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Original Research Article

Knowledge and attitudes regarding effect of diabetes mellitus on eyes and community-based screening for diabetes, hypertension, and visual impairment in central India- a community-based cross-sectional study

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ABSTRACT

Background: Ocular complications associated with DM are progressive and rapidly becoming the world's most significant cause of morbidity and are preventable with early detection and timely treatment. This study was planned to assess knowledge regarding diabetes mellitus and their views and perspectives on diabetes and diabetes related eye diseases and to screen for diabetes, hypertension, and visual impairment in central India.
Methods: A cross sectional study was conducted during annual holy celebrations in the metropolitan city of Mumbai. A large cohort underwent habitual visual acuity assessment (HVA), diabetes screening by random finger prick blood sugar, blood pressure screening. A questionnaire survey was administered to every 5th participant who registered for the free screening. All the variables were analysed using descriptive statistics to calculate frequencies, mean, range and chi-square test was used for analytical statistics.
Results: A total of 6300 participants were surveyed. More than two third of the study participants (79.5%) know about diabetes and raised blood sugar level causes problem. Around 87.3% had good knowledge about diabetes. Around 42.7% of the study participants never had eye examination in their lifetime. Nearly 40% of participants were screened positive for hypertension and 23.9% had raised blood sugar level. Unfortunately, 6.0% had visual impairment on visual acuity examination.
Conclusions: Despite our study shows that majority of the participants had knowledge about diabetes mellitus and importance of eye screening, only half of the people with diabetes mellitus underwent routine eye examination or screening.

Keywords: Diabetes, Diabetes related eye disease, Hypertension, Knowledge, Perspective, Screening

INTRODUCTION

Globally, diabetes mellitus (DM) is now one of the most common non-communicable diseases (NCDs) and accounts for 4.2 million deaths annually. According to the International Diabetes Federation, approximately 463 million adults (20-79 years) were living with diabetes in 2019 and by 2045 this number will rise to 700 million. About 79% of adults with diabetes were living in low- and middle-income countries. The more worrisome fact is that about 50% of those with diabetes remain undiagnosed.[1] The prevalence of diabetes in India is 7.3% i.e. 62.4 million people living with diabetes in 2011 as per Indian Council of Medical Research- India diabetes

(ICMR- INDIAB) population based cross-sectional study.[2]

DM is a silent disease in which many sufferers become aware that they have diabetes only when they develop one of its life-threatening complications. It causes significant morbidity owing to specific microvascular complications such as, retinopathy, nephropathy and neuropathy, and macrovascular complications such as, ischaemic heart disease, and peripheral vasculopathy. Ocular complications associated with DM are progressive and rapidly becoming the world's most significant cause of morbidity and are preventable with early detection and timely treatment.[3] Health education is one of the key components in ensuring better treatment and control of diabetes. Studies have shown that increasing knowledge regarding diabetes and its complications has significant benefits in terms of early diagnosis and compliance to treatment, thereby reducing the complications associated with diabetes.[4] This study was planned to assess knowledge regarding diabetes mellitus and their views and perspectives on diabetes and eyes.

METHODS

A large cohort in western India underwent habitual visual acuity assessment (HVA), diabetes screening by random finger prick blood sugar, blood pressure screening. Participation in the screening was voluntary and all tests were provided free as part of a long-term diabetes and vision screening project in western India. The cohort for this study is from a screening project conducted in 2018 over a 10-day period. The screening was conducted in the community at a prominent location during annual holy celebrations in the metropolitan city of Mumbai. Approximately, 50,000-60,000 people a day and people of various ages, educational and socio-economic backgrounds visit this location which makes an ideal location to assess a heterogeneous cohort which would be representative of a population of a large urban city in western India.

In this research, a cross-sectional study design was applied in which a questionnaire survey was administered to every 5th participant who registered for the free screening.

Inclusion criteria

The study included participants who were willing to give informed consent, participated in the screening program.

Exclusion criteria

The study excluded if the participant was not willing to give informed consent or participant found to be sick for any medical reasons.

If the 5th participant refused participation, then the next participant was asked to participate. Trained professional survey personnel administered the questionnaire survey (Leadtech private limited, New Delhi). The surveys were designed to assess knowledge attitude and perspective of the participants regarding diabetes and diabetes related eye disease. The questionnaire was administered by using convenient sampling method during the day of screening; therefore, the sample size was 6300 participants. The study period was one day.

