Research Article

Awareness of Type 2 diabetes mellitus in rural population of Mangalore, South India

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ABSTRACT

Background: As an emerging epidemic of the 21st century, diabetes would threaten to overwhelm the health-care system in the coming years posing a major challenges to patients and national economies. Currently, 415 million adults are found to be diabetic which is likely to cross 642 million by 2040. Awareness and health-seeking behavior are important in the reduction of burden of the disease and its long-term complications. **Objectives:** The objective of this study is to assess the awareness of Type 2 diabetes mellitus among the general and diabetic population in the rural community of Mangalore. **Materials and Methods:** A Community-based cross-sectional study was conducted in rural population among subjects aged 35 years and above. Based on the prevalence rate of 16.6% by Rao *et al*., 226 subjects were interviewed by systematic random sampling method, and among them, 64 were found to be diabetic at the time of the survey. **Results:** Of 226 persons interviewed, 28.8% were aware of symptoms, 31.9% were aware of risk factors, and among them, majority were aware of increased intake of sweets in association with diabetes, and 49.6% were aware of warning signs of hypoglycemia. Only 22.6% were aware of complications of diabetes. Mean awareness score was 21.23 among diabetics than compared with the general population, 17.07 ($P < 0.05$). Overall awareness of diabetes among the subjects was found to be <50%. **Conclusion:** The study highlighted the low awareness status in this population for which there is a need for an effective health education program in the community in prevention and long-term control of diabetes.

KEY WORDS: Awareness; Rural Population; Type 2 Diabetes Mellitus

INTRODUCTION

Global reports, in the year 2010, stated that diabetes accounted for 12% of the total health expenditure or around 376 billion dollars, which is expected to cross 490 billion dollars by 2030. Due to lack of resources and limited infrastructures, many developing countries face an hurdle to manage the epidemic of diabetes. As per the recent report of international diabetes federation, 415 million individuals are diabetic globally and it is likely to peak around 642 million by the year 2040, and worldwide, every 1 in 11 individuals are found to be detected diabetic, but unfortunately 46.5% of them remain undiagnosed and three-fourth of them live in low- and middle-income nations with 5 million of global deaths being currently attributed to diabetes.[1,2]

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Majority of the people with diabetes fall in the age group of 45–64 years in the low economic countries. This productive group is expected to drive the economic engine of the country to achieve the required international development goals. Along with the reduced productivity, diabetes tends to further impose a high economic burden on nation in terms

of health-care expenditure and loss of productivity with inevitable economic progress.[3]

In India, 69.1 million people are victims of diabetes mellitus (DM) and are estimated to have the second highest number of cases of DM in the world after China in 2015.[4] The epidemic has reached its peak in parallel with rapid urbanization, nutrition transition, sedentary lifestyles, and physical inactivity leading to increase in the prevalence of obesity.[2,4] India and China will remain as the two nations with the highest numbers of individuals being the victims of diabetes accounting to 79.4 million and 42.3 million cases by the year 2030 followed by other countries such sa Indonesia, Pakistan, Bangladesh, and Philippines.[5]

Diabetes is termed as an "iceberg disease," and many cases become aware that they have diabetes only when they develop one of its life-threatening complications. Awareness of diabetes and health-seeking behavior among the community can assist in early detection of the disease, help to assess their risks, motivate them to seek proper treatment and care, inspire them to take charge of their disease for their lifetime, and in turn, reduce the incidence of complications.[6,7]

India with a varied social, economic, cultural, and educational background have a people surrounded with myths and beliefs regarding diseases. Studies have shown that there is still an inadequate awareness about various aspects of diabetes among the general public and also there is also a lack of knowledge and awareness about the existing interventions in prevention and management of its complications.[8,9]

Hence, with this background, the current study was conducted with an objective to assess the awareness of Type 2 DM among the general population and diabetics residing in the rural area of Mangalore, South India.

MATERIALS AND METHODS

The present study was a community-based cross-sectional study conducted over 12 months from October 2015 to November 2016 in Kuthar and Manjanady villages of Dakshina Kannada district which are the rural field practice areas of the Department of Community Medicine, K.S. Hegde Medical Academy, Mangalore. The study participants included the participants in the age group of 35 years and above who were permanent residents of the villages, and those with gestational diabetes, suffering from any psychiatric disorders, and individuals with Type I DM were excluded from the study. Based on the prevalence rate of 16% from a study by Rao *et al*.[10] and taking 10% for the non-respondents with absolute precision of 5%, using the formula ($n = Z^2pq/ d^2$), the minimum final desired sample came approximately to 226. Among the total of 3260 households, a minimum of 226 households were interviewed using systematic random sampling method with an average sampling interval of 15 ($K^{th}=15^{th}$), and from each household, one individual in the age group of 35 years and above was selected randomly. If the house was found to be locked or there was a non-respondents in the house, the immediate next house was selected for the study. A pilot study was done among 50 participants to check for the feasibility of the study tool. Selected subjects were interviewed by administering a pretested questionnaire after obtaining a written informed consent.

