Assessment of Knowledge of Diabetes Mellitus among the Rural Population of Erode District of Tamil Nadu, South India

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ABSTRACT

Background: Knowledge of a disease is an important component of health literacy, that can minimize the mortality and morbidity associated with the problem. Lack of knowledge of a disease leads to the emergence of complications associated with clinical conditions. Hence, a prospective cross-sectional study was conducted to evaluate the knowledge of diabetes mellitus (DM) among the rural residents of Erode district, Tamil Nadu, India. **Materials and Methods:** The diabetes knowledge was examined using modified version of the Michigan DM questionnaire. The questionnaire includes 10 questions about general DM awareness, diabetic complications, prevention, and control. It also includes information about the socio-demographic characteristics of the participants. **Results:** In the current study, there were 974 individuals participated and completed the study. The findings showed that there is no statistically significant difference in knowledge of DM across different genders, educational levels, or occupation (*p*=0.470), However, there is a statistically significant difference in age-related knowledge of DM (*p*=0.006). The majority of the study participants are well known about the disease condition (66.6 %), the best method to monitor blood glucose at home (54.1 %), and complications of diabetes (53.8 %). Whereas, the overall diabetes knowledge was average (46.3 %) to good (40.9 %), with very least have excellent knowledge DM (5.0 %). **Conclusion:** According to this research, there is no statistically significant variation in gender, educational attainment, or employment situation when it comes to the various age groups understanding of diabetes mellitus. To raise awareness of DM among the general public, there is a need for well-organized educational interventional program(s) that target the weak points.

Keywords: Metabolic disorder, Hyperglycaemia, Patient education, Morbidity, Mortality.

INTRODUCTION

Diabetes is a group of metabolic disorders characterized by hyperglycaemia which leads to micro and macrovascular complications in the human body. These complications lead to poor quality of life and shortened life expectancy.[1,2] The prevalence of individuals with diabetes mellitus (DM), which has increased from 4.7 percent to 8.5 percent since 1980 is estimated to be 422 million worldwide, as per the World Health Organization (WHO).[3] In Asian countries, particularly in India and Pakistan, the prevalence of diabetes was discovered to be 8.5% and 6.7%, respectively.[4] Diabetes management requires not just the use of medications but also adequate patient disease understanding and healthy self-care practices. Diabetes Mellitus

(DM) is a major non-communicable disease (NCD) that poses a substantial threat to public health around the world. In most cases, diabetes develops into a chronic condition, reducing patient's quality of life and increasing morbidity and mortality, as well as putting a significant financial burden to the healthcare system and government budget.[5-7]

Knowledge of a disease is an important component of health literacy, that can minimize the mortality and morbidity associated with the problem. The diabetes knowledge of the patient and background information of the patient can be used to evaluate a person's diabetes risk, motivation to seek appropriate medication use and care, and inspiration to manage their disease for the rest of their life. Studies have demonstrated that a lack of understanding of the disease contributes to a poor comprehension of medical and health information. As a result, management measures are only partially followed, which eventually has a negative impact on health outcomes. Differences in knowledge levels have been identified based on educational attainment,

gender, and socioeconomic status. Diabetes-related micro- and macrovascular issues, such as diabetic foot ulcers, diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy, are made more likely by poor diabetes treatment.[8] Diabetes comorbidities and poor diabetes control place a significant financial burden on individuals, society, and the healthcare system.[9,10] According to a number of research, developing and underdeveloped nations have limited awareness of diabetes.[11–13] Low levels of diabetes education and understanding of preventative measures have an impact on self-care behaviour and the utilization of available services. As a result, knowledge serves as a foundation for the development of healthy habits. There is evidence that DM self-care-aware patients have improved long-term glycaemic control. Knowing about glycemic control can help people comprehend the hazards of having diabetes and stimulate them to seek the right treatment and caution to keep the illness under control.[14] Increasing public awareness of diabetes could lead to better overall health behaviour in society and lower the chance of having diabetes.[15,16]

For a long time, assessing diabetes knowledge has been a crucial part of evaluating patients with diabetes as a whole. According to a study by Al-Qazaz HK, *et al.*, patients who are better informed about their disease and its complications are more likely to comply with treatment and experience fewer disease-related problems.[17] Though there were many studies conducted across the world, still there is a lack of diabetes-related knowledge among the people living in rural areas.[18,19] Therefore, research was carried out with an aim to evaluate the levels of knowledge of Type-2 DM among the DM patients of different age group, gender, occupation, and education level in the rural population of Erode district of Tamil Nadu. The results of this study may be used to determine the population's knowledge gaps and attitudes around diabetes, which will help inform the creation of DM prevention programmes in the nation.