Validated questionnaire surveys were modified using community-based focus discussions. The survey questionnaire was designed in English and translated to Hindi and Marathi; the two most common languages used in Mumbai. Translation based discrepancies were checked by administering both the English and translated questionnaires to un-involved and un-biased local doctors (general practitioners, diabetologists and ophthalmologists) (n=50). Based on their observations, using the English questionnaire as the standard, the language of the translated questionnaires was modified. The modified questionnaire was then piloted amongst 100 random patients and relatives in the out-patient department. Based on the responses from the participants and the observations of the survey personnel the survey was further modified to ensure clarity of questions to the lay person irrespective of their educational status, clear understanding of the options for the questions and to ensure that the survey took no more than 7 minutes to complete. The modified survey was then piloted amongst 100 random volunteers at the hospital (none of them medical or para-medical professionals) and the survey was finalized.

Professional survey professionals using electronic devices like iPad and tablets administered the questionnaire survey. Leadtech has their proprietary survey software. All the questions had forced choice responses, multiple options (for some questions only 1 response was allowed and for some multiple responses could be selected) and there was no free text for responses of the questionnaire. No blank responses were permitted.

The first part of the survey collected basic socio-demographic data like age (18-40, 40-60 and >60), sex (male, female), educational status (<10th standard, graduate, post-graduate), residence (Mumbai, other city or village), income (Rs 50000/year, 50,000-2,00,000/year and >2,00,000/year) and if the participant had a driving license (not driving, car, two-wheeler, bus/truck- the largest vehicle driven was selected). The second part of the survey collected the participants results from the screening tests; blood pressure, random blood sugar, HVA right and left eye. Following this were the questions regarding knowledge, attitude and perspective towards diabetes and diabetes related eye disease.

Ethical clearance was obtained from Institutional Ethics Committee, Ashwini Rural Medical College, Hospital and Research Centre, Kumbhari, Solapur.

Data analysis was done using Statistical Package for Social Science (SPSS) software version 23. All the variables were analysed using descriptive statistics to calculate frequencies, mean, range etc. By considering 95% level of significance, chi-square test, Fischer exact test and t test were applied to determine the association between different variables.

RESULTS

A total of 6300 participants were surveyed. Demographic characteristics of the subjects and gender differences are shown in Table 1. Most of the study participants were in the age group of 20 to 40 years and 5.2% were elderly. Out of 6300 participants, 73.7% were males and 26.3% were females. More than half (52%) of the study participants had below higher-level education and majority (96.6%) of the them were living in urban area. Majority (97.8%) of them belonged to Hindu religion and as much as 43.9% of study participants had annual income of less than 50,000.

More than two third of the study participants (79.5%) know about diabetes and raised blood sugar level causes problem. Around 87.3% had good knowledge about diabetes. Almost half of the participants believe that diabetes occurs only after 60 years. Only 58% of the participants have ever checked their blood sugar level. Out of 6300 participants, 40.5% were already diagnosed with raised blood sugar level.

Table 1: Distribution of the study participants based on socio-demographic characteristics (n=6300).

Variables	Number	Percentage
Age (years)		
20-40	3786	60.1
41-60	2187	34.7
>60	327	5.2
Gender		
Male	4640	73.7
Female	1660	26.3
Education		
<10 standard	3294	52.3
Graduate	2434	38.6
Post-graduate	572	9.1
Residence		
Urban	6084	96.6
Rural	216	3.4
Religion		
Hindu	6163	97.8
Muslim	41	0.7
Christian	33	0.5
Sikh	8	0.1
Other	55	0.9
Annual income		
<50000	2766	43.9
50000-200000	2518	40
>200000	1016	16.1

Table 2: Knowledge, perception and practise about diabetes mellitus among study participants (n=6300).