The study tool contained 2 sections which included sociodemographic profile and section 2 were questions on awareness of symptoms of Type 2 DM and its risk factors including family history, awareness of signs of hypoglycemia, and complications of Type 2 diabetes among the diabetics and general population. Prevalence of diabetes was assessed by checking random blood sugars using an automated glucometer under aseptic precautions, and average values of two RBS reading recorded on different days measuring >200 mg/dl were considered as diabetic.[11]

Awareness Scores

The awareness responses were in the form of yes, no, and do not know, and the participants who gave a correct responses were scored 2, wrong responses were given 0, and those who were unaware were given a score of 1. The overall maximum scores were found to be of 40. Scores of <15=poor, 16–29=average, and >30 were scored as good awareness scores.

Statistical Analysis

The data were summarized using the descriptive statistics such as frequency and percentages of qualitative data. The inferential statistics used was Chi-square test and Fisher's exact test. Independent sample *t*-test and one-way ANOVA were done to compare the mean awareness scores. The $P < 0.05$ was considered as statitically significant. The data management and analysis were performed using Microsoft Excel and SPSS version 20 (SPSS Inc., Chicago, IL, USA). The study was approved by the Institutional Ethics Committee, Nitte University.

RESULTS

Among the 226 participants, 71 (31.4%) were male and 155 (68.6%) were female, and the mean age of the subjects was 54 ± 11 years. The mean awareness scores among the study subjects were 18.3 ± 5.6 with minimum score of 11 and maximum score of 31. Among the sociodemographic variables, higher educational status and marital status showed a significant difference in the mean awareness scores ($P < 0.05$); however, age group, gender, religion, occupation, and socioeconomic status did not show any

Table 1: Sociodemographic variables and its association with mean awareness scores

Sociodemographic variables	Total=226 (100%)	Mean awareness scores±SD	*P* value
Age group (years)			
35–45	62 (27.5)	17.4±5.0	0.50
46–55	71 (31.4)	18.7±5.9	
56–65	59 (26.1)	18.7±5.9	
>66	34 (15)	17.8±4.9	
Gender			0.53
Male	71 (31.4)	18.6±5.8	
Female	155 (68.6)	18.0±5.4	
Marital status			0.05
Unmarried	4 (1.8)	25.0±4.0	
Married	211 (93.4)	18.1±5.5	
Widow/widower	11 (4.9)	18.1±6.0	
Religion			0.14
Hindu	69 (30.5)	19.3±6.1	
Muslims	142 (62.8)	17.7±5.3	
Christians	15 (6.7)	17.6±4.8	
Educational status			0.002
Illiterate	82 (36.3)	17.0±5.0	
Primary school	115 (50.9)	18.3±5.7	
High school	21 (9.3)	20.1±5.6	
Higher secondary (PUC)	5 (2.2)	22.0±4.3	
Graduate	3 (1.3)	27.0±1.0	
Occupation			0.44
Skilled	11 (4.9)	21.1±6.3	
Semi skilled	62 (27.4)	18.1±5.7	
Laborer	28 (12.4)	18.0±5.8	
Homemaker	79 (35.0)	18.3±5.7	
Unemployed	46 (20.4)	17.6±4.9	
Socio economic status (Total *per capita* income)			0.72
Class I	14 (6.2)	18.3±3.9	
Class II	34 (15.1)	18.9±6.0	
Class III	66 (29.2)	18.7±5.8	
Class IV	71 (31.4)	17.7±5.7	
Class V	41 (18.1)	17.6±4.9	

SD: Standard deivation

significant difference in the mean awareness scores [Table 1]. The overall prevalence of diabetes among the study subjects was found to be 28.3% (64 of 226), of which 6 (2.7%) were newly detected at the time of the study.

Only 65 of 226 (28.8%) were aware of one or two symptoms of diabetes, and majority were aware of polyuria or increased micturition, 18.1%. Awareness of symptoms was found to be good among the diabetic subjects than compared with the general population ($P < 0.05$). Only 72 (31.9%) of 226 participants were aware of the risk factors for Type 2 diabetes. Among them, majority (93.1%) were aware that increase in intake of sweets would increase the risk of developing diabetes [Table 2 and Figure 1].

