

Status of Oral Health Screening of Diabetes Patients : A cross- sectional study

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Abstract

Background

Oral complications are prevalent in diabetes and these complications have potential impact on patients' overall health and well-being. The aim of the study was to investigate the frequency of oral health screenings among patients with diabetes and its associated factors.

Methods

A cross sectional study was conducted involving 106 patients. Data were collected with a pretested and structured questionnaire. Chi-square test was conducted to assess the association between outcome variables and selected covariates. At the same time, multivariate binary logistics regression model was used to determine the factors that are related to oral health screening status of diabetes patients. SPSS (Statistical Package for Social Science) version 25 was used for data management, analysis.

Results

Of the respondents, only 28.30 percent of the diabetes patients in the study had received an oral health screening. Participants having higher educational level were more likely to have oral health screening than those who cannot read and write (OR=1.733). Moreover, the odds of having an oral health check-up were less likely who had higher monthly income compared to those who had monthly salary less than 15000 taka (OR=0.163 and 0.115 respectively). The odds of people who brush their teeth two or more times a day were more likely to have oral screening against those who brush their teeth once a day (OR=0.202). Participants who knew diabetes affect the teeth were three times higher to have oral screening than their counterparts (OR=3.250) whereas those who knew oral check-up prevents tooth loss were more prone to go for oral screening than their counterparts.

Conclusion

The findings of the study indicate that there is a need to improve the oral health screening status among diabetes patients in the country. The factors identified as associated with a higher frequency of oral health screening- higher educational level, lower monthly income, higher frequency of tooth brushing per day can help inform targeted interventions to improve screening rates. To improve oral health screening for diabetes patients, health education programs can be implemented to increase awareness and understanding of the importance of regular dental check-ups.

Keywords: Oral Health, Diabetes, Dental Check-Up.

1. Background

Diabetes is a chronic disease that develops when the pancreas fails to produce enough insulin or an improper insulin response in peripheral tissues [1]. In 2017, it was reported that 451 million people aged 18–99 had diabetes worldwide, and that figures are likely to increase to 693 million by 2045[2]. The prevalence of diabetes is highest in low- and middle-income countries than it is in high-income countries [1]. Like all other developed and

developing countries the prevalence of diabetes is increasing in Bangladesh. The International Diabetes Federation (IDF) reported that 7.11 percent of Bangladeshis had diabetes [3]. The number of diabetes patients is projected to increase to 11.1 million by 2030, putting the country among the top seven countries in the world [4]. It is a leading cause of blindness, kidney failure, heart attacks, strokes, and amputations of the lower limbs [1].

Because of this disease, several other health complications arise that may affect the entire body. The oral cavity also gets critically affected by the diabetic condition along with complications arising from oral infections. Complications such as reduced saliva secretion, oral lesions, infections and cancer found in such patients. Moreover, mucosal-neuro-sensory disorders, delayed mucosal wound healing, dental caries and tooth loss are more common complications in diabetes patients [5,6]. People with diabetes need to have their dental care on a daily basis [7]. Moreover, diabetes patients have a higher prevalence of dental caries, pulpitis, and periodontitis [8]. The prevalence, incidence, and development of periodontal disease are all higher in diabetes patients. There are connections between diabetes and oral diseases, especially periodontitis. According to a study, participants with diabetes had worse periodontal health than those without diabetes [9]. Patients with diabetes mellitus are more likely to have periodontitis and gingivitis, as well as other soft tissue disorders in the mouth. Another study found that diabetes frequently changes the oral cavity and complicates the metabolism of the patients [10]. A study has examined that diabetes patients were not aware of the impact of diabetes on periodontal health [11]. It is important for diabetes patient to visit a dentist regularly to reduce dental problem. Diabetes patients avoided dental treatment due to the possibility of uncomfortable or costly periodontal therapy [12]. This is due to rising health-care prices, negative attitudes toward health-care, and a lack of awareness. It is essential to understand the risk of periodontal disease, dry mouth, and how to avoid these oral problems, as well as how to effectively treat these conditions in people with diabetes. According to the results of a study, more than half of the participants lacked sufficient oral health information in relation to diabetes [13]. As most patients believe that diabetes is only related to kidney dysfunction, oral health care gets overlooked or it is not considered in the regular treatment regimen, creating multiple complications in the oral cavity, which sometimes become untreatable [14,15]. Besides a higher cost of dental care, lower awareness of oral health care among diabetes patients, transportation cost and dental fares were among factors affecting oral health status of diabetes patients [6,14].

To the best of our knowledge, there were few published works in Bangladesh that primarily focused on the oral health screening status of diabetes patients and its associated factors. The aim of this study is to evaluate the oral health screening status of diabetic patients as well as identifying factors that influence it.

2. Methods

2.1. Study Participants

An online-based cross-sectional study was undertaken on 106 participants. The source population was all diabetes patients. The study population included 106 diabetes patients who were available during the data collection period. For achieving the objectives, online survey was employed due to covid-19. The primary data were collected by using online survey questionnaire. The selected participants were sent survey questionnaire prepared in Google form through email and sending link through social media. As the study also involves illiterate population, their informed consent was obtained from their respective LARs as well.

