2225 (35.8)	520 (33.8)
No	3986 (64.1)	1018 (66.1)
History of eye treatment		
Yes	2279 (36.6)	724 (47.07)
No	3932 (63.3)	814 (52.9)

of health insurance. The value of  $P < 0.05$  was considered statistically significant. Thus, 3457 (55.6%) people were found to possess good knowledge and 2754 (44.3%) constituted the group with poor knowledge. Female sex ( $P < 0.001$ ), literate population ( $P < 0.001$ ), those with history of eye consultation ( $P < 0.001$ ) and those without health insurance facility ( $P < 0.001$ ) were found to have significantly better knowledge regarding the disease [Table 2].

The average attitude score of the people toward DM was 3.68 (range – 8–16), whereas the median attitude score was 4. Though misconceptions such as consumption of sweets could lead to DM were seen in a majority of the population (4875 i.e. 79.5%), more than half the population i.e. 4137 (66.6%) people knew that DM could cause blindness and 4678 (75.3%) strongly felt that the patients with DM should undergo

periodic eye checkups [Fig. 2]. When analyzed statistically, literate people ( $P < 0.001$ ) and those with the history of eye treatments ( $P < 0.001$ ) were found to have a better attitude toward the disease compared to their counterparts [Table 2].

Of the total population, 1538 (25.4%) were confirmed to be with DM and on its treatment. The average duration of DM ranged from 1 month to 40 years. These patients with DM were given additional 12 questions pertaining to the disease: 3 knowledge, 4 attitude, and 5 practice questions. The KAP score for diabetics was calculated separately. Of the patients with DM, only 619 (40.7%) had good knowledge regarding the disease, 828 (53.8%) had a positive attitude, and 886 (57.6%) believed in good practice methods. A total of 913 (59.4%) patients had shared their experience with family and friends. A very low proportion of them (553 [36%]) said that they had been informed regarding diabetic retinopathy by their treating physician. Surprisingly, 620 (40.3%) knew that poor control of hypertension could worsen diabetic retinopathy. Though 57% of them were observed to have good practice patterns with regard to DM control and treatment, they were very ignorant with respect to eye checkups and follow-ups. Only 148 (9.6%) people had undergone eye checkups for diabetic retinopathy and 150 (9.8%) were following up frequently; 1188 (77.2%) people said they would prefer an eye checkup only if they have an eye problem or probably never.

On statistical analysis, literacy showed a significant association with good knowledge ( $P < 0.001$ ), positive attitude ( $P < 0.001$ ), and good practice culture ( $P = 0.003$ ). History of eye consultation also showed significant association with possessing good knowledge ( $P = 0.008$ ) and good practice patterns ( $P < 0.001$ ). Although overall female population had shown better knowledge, in the diabetic group, men showed a significantly better knowledge ( $P < 0.001$ ) and positive attitude ( $P = 0.001$ ) [Table 3].

### Discussion

It is well known that prolonged duration of disease results in various disease-associated complications mainly as a result of ignorance and poor disease control, thus contributing to the disease-related morbidity. The main objective of this study was to ascertain the awareness level and the practice patterns of the people.

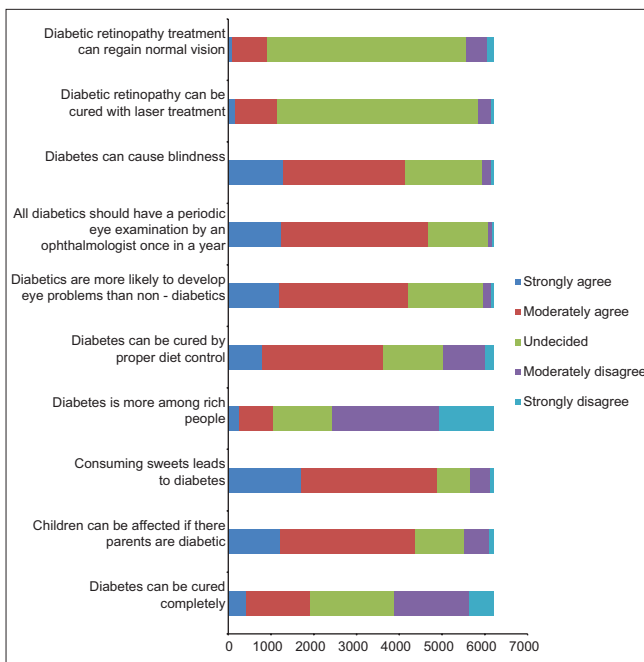


Figure 2: Bar chart representing the attitude of the population towards diabetes and diabetic retinopathy