Nearly half of the study subjects, 112 (49.6%), were aware of the warning signs of hypoglycemia, where 44.7% of them were aware of giddiness. Awareness of the signs of hypoglycemia was comparatively better in the diabetic population ($P < 0.05$). Only 51 (22.6%) of 226 study subjects were aware of the complications of diabetes. Among them, most of them knew about ocular complications (51%) and renal complications and delayed healing of wound (43.1%), and most of the diabetic subjects were aware of renal complications, 58.3% ($P < 0.05$) [Table 3].

Independent sample *t*-test showed that there was a difference in mean awareness scores between the diabetic and

Table 2: Awareness of symptoms and causes for Type 2 DM among diabetic and general population

Awareness of symptoms of Type 2 DM	Disease status		Total *n*=226 (100%)	Chi-square (χ^2 value)	*P* value
	n (%) of only correct responses				
	Diabetic (*n*=64)	Non-diabetic (*n*=162)			
Increased frequency of urine	29 (45.3)	12 (7.4)	41 (18.1)	44.3	<0.001
Increased thirst	23 (35.9)	4 (2.5)	27 (11.9)	48.8	<0.001
Increased hunger	15 (23.4)	2 (1.2%)	17 (7.5)	32.5	<0.001
Unexplained weight loss	10 (15.6)	5 (3.1)	15 (6.6)	11.6	0.002
Awareness of causes for Type 2 DM (*n*=72)	**Disease status**		**Total *n*=72 (100%)**	**Chi-square (χ^2 value)**	***P* value**
	***n* (%) of only correct responses**				
	Diabetic (*n*=27)	**Non-diabetic (*n*=45)**			
Hereditary	11 (40.7)	17 (37.8)	28 (38.9)	0.062	0.803
Increased intake of sweets	25 (92.6)	42 (93.3)	67 (93.1)	0.014	1.00
Decreased physical activity	3 (11.1)	12 (26.7)	15 (20.8)	2.476	0.116
Obesity	6 (22.2)	8 (17.8)	14 (19.4)	0.213	0.645
Habits such as alcohol and tobacco consumption	4 (14.8)	2 (4.4)	6 (8.3)	2.902	0.188

DM: Diabetes mellitus

Table 3: Awareness of signs of hypoglycemia and complications among diabetic and general population

Awareness of signs of hypoglycemia	Disease status		Total *n*=226 (100%)	Chi-square (χ^2 value)	*P* value
	n (%) of correct response				
	Diabetic (*n*=64)	Non-diabetic (*n*=162)			
Increased sweating	26 (40.6)	33 (20.4)	59 (26.1)	9.75	0.002
Giddiness	43 (67.2)	58 (35.8)	101 (44.7)	18.2	<0.001
Fatigue	22 (34.4)	31 (19.1)	53 (23.5)	5.93	0.015
Blurring of vision	17 (26.6)	19 (11.7)	36 (15.9)	7.84	0.013
Awareness of complications of DM (*n*=51)	**Disease status**		**Total *n*=51 (100%)**	**Chi-square (χ^2 value)**	***P* value**
	***n* (%) of correct response**				
	Diabetic (*n*=24)	**Non-diabetic (*n*=27)**			
Renal	14 (58.3)	8 (29.6)	22 (43.1)	4.26	0.039
Cardiac	9 (37.5)	11 (40.7)	20 (39.2)	1.16	0.769
Ocular	13 (54.2)	13 (48.1)	26 (51.0)	0.18	0.668
Neurological	5 (20.8)	6 (22.2)	11 (21.6)	0.01	0.904
Delayed wound healing	9 (37.5)	13 (48.1)	22 (43.1)	0.58	0.443

DM: Diabetes mellitus

non-diabetic subjects and the scores were comparatively better in diabetics ($P < 0.001$). Overall 96 (42.5%) had a poor score, 122 (54%) had average scores, and only 8 (3.5%) had good awareness scores [Table 4].

DISCUSSION

Among the 226 study subjects, overall 65 (28.8%) were aware of the symptoms, 72 (31.9%) were aware of the causes, 51 (22.6%) were aware of the complications, and 112 (49.6%) were aware of the warning signs of hypoglycemia. Awareness of various aspects of diabetes was found to be better among the diabetics (mean score = 21.23) in comparison with the general population (mean score = 17.07). However, an overall awareness of diabetes among the study subjects was found to be <50%.