MATERIALS AND METHODS

A prospective cross-sectional study was undertaken among the rural population in the Erode district of Tamil Nadu, India. A total of 974 patients who were 18 years of age or older and gave written informed consent to participate in the trial were randomly chosen by utilizing a convenience sample technique. Any mentally ill or cognitively impaired subjects were not allowed to participate in the study.

Table 1: Demographic properties of participants (*n*=974).

No.	Demographic Characteristics	Number of Respondents (N)	Percentage (%)
	Age in Years		
1	Up to 30 years	25	2.6
2	31-40 Years	96	9.9
3	41-50 years	211	21.7
4	51-60 years	308	31.6
5	61-70 years	224	23.0
6	Above 70 years	110	11.3
	Total	974	100.0
Gender			
1	Male	431	44.3
2	Female	543	55.7
	Total	974	100.0
Education			
1	Illiterate	269	27.6
2	Primary	203	20.8
3	Secondary	162	16.6
4	Higher Secondary	340	34.9
	Total	974	100.0
Occupation			
1	Business	189	19.4
2	Employed	274	28.1
3	Unemployed	511	52.5
	Total	974	100.0

A modified Michigan's diabetes knowledge questionnaire was used to evaluate the knowledge on diabetes. The questionnaire consists of 10 topics covering basic diabetes awareness, diabetic complications, and prevention and control of diabetes as well as socio-demographic information about the participants. The survey instrument also contained study materials and a written informed consent form.

Data was acquired from the diabetic population in the rural area of Erode district, Tamil Nadu by utilizing convenience sampling method. Individuals signed a written informed consent form after receiving a thorough explanation of the study project's aims and objectives prior to the data collection. A face-to-face interview was undertaken to collect the data. Each interview lasted between fifteen and twenty minutes. They were given the chance to express more thoughts on the subject once the interview was over.

In order to analyse the data, SPSS version 26.0 was used. The gathered demographic data were analysed using descriptive studies, and the appropriate applications of the one-way analysis of variance (ANOVA) and the student's t-test were made. When we comparing two groups, the student's t-test was employed, and when comparing more than two groups, the one-way ANOVA was utilized. This study was approved by institutional ethics committee of Swamy Vivekanandha College of Pharmacy, Thiruchengode, Erode via approval number SVCP/IEC/JAN/2021/15.

RESULTS

In this research, the majority of individuals (31.6 %, n= 308) were within a range of 51-60 years old and only a minimum of individuals (2.6 %, n= 25) were less than 30 years old. On the other hand, around 23.0 % (n= 224) were between 61-70 years old and 21.7 % (n=211) were between 41-50 years old and 11.3 % (n=110) of the participants fall 70 years and above. The largest number of study participants received education from higher secondary school level (n=340, 34.9 %) and 27.65 % (n=269) of study participants were illiterate. Whereas 20.8 % (n=203) of the participants received at least primary level education and 16.6 % (n=162) received secondary level education. The largest percentage of study participants were unemployed (52.5 %, n=511), 28.1 %, (n=274) were employed and 19.4 % (n=189) were doing business. Among the participants, around 55.7 % (n=543) were female and the remaining (44.3 %, n=431) were male. In the current research, there were majority of female participants in the age group of 51-60 years (n=178) and 61-70 years (n=135) and majority of males in the age group of 30 years and below (n=14) whereas, males and females were equally distributed in the age range from 31-40 (n=48) years. For the educational level, there were more female participants who were illiterate, primary and higher secondary level. Whereas more male participants were secondary school level. For the occupation level, there are more

Table 2: Gender-wise distribution of respondents (n=974).