Variables	Number	Percentage
Know about diabetes		
Yes	5010	79.5
No	1290	20.5
Do you know that raised sugar levels in the blood can cause problems		
Yes	5040	80
No	1260	20
Knowledge about diabetes		
Answered correctly	5499	87.3
Answered incorrectly	801	12.7
Perception about diabetes		
Diabetes occurs after 60 years		
Agree	2814	44.7
Disagree	2879	45.7
Don't know	607	9.6
Diabetes can affect people less than 20 years old		
Agree	2905	46.1
Disagree	2776	44.1
Don't know	619	9.8
Diabetes affect without family history		
Agree	3737	59.3
Disagree	2075	32.9
Don't know	488	7.7
Diabetes occurs mainly in rich people		
Agree	2187	34.7

Continued.

Variables	Number	Percentage
Disagree	2868	45.5
Don't know	1245	19.8
Diabetes occurs mainly in fat people		
Agree	2463	39.1
Disagree	2660	42.2
Don't know	1177	18.7
Diabetes occurs in people in villages		
Agree	2364	37.5
Disagree	2768	43.9
Don't know	1168	18.5
Diabetes mainly affects people who eat lots of sweet things		
Agree	3364	53.4
Disagree	2421	38.4
Don't know	515	8.2
Diabetes affects people who do not eat chocolates and sweets		
Agree	3682	58.4
Disagree	2176	34.5
Don't know	442	7
Diabetes mainly affects people who do not exercise		
Agree	3388	53.8
Disagree	2398	38.1
Don't know	514	8.2
Diabetes can affect athletes/sportsmen/marathon runners		
Agree	3437	54.6
Disagree	2349	37.3
Don't know	514	8.2
Practise about checking blood sugar		
Have you ever checked blood sugar		
Yes	3651	58
No	2649	42
Have you ever diagnosed with raised blood sugar		
Yes	2552	40.5
No	3748	59.5

Table 3: Perception and practise about eye examination among study participants (n=6300).

Variables	Number	Percentage
Previous eye check-up		
<1 year	2160	34.3
>2 year	872	13.8
>5 year	576	9.1
Never	2692	42.7
Who do you see for eye examination		
Eye specialist	3192	50.7
Family doctor	884	14
Lens kart	1382	21.9
Optician	842	13.4
According to you, your vision is		
Abnormal	2090	33.2
Normal	4210	66.8

Table 4: Burden of raised blood sugar and visual impairment among study participants (n=6300).

Variables	Number	Percentage
Blood pressure		
Normal	1302	20.7
Pre hypertension	2447	38.8
Stage 1 hypertension	2201	34.9
Stage 2 hypertension	350	5.6
Random blood sugar		
≤140 mg/dl	4792	76.1
>140 mg/dl	1508	23.9
Visual acuity examination		
Normal	5920	94
Mild Impairment	189	3.0
Moderate impairment	181	2.9
Severe impairment and blindness	10	0.2

Table 6: Association between perception of factors responsible for diabetes mellitus and vision examination.