Higher educational status and marital status showed a better awareness scores among the sociodemographic variables which reflected the findings of a study by Murugesan *et al.* in Southern India and by Mumu *et al*. where higher educational status showed a significant association with awareness of diabetes.[8,12] Similar study by Vankudre *et al.* in Kanchipuram district showed a significant difference in awareness scores with the marital status (mean score of 37.3 ± 5.98).[13] Among the participants who were aware of the symptoms, 18.1% knew about polyuria, and among the diabetics, 45.3% were

Table 4: Awareness scores between the diabetics and general population

Disease status	Mean scores	SD	*t*	*P* value
Diabetic	21.23	5.11	5.35	<0.001
Non-diabetic	17.07	5.62		

SD: Standard deviation

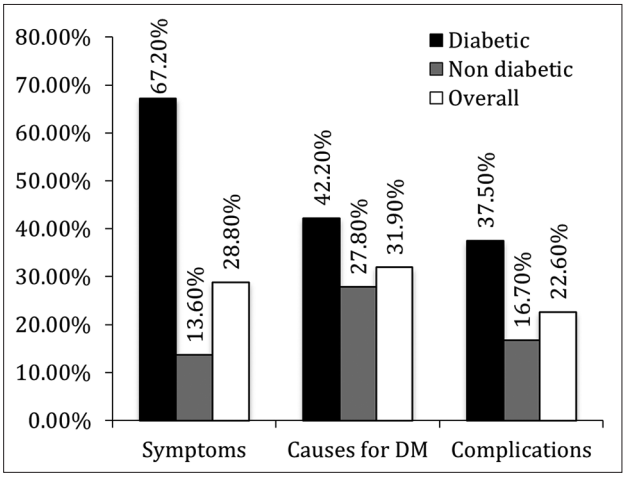

Figure 1: Awareness of diabetes among the subjects

aware of it followed by 35.9% of the diabetics were aware of polydypsia, 23.4% of polyphagia, and 15.6% of them knew about unexplained weight loss. Similar study conducted by Shah *et al*. among the diabetic subjects in Gujarat found that 17.6% were aware of the causes of diabetes, 58.8% perceived polyuria as one of the major symptom, and 59% believed that diabetes had a hereditary inheritance. Similar findings were reflected in the current study where nearly half of the diabetics (45.3%) were aware of polyuria and 40.7% of them were aware of genetic inheritance.[14]

Mathew *et al*. in a study conducted among the adult population in South India found that 54.4% perceived that positive family history is a major risk factor followed by 42.4%, 47.8%, and 53.6% of them reported that excessive sugar intake, obesity, and physical inactivity were the risk factors for Type 2 DM. However, in the current study, 93.1% perceived that increased intake of sweets is a major risk factor followed by familial inheritance (38.9%).[15] The current study could not find much differences in awareness of risk between the diabetics and the general population. Among the study participants, 112 (49.6%) were aware of the warning signs of hypoglycemia and nearly half of them, 44.7%, were aware of giddiness. Similar findings were reflected in a study by Sawant *et al*. where awareness of hypoglycemia was found to be 56.3%.[9]

Only 22.6% of the study subjects were aware of the complications of diabetes, and among them, more than 50% were aware of ocular complications and 43.1% knew about renal complications and delayed healing of wound. Similar findings were reflected in a study by Murugesan *et al*. in the urban population of South India where only <30% of the subjects were aware of renal, ocular, and neurological complications. Similar study conducted by Shah *et al*. among the diabetic subjects in Gujarat found that 60% were unaware of the complications and only few perceived that heart problems were a major complication and only few knew about the renal complications. The findings of the study reflected the present study where only 47.0% of the diabetics were aware of the complications, and among them, 58.3% knew that kidneys are the most commonly affected organs.[8,14] A study by Mumu *et al*. on awareness of Type 2 diabetes in the population of Bangladesh showed that 13% had good knowledge, 68% had average, and the remaining 14% had a poor knowledge of diabetes. Similarly, in the present study, 54% of the subjects were scored average, 42.5% scored poor and the remaining 3.5% scored good on awareness of diabetes.[12]

Strength and Limitations

As the study population was homogenous in terms of religion, literacy, and socioeconomic status, the findings of the study can be extrapolated to the rest of the population. A minimum sample size of 226 has limited to see any differences in awareness scores among the sociodemographic variables such as age group, gender, religion, occupation, and socioeconomic status and also differences in awareness of risk and complications of diabetes among the diabetic and the general population.

CONCLUSION

The study found that overall 28.8% were aware of symptoms, 31.9% were aware of causes, and 22.6% were aware of complications of diabetes. The overall awareness of diabetes among the study subjects was found to be <50% where 42.5% had scored poor, 54% had average scores, and only 3.5% had good awareness scores. However, the awareness was found to be comparatively better in diabetics than the general population. Due to rise in epidemic of diabetes in developing countries like India which pose a huge health-care burden and economic challenge, there is a need for an improved education to alert the population about the risk factors for diabetes and training the diabetics to manage their disease more effectively for long-term control and prevention of complications. There is a need for an repeated reinforcement of comprehensive health education programs to increase the awareness of diabetes among the public.

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