No.	Demographic Characteristics	Male (431)		Female (543)		Total	
		N	%	N	%	N	%
Age in Years							
1	Upto 30 years	14	3.2	11	2.0	25	5.3
2	31-40 Years	48	11.1	48	8.8	96	20.0
3	41-50 years	104	24.1	107	19.7	211	43.8
4	51-60 years	130	30.2	178	32.8	308	62.9
5	61-70 years	89	20.6	135	24.9	224	45.5
6	Above 70 years	46	10.7	64	11.8	110	22.5
	Total	431	100.0	543	100.0	974	200.0
Education							
1	Illiterate	121	28.1	148	27.3	269	55.3
2	Primary	96	22.3	107	19.7	203	42.0
3	Secondary	88	20.4	74	13.6	162	34.0
4	Higher Secondary	126	29.2	214	39.4	340	68.6
	Total	431	100.0	543	100.0	974	200.0
Occupation							
1	Business	141	32.7	48	8.8	189	41.6
2	Employed	151	35.0	123	22.7	274	57.7
3	Unemployed	139	32.3	372	68.5	511	100.8
	Total	431	100.0	543	100.0	974	200.0

female participants who were unemployed (*n*=372). The detailed demographic information is presented in Table 1 and Table 2.

To evaluate the participants' general knowledge of diabetes, diabetic complications, prevention, and treatment, a ten-item modified Michigan diabetes knowledge assessment questionnaire was employed. The research showed that, of the 974 study participants, 649 (or 66.6 percent) had heard of diabetes mellitus. Of these, 374 were male and 275 were female. All (100 %) of the study participants answered any one of the organs affected by the high-fat diet. In terms of their knowledge, the majority (*n*=570; 58.5 %) of the study participants agreed that if they skip breakfast after taking insulin, drastically will decrease the blood glucose level. Among them, a similar percentage of females (59.3 %) and males (57.5 %) agreed with the statement. One hundred and thirty-eight participants (14.2 %) said if they skip breakfast after taking insulin, it will drastically increase their blood glucose level. Two hundred and sixty-six participants (27.3 %) stated that if they skip breakfast after taking insulin, their blood glucose levels remain the same. A total of 291 (53.6 %) females and 236 (54.8 %) males agreed that a blood test is the best method for home glucose testing. However, an equal number of females (*n*=164; 30.2 %) and males (*n*=136; 31.6 %) answered that both blood tests and urine tests are equally effective for the best method for home glucose testing.

The majority (*n*=549; 56.4 %) of the study participants answered that the best way to take care of their feet was washing the wound every day and also protecting them from injuries. Among them (*n*=301; 55.4) were females and (*n*=248; 57.5 %) were females. A total of 524(53.8 %) study participants knew about complications of diabetes that kidney, heart, and eyes are affected by DM. Among them, an equal number of (*n*=287; 52.9 %) were females and (*n*=237; 55.0 %) were males.

The majority of the study participants (*n*=479; 49.2 %) stated that numbness and tingling may be the symptoms of nerve disease. Among them, (47.9 % (*n*=260) were female, 50.8 % (*n*=219) were male. A total of 457(46.9 %) study participants mentioned that, if the patients feel giddiness or faint immediately, they should take chocolate. Among them, 251(46.2 %) were females, 206 (47.8 %) were males.

A total of 261 (26.8%) respondents mentioned that lung problems are not associated with DM. Among them, 143(26.3%) were females and 118(27.4%) were males. The majority of the respondents (*n*=452; 46.4%) answered that they should avoid carbohydrate-rich food, among them, 250 (46%) were females and 202(46.9%) were males.

The overall assessment of patients' knowledge of diabetes revealed that 40.9 % (*n*=398) of the respondents have good knowledge, 46.3 % (*n*=451); have average knowledge, however, only 5% (*n*=49) were having excellent knowledge of diabetes. The particulars are presented in Table 3.

The mean scores for both males and females were almost the same, implying that there was no significant difference in knowledge between the males and females (*p*>0.726). The data are shown in Table 4. ANOVA results show that the knowledge of study participants with different age groups have significant difference (*p*<0.0006) education level and occupation was no significant difference among the study population. The participants aged 51-60 have the highest mean value of 2.53 with a standard deviation of 0.65 and the participants aged less than 30 have the lowest mean value of 2.12 with a standard deviation of 0.67 (*p*<0.006). As for the education, the secondary educated level participants have the highest mean value 2.54 with a standard deviation of 0.71 (*p*=0.126), and for the occupation, those who are self-employed have the highest mean value 2.49 with a standard deviation of 0.74 (*p*>0.470). The data are presented in Table 5.