Table 2: Factors influencing knowledge and attitude in the general population

Variable	Knowledge			Attitude		
	Good (%)	Poor (%)	P	Positive (%)	Negative (%)	P
Sex						
Male	1600 (59.6)	1083 (40.4)	<0.001	1425 (53.1)	1258 (46.9)	0.67
Female	1857 (52.6)	1671 (47.4)		1855 (52.6)	1673 (47.4)	
Education						
Literate	3298 (58.2)	2367 (41.8)	<0.001	3105 (54.8)	2560 (45.2)	<0.001
Illiterate	159 (29.1)	387 (70.9)		175 (32.1)	371 (67.9)	
Health insurance						
Yes	1157 (52)	1068 (48)	<0.001	1153 (51.8)	1072 (48.2)	0.24
No	2300 (57.7)	1686 (42.3)		2127 (53.4)	1859 (46.6)	
Eye treatment						
Yes	2124 (58.9)	1480 (41.1)	<0.001	2014 (55.9)	1590 (44.1)	<0.001
No	1333 (51.1)	1274 (48.9)		1266 (48.6)	1341 (51.4)	

**Table 3: Factors influencing knowledge, attitude and practice in the diabetic population**

	Knowledge			Attitude			Practice		
	Good (%)	Poor (%)	P	Positive (%)	Negative (%)	P	Good (%)	Poor (%)	P
Sex									
Male	334 (45.9)	394 (54.1)	<0.001	423 (58.1)	305 (41.9)	0.001	432 (59.3)	296 (40.7)	0.38
Female	285 (35.2)	525 (64.8)		405 (50)	405 (50)		463 (57.2)	347 (42.8)	
Education									
Literate	592 (42.2)	812 (57.8)	<0.001	779 (55.5)	625 (44.5)	<0.001	833 (59.3)	571 (40.7)	0.003
Illiterate	27 (20.1)	107 (79.9)		49 (36.6)	85 (63.4)		62 (46.3)	72 (53.7)	
Health insurance									
Yes	205 (39.4)	315 (60.6)	0.63	285 (54.8)	235 (45.2)	0.58	290 (55.8)	230 (44.2)	0.16
No	414 (40.7)	604 (59.3)		543 (53.3)	475 (46.7)		605 (59.4)	413 (40.6)	
Prior eye treatment									
Yes	317 (43.8)	407 (56.2)	0.008	406 (56.1)	318 (43.9)	0.09	464 (64.1)	260 (35.9)	<0.001
No	302 (37.1)	512 (62.9)		422 (51.8)	392 (48.2)		431 (52.9)	383 (47.1)	

Our study revealed good knowledge levels in 55.6% of the population and the fact that about 66.6% knew DM could cause blindness. According to the Chennai urban rural epidemiology study,<sup>[8]</sup> only 19.0% (4951/26,001) of the total population and only 40.6% (621/1529) of diabetics were aware that DM could produce some complications. In another KAP study by Rani *et al.*,<sup>[9]</sup> 966 (49.9%) individuals had knowledge about DM and 718 (37.1%) about diabetic retinopathy. They attributed literacy as the reason for the better knowledge among Malayalam-speaking subjects (i.e. Keralites). Our survey population being Keralites (i.e. Malayalam speakers) also showed a significant association between literacy and good knowledge as well as a positive attitude in the diabetic group and also the general population, which is similar to the results of other population studies.<sup>[9-11]</sup> We observed women in the general population to have significantly better knowledge about the disease, which is similar to the results of the study by Rani *et al.*<sup>[9]</sup> Although Murugesan *et al.*<sup>[12]</sup> had more female participants in their study group, they observed lower rates of education and lower levels of awareness among them. According to the 2011 Indian census, Kerala ranks first in overall (93.9%) and female (91.98%) literacy. Better literacy of our study group, especially higher female literacy, could probably account for the better awareness in our population.