Variables	Normal vision, n (%)	Abnormal vision, n (%)	Chi-square value	P value
Blood sugar problem can occur only after the age of 60				
Agree	2626 (44.4)	188 (49.5)	7.003	0.03*
Disagree	2730 (46.1)	149 (39.2)		
Don't know	564 (9.5)	43 (11.3)		
Blood sugar problem can affect people less than 20 years old				
Agree	2744 (46.4)	161 (42.4)	2.857	0.24
Disagree	2601 (43.9)	175 (6.3)		
Don't know	575 (9.7)	44 (11.6)		
Blood sugar problem can affect people without a family history				
Agree	3524 (59.5)	213 (56.1)	6.435	0.04*
Disagree	1950 (32.9)	125 (32.9)		
Don't know	446 (7.5)	42 (11.1)		
Blood sugar problem occurs mainly in rich people				
Agree	2053 (34.7)	134 (35.3)	1.874	0.392
Disagree	2687 (45.4)	181 (47.6)		
Don't know	1180 (19.9)	65 (17.1)		
Blood sugar problem mainly affects people who eat lots of sweet things				
Agree	3160 (53.4)	204 (53.7)	0.42	0.811
Disagree	2279 (38.5)	142 (37.4)		
Don't know	481 (8.1)	34 (8.9)		
Blood sugar problem affects people who do not eat chocolates and sweets				
Agree	3476 (58.7)	206 (54.2)	3.615	0.164
Disagree	2035 (34.4)	141 (6.5)		
Don't know	409 (6.9)	33 (8.7)		
Blood sugar problem can affect athletes / sportsmen / marathon runners				
Agree	3240 (54.7)	197 (51.8)	2.781	0.249
Disagree	2205 (37.2)	144 (6.1)		
Don't know	475 (8.0)	39 (10.3)		
Blood sugar problem mainly affects people who do not exercise				
Agree	3188 (53.9)	200 (52.6)	2.391	0.302
Disagree	2257 (38.1)	141 (5.9)		
Don't know	475 (8.0)	39 (10.3)		
Blood sugar problem occurs mainly in fat people				
Agree	2328 (39.3)	135 (35.5)	2.164	0.339
Disagree	2490 (42.1)	170 (44.7)		
Don't know	1102 (18.6)	75 (19.7)		
Blood sugar problem occurs in people in villages				
Agree	2220 (37.5)	144 (37.9)	0.362	0.835
Disagree	2606 (44.0)	162 (42.6)		
Don't know	1094 (18.5)	74 (19.5)		
Do you know that raised sugar levels in the blood can cause problems				
Yes	4732 (79.9)	308 (81.1)	0.28	0.643
No	1188 (20.1)	72 (18.9)		
Do you know what diabetes is				
Yes	4718 (79.7)	292 (76.8)	1.78	0.19
No	1202 (20.3)	88 (23.2)		
Asked about diabetes				
Answered correctly	5178 (87.5)	321 (84.5)	2.881	0.095
Answered incorrectly	742 (12.5)	59 (15.5)		
Last time eye examination done				
<1 year	2012 (34.0)	148 (38.9)	64.39	0.001*
>2 year	806 (13.6)	66 (17.4)		

Continued.

Variables	Normal vision, n (%)	Abnormal vision, n (%)	Chi-square value	P value
>5 year	509 (8.6)	67 (17.6)		
Never	2593 (43.8)	99 (26.1)		
Who do you see for an eye examination				
Eye specialist	2988 (50.5)	204 (53.7)	7.226	0.065
Family doctor	823 (13.9)	61 (16.1)		
Lens kart	1319 (22.3)	63 (16.6)		
Optician	790 (13.3)	52 (13.7)		
According to you, your vision (if has glasses, with glasses) is				
Normal	4015 (67.8)	195 (51.3)	43.879	0.001*
Abnormal	1905 (32.2)	185 (48.7)		
Total	5920	380		

Unfortunately, 42.7% of the study participants never had eye examination in their lifetime but about 34.3% had previous eye check in less than one year. Half of them (50.7%) answered that they will have eye check-up from eye specialist and around 66.8% of study participants believes their vision is normal.

On screening, nearly 40% of participants were screened positive for hypertension and 23.9% had raised blood sugar level. Unfortunately, 6.0% had visual impairment on visual acuity examination (Table 4).

It was found that the participants agreed for factor such as diabetes can occur after 60 years, eats lots of sweets, do not exercise had a significantly raised blood sugar level compared to the participants who did not agree for the given factors. The participants who did not agree for factors such as diabetes affects less than 20 years, obese people, village people had a significantly raised blood sugar level compared to the participants who did agree for the given factors.

It was found that the participants agreed for factor such as diabetes can occur after 60 years, affect people without family history had a significant abnormal vision compared to the participants who did not agree for the given factors.

DISCUSSION

This study was undertaken among 6300 study participants, to assess their knowledge and perception about diabetes. Around 60% of participants were in the age group of 20-40 years and more than two third were male. Among these, 87.3% had correct knowledge about diabetes, 58% of participants have ever checked their blood sugar and about 40.5% were diagnosed with raised blood sugar. On visual examination, more than 94% of them had normal vision, 3% had mild and 2.9% moderate vision impairment and 0.2% had severe impairment

In current study we assessed the knowledge, attitude, practices and perception of diabetes mellitus with the help of set of questionnaires. Out of the total participants, around 60% of the study participants were in the age group of 20-40 years and 5% were elderly. Most of our participants were in younger age group which can be compared with National ICMR INDIAB study but this is contrary to the study conducted by Tejaswi et al as it was conducted in tertiary care hospitals in central India where most of the study participants were in age group of >40 years.[5]