DISCUSSION

The study investigated the level of type 2 DM awareness among the study population in the rural Erode district. The results shows that there was a statistically remarkable difference in the average knowledge levels across the study participants' age groups (*p*=0.006). Results from the recent literature analyzing the relation between age and diabetes knowledge were contradictory.[20-23] But there were no differences in knowledge that were statistically significant based on gender (*p*=0.726), education (*p*=0.126), or occupation (*p*=0.470). The older patients in this study had more knowledge than the younger participants, and there was statistical significance in the average knowledge of study participants with dissimilar age groups. This result is consistent with earlier research by Palanisamy *et al*., in which there was a significant difference between the mean knowledge levels of study participants in different age groups and that the younger participants had more knowledge than the older participants with a lower mean value (μ=58.920).[24]

There is literature evaluating the association between gender and knowledge that found that gender does not play a significant role in DM knowledge.[25,26] These findings contradict prior studies by Bharath C, *et al.,* which found that knowledge responses based on gender suggested that male had superior knowledge than female, and a significant difference was noted only for question 2 (*p*<0.03).[27] The level of education was found to be the most important determinant in DM knowledge.[28] In a study conducted by Konduru SS *et al*., knowledge regarding DM was increased in graduates.[29] However, in this study, there were no discernible knowledge gaps between participants with various levels of schooling. (*p*=0.126). This indicates that, regardless of education level, everyone has nearly the same amount of information about DM.

In this study, the occupation showed there was no significant differences in knowledge among the study participants. This finding is consistent with previous studies by Daniel Asmelash

Table 3 Assessment of Knowledge on Diabetes and Participants' Response (*n*=974).

Questions	Response	Male (431)		Female (543)		Total	
		N	%	N	%	N	%
What is diabetes mellitus?	Increase in weight	37	8.6	36	6.6	73	7.5
	Decrease in weight	73	16.9	81	14.9	154	15.8
	Increase in blood glucose level	275	63.8	374	68.9	649	66.6
	None of the above	46	10.7	52	9.6	98	10.1
	Total	431	100.0	543	100.0	974	100.0
Which organ will be affected by high fat diet?	Kidney	99	23.0	90	16.6	189	19.4
	Heart	244	56.6	330	60.8	574	58.9
	Lungs	44	10.2	61	11.2	105	10.8
	Eye	44	10.2	62	11.4	106	10.9
	Total	431	100.0	543	100.0	974	100.0
If you take your morning insulin but skip breakfast your blood glucose level will be usually	Increase	55	12.8	83	15.3	138	14.2
	Decrease	248	57.5	322	59.3	570	58.5
	Remain the same	128	29.7	138	25.4	266	27.3
	Total	431	100.0	543	100.0	974	100.0
Which is the best method for home glucose testing	Urine test	59	13.7	88	16.2	147	15.1
	Blood test	236	54.8	291	53.6	527	54.1
	Both is equally good	136	31.6	164	30.2	300	30.8
	Total	431	100.0	543	100.0	974	100.0
The best way to take care of your feet is to	Look at and wash them each day	82	19.0	130	23.9	212	21.8
	Protect from injuries	101	23.4	112	20.6	213	21.9
	Both	248	57.5	301	55.4	549	56.4
	Total	431	100.0	543	100.0	974	100.0
What are the complications of diabetes mellitus?	Kidney damage	97	22.5	121	22.3	218	22.4
	Heart damage	47	10.9	59	10.9	106	10.9
	Eye damage	50	11.6	76	14.0	126	12.9
	All	237	55.0	287	52.9	524	53.8
	Total	431	100.0	543	100.0	974	100.0
Numbness and tingling may be the symptoms of	Kidney disease	46	10.7	74	13.6	120	12.3
	Nerve disease	219	50.8	260	47.9	479	49.2
	Liver disease	114	26.5	147	27.1	261	26.8
	Eye disease	52	12.1	62	11.4	114	11.7
	Total	431	100.0	543	100.0	974	100.0
If you feel giddiness or faint immediately you should	Do exercise	105	24.4	142	26.2	247	25.4
	Lie down and rest	53	12.3	75	13.8	128	13.1
	Take insulin	67	15.5	75	13.8	142	14.6
	Take chocolate	206	47.8	251	46.2	457	46.9
	Total	431	100.0	543	100.0	974	100.0