In 2002, a similar KAP study in our outpatient department<sup>[13]</sup> revealed that 50.8% of patients were aware of frequent eye check-ups and only 19% knew about retinopathy. Our survey of the general population 11 years later revealed that 75.3% (4378/6211) strongly felt that all patients with DM should undergo periodic eye checkups, and 71.3% were aware of diabetic retinopathy, which reflects that with time level of awareness has also increased.

Sadly, among our diabetic population, the average KAP scores were quite low. The knowledge levels were low compared to those of the general population, and only half the population had positive attitude. Low knowledge levels among patients with DM highlight the lacunae of the medical fraternity on imparting disease-specific knowledge to the patients.

The practice patterns seen among the patients with DM in our population also deserve a special mention. Although 75% of our general population felt that the patients with DM should

undergo frequent eye checkups, only 9.6% of the patients with DM had been checked for diabetic retinopathy and only 9.8% were on follow-up, which reflects insufficient motivation among patients with DM. Rani *et al.*<sup>[9]</sup> also observed poor practice patterns in a high percentage of population despite good attitude levels. Namperumalsamy *et al.*<sup>[14]</sup> observed that only 6.8% of the patients with DM had undergone dilated fundus evaluation before their screening project and only one-fourth of the screened population with retinopathy returned for examination at the hospital. Padmaja *et al.*<sup>[15]</sup> also observed that 67% of the people in the rural areas and 25% in the urban areas had never been screened for diabetic retinopathy. This highlights the fact that despite good knowledge and attitude, insufficient motivation of the patients with DM for evaluation and follow-ups is a potential barrier to improve their practice patterns.

General practitioners and physicians are usually the first access points of the patients with DM. Only 36% of our people said that they had information from their treating doctors, which is similar to the low numbers (only 22%) reported by Murugesan *et al.*<sup>[12]</sup> Namperumalsamy *et al.*<sup>[16]</sup> also observed that only 16% of the paramedical staff were informed regarding the disease by medical personnel, and nearly three-fourth of the paramedical staff had no education material for public health education. Raman *et al.*<sup>[17]</sup> had observed low levels of awareness among general practitioners and suggested programs for updating and training them. As a part of Kerala comprehensive diabetic retinopathy training model which was conducted just before this survey, we had given training regarding early detection and timely intervention of diabetic retinopathy to nearly 200 doctors (general practitioners in Kerala) along with other paramedics and health workers. Before the training, we had distributed questionnaires to all general practitioners to assess their level of awareness. Although a vast majority of the doctors (86.74%) opined that newly detected Type 2 diabetic patient required immediate retinopathy screening, very few respondents (10.5%) were aware about the need for regular annual eye check-ups for diabetics. Many of the doctors (81.70%) felt that if the visual acuity is very good and the patient has no vision related complaints he is unlikely to have diabetic retinopathy. Our survey on the general practitioners once again stressed the need for targeting all the

practitioners, paramedics, and the multipurpose workers at the grassroot levels. This would go a long way in creating better disease awareness and public motivation, thus helping prevent or delay the onset of DM-related complications.

In developing countries such as India, most of the health-care costs are borne by the people. This results in economic burden, especially on the lower and the middle-class citizens. The lack of follow-ups in our population also could be attributed to monetary reasons. About 35.8% of our study population had insurance. Involving health policymakers and creating an increased awareness among them regarding the magnitude of the problem may convince them to come up with better insurance coverage for the patients with DM. This may help allay the economic burden, thus prompting people to seek health-care services rather than avoid due to economic reasons.

Our study has a disadvantage that the participants do not constitute a representative sample of the entire state. However, it does give us a general idea regarding the awareness level of people in a suburban state with a considerably literate population. Better literacy, especially with better female literacy, has definitely contributed to better awareness among our population; however, the poor practice patterns are definitely a cause of concern. The multi-pronged prevention, awareness, counseling, and evaluation study<sup>[18]</sup> in Chennai has proved that through direct public education and mass media campaigns the level of awareness about DM and its complications can be improved substantially. We would also recommend community, especially female empowerment, for better public motivation with emphasis on the necessity of screening and timely follow-ups to prevent sight-threatening complications associated with diabetic retinopathy.

## Conclusions

Better literacy, especially among women, is contributory to better public awareness; however, the trend for poor practice patterns needs to be radically changed with aggressive public motivation emphasizing the necessity of screening for retinopathy and periodic follow-ups.

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### Conflicts of interest

There are no conflicts of interest.

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