More than two-third of our study participants were male. This gender distribution is not similar to ICMR-INDIAB study which was done at a national level across fourteen states in which the gender distribution was almost equal in Maharashtra. This is also supported by the study conducted by Tejaswi et al as it was conducted in tertiary care hospitals in central India.[5] And almost 96.6% of our study participants were living in urban area. This is high as compared to INDIAB study where about 56.5% belong to urban area in Maharashtra. In our study, near about 58% of participants have ever checked their blood sugar and about 40.5% were diagnosed with raised blood sugar. But when we checked random blood sugar of all participants, around one third (23.9%) had raised blood sugar. The self-reported raised blood sugar in our study is higher as compared to INDIAB study in Maharashtra (10.9%).[6]

In our study, around 80% knows about diabetes mellitus, which is comparable to the study conducted by Kurian et al in a rural community in Kerala (89%), but in INDIAB study, only 43.2% were aware about diabetes mellitus.[7,8] In current study, nearly about 87.3% of study participants had answered correctly on knowledge about diabetes mellitus. This is high compared to the study conducted by Tejaswi et al as it was conducted in tertiary care hospitals in central India in which 16% of the participants had good level of knowledge.[5]

In our study, less than half of them (44.7%) feels that diabetes occurs after 60 years and nearly 46.1% agrees that the disease can affect people less than 20 years. More than half of them (59.3%) aggress that diabetes can occur without family history, 34.7% of them agreed that disease occurs in rich people, 34.7% agreed that disease mainly occur in fat people. More than half of study participants agreed that disease affects people who eats lots of sweet

and who do not exercise. These findings were almost similar to the study conducted by Kurian et al in a rural community in Kerala in which the most common risk factor identified by respondents was diet (57.4%) followed by heredity (17.2%) and physical inactivity (4.9%).[7-9] In present study, it was found that the participants agreed for factor such as diabetes can occur after 60 years, eats lots of sweets, do not exercise had a significantly raised blood sugar level compared to the participants who did not agree for the given factors and participants who did not agree for factors such as diabetes affects less than 20 years, fat people, village people had a significantly raised blood sugar level compared to the participants who did agree for the given factors. The perception among participants were similar to the existing literature on risk factors of diabetes mellitus. This is also evident in a study conducted by Adhikary et al among rural resident in Delhi where the risk factors identified were age more than 60 years, family history of diabetes and sedentary work.[10] An another study by Tripathy et al, a large community based study in Punjab, in which family history and age group (45-69 years) were identified as a risk factor for diabetes.[11]

In our study, the participants agreed for factor such as diabetes can occur who do not have family history, can affect athletes/sportsmen had a significantly raised blood sugar level compared to the participants who did not agree for the given factors. This finding is contrary to the study conducted by Adhikary et al and Tripathy et al where family history was identified as a risk factor for diabetes.[10,11]

In current study, it was found that around 42.7% of participants had never undergone eye examination. About more than one third of study participants feels their vision is abnormal but on eye examination, more than 94% of them had normal vision, 3% had mild and 2.9% moderate vision impairment and 0.2% had severe impairment. This finding is almost similar to the National Blindness and Visual Impairment survey (2015-2019), in which mild visual impairment in all age groups were 2.9%, moderate were 1.84% and severe were 0.35%.[12] Our study was a community-based study for assessing the level of knowledge, attitudes and practices regarding effect of diabetes on eye. We also screened the participants for diabetes, hypertension and visual impairment, thereby initiating the treatment who are found to be confirmed with the disease. However, our study also has some limitations where the findings are reflective to the population at study and cannot be generalized. There are other variables or determinants which may determine the level of knowledge, attitude and belief which could not be assessed in this study.

CONCLUSION

Our study showed that majority of the study participants never underwent eye examination. Many participants also believed that diabetes mellitus may affect the eye and may lead to impaired vision. Majority of the participants had the knowledge of diabetes, risk factors associated with diabetes and complications. Therefore, primary prevention methods like awareness, health education, counselling may play a vital role in reducing the burden of eye diseases due to diabetes. It is also recommended that routine eye screening of people with diabetes mellitus may help in early identification of people who are at higher-risk of developing diabetic-related eye disease and help in early initiation of treatment.

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