Which of the following is usually not associated with diabetes	Vision Problem	185	42.9	243	44.8	428	43.9
	Kidney Problem	63	14.6	80	14.7	143	14.7
	Lung Problem	118	27.4	143	26.3	261	26.8
	Nerve Problem	65	15.1	77	14.2	142	14.6
	Total	431	100.0	543	100.0	974	100.0
You should avoid the following one	Carbohydrate Rich Food	202	46.9	250	46.0	452	46.4
	Protein rich food	53	12.3	74	13.6	127	13.0
	Fiber rich food	102	23.7	126	23.2	228	23.4
	Vitamin rich food	74	17.2	93	17.1	167	17.1
	Total	431	100.0	543	100.0	974	100.0
Patient Knowledgeable Status	Poor	38	8.8	38	7.0	76	7.8
	Average	195	45.2	256	47.1	451	46.3
	Good	176	40.8	222	40.9	398	40.9
	Excellent	22	5.1	27	5.0	49	5.0
	Total	431	100.0	543	100.0	974	100.0

Table 4: Independent Sample Test for Knowledge with Different Genders

Gender	N	Mean	SD	't' Value	Sig.
Male	431	2.42	0.72	0.350	0.726
Female	543	2.43	0.69		

Table 5: Results of Questionnaire separated by Age, Education and Occupation

No.	Variables	Number	Mean	SD	Sig.
	Age in Years				
1	Upto 30 years	25	2.12	0.67	
2	31-40 Years	96	2.30	0.74	
3	41-50 years	211	2.39	0.73	
4	51-60 years	308	2.53	0.65	0.006
5	61-70 years	224	2.47	0.73	
6	Above 70 years	110	2.35	0.72	
	Total	974	2.36	0.71	
Education					
1	Illiterate	269	2.39	0.70	
2	Primary	203	2.45	0.72	
3	Secondary	162	2.54	0.71	0.126
4	Higher Secondary	340	2.40	0.71	
	Total	974	2.45	0.71	
Occupation					
1	Business	189	2.49	0.74	
2	Employed	274	2.43	0.75	
3	Unemployed	511	2.41	0.67	0.470
	Total	974	2.44	0.72	

et al., where the occupation and educational status showed significant association with the practice towards glycaemic control.[30] Considering the rapid spread of diabetes in developing countries and reports of poor knowledge about DM, the evidence

suggests that interventions are needed, and patients should be empowered for better self-management of diabetes as it can lead to positive changes in beliefs, increased health information, and improved health care skills. Overall, diabetes management knowledge was lower than risk factor knowledge. Furthermore, health practitioners must educate the rural community about the importance of living a healthy lifestyle to raise diabetes awareness and knowledge. Diabetes status, other chronic diseases, physical activity, and ever heard of diabetes may be evaluative determinants towards knowledge of risk factors and diabetes management. The results of this study might not adequately reflect the real knowledge on diabetes among the rural residents of Erode district, India. Unless the respondents have been trained and counselled by health care specialists, the questionnaire should not be tried diligently.

CONCLUSION

This study concluded that there is a statistically significant difference in knowledge of DM among different age groups, whereas the gender of the study participants, education and occupational status of the study participants do not have a significant difference. Diabetic patients are more likely to develop diabetic complications due to a lack of knowledge and understanding of the disease. Hence, to prevent diabetes and its complications there is an urgent need for educational campaigns with a prioritized focus on poorer, rural, less educated populations, on proper lifestyle interventions to improve the self-care behaviour of patients. Integrated knowledge on diabetes management should be focused on improving glycaemic control and reducing co-morbidities in this community. Thus, knowledge about diabetes is essential as it correlates with better outcomes leading to improved quality-adjusted life years. An improved and well-structured educational programme(s) that addresses the areas of weakness is recommended to increase the level of knowledge of DM among the general population.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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