For this study, the outcome variable (oral health screening status) was assessed as "yes" or "no" in this analysis, with "yes" indicating whether the diabetes patients have visited a dentist every six months or twice a year, otherwise "no" indicating that they have not. The independent variables are age, gender, habitat, education, marital status, occupation, monthly income etc.

2.2. Analysis of Data

Descriptive statistics were used in this research, that is, frequency distributions were analyzed for all variables. We used bivariate analysis to examine the association between dependent variable and selected independent variables. In the bivariate setting, we applied the independence test. For independence test, we used the chi-square statistic. Binary logistic regression was used to assess the effect of an independent variable on dependent variable. SPSS (Statistical Package for Social Science) version 25 was used for data management, analysis.

3. Results

3.1. Participants' Socio-Demographic Characteristics

A summary of the socio-economic and demographic characteristics of the participants is presented in Table 1. Among the 106 subjects 61% were male and 38.7% were female. The average age was 1.39 years. 52.8% respondents have normal weight and 3.8% have overweight. 57.5% of the respondents were married. It was observed that 39.6% were service holder; 14.2% were housewife and 34% have family income less than 15000 taka; 41.5% participants earn more than 25000 taka. According to the educational status, most of the participants (56.6%) had completed college and higher level.

Characteristics	Categories	%
Gender	Male	61.3
	Female	38.7
Age	25-39	27.4
	40-54	37.7
	>55	34.9

Marital status	Married	57.5
	Single	24.5
	Widowed	6.6
	Separated	11.3
Occupational status	Service	39.6
	Housewife	14.2
	Business	19.8
	Daily laborer	7.5
	Jobless	18.9
Educational status	Cannot read and write	5.7
	Read and Write	10.4
	Primary Education	13.2
	Secondary Education	14.2
	College and Above	56.6
	Body Mass Index	<18.5KG/M2
	18.5–24.9 KG/M2	52.8
	25–29.9 KG/M2	35.8
	>30 KG/M2	3.8
Monthly income	<15000	34
	15000-20000	12.3
	21000-25000	12.3
	>25000	41.5

Table 01: Distribution of Participants' Socio-Demographic Characteristics

3.2. Behavioral and Physical Characteristics of Diabetes Participants

Table 2 shows, among the respondents 63.2% took oral medicine and 36.8% used insulin. 43.4% were suffering from diabetes less than 5 years whereas 6.6% were suffering from 15 years to 20

years. The most of the patients (67%) had a positive family history of diabetes, and 43.4% had diabetes for less than five years. The majority of the respondents (88.7%) brush their teeth regularly and 50.9% patients cleaned their teeth once a day.

Characteristics	Categories	%
Diabetes mellitus type	Type 1	50
	Type 2	50
Medication type	Oral	63.2
	Injection form	36.8
Blood sugar level	Yes	61.3
	No	38.7
Duration since diagnosis for DM in years	<5	43.4
	5–10	29.2
	10–15	12.3
	15–20	6.6
	>20	8.5
Family history of diabetes mellitus	Yes	67
	No	33

Tooth brushing	Yes	88.7
	No	11.3
Number tooth brushing per day	2 and more	31.1
	Once	50.9
	Occasionally	17.9

Table 02: Distribution of Behavioral and Physical Characteristics of Diabetes Participants.

3.3. Perception of Diabetes Participants

From table 3, 35.8% respondents agreed that diabetes cause a higher risk of periodontal disease whereas 56% patients agreed that complication of this disease is dangerous. Most of the patients

thought tooth brushing reduce the risk of periodontal disease. More than half of respondents perceived that oral check-up had benefits of preventing tooth loss. 60.4% agreed that diabetes don't affect teeth.

Characteristics	categories	percentage
a person with diabetes mellitus have a higher risk of periodontal disease	Yes	35.8
	No	64.2
complication of periodontal disease is dangerous	Yes	56
	No	50
tooth brushing reduces the risks of periodontal disease	Yes	57.5
	No	42.5
having oral check-up prevents tooth loss	Yes	51.9
	No	48.1
Cost of treatment is high	Yes	61
	No	45
Diabetes don't affect teeth	Yes	60.4
	No	39.6

Table 03: Distribution of Perception of Diabetes Participants

Chi-square test of the outcome variable and characteristics of participants for full data are shown in Table 04, Table 05 and Table 06. Variables that showed statistically significant differences of the outcome variables, in full data, according to Pearson Chi-square

test, were considered for logistic regression. In total, twelve factors were found to be significantly associated with oral screening status based on our collected data set.

variables	categories	Oral screening		Chi square test	P-value
		Yes	No		
Gender	Male	10	55	13.818	0.000*
	Female	20	21		
Age in years	25-39	8	21	3.28	0.194
	40-54	15	25		
	≥55	7	30		
Marital status	Married	13	48	8.46	.067
	Single	9	17		
	Widowed	5	2		
	Separated	3	9		
Occupational status	Service	6	36	12.46	.014*
	Housewife Business	6	9		
	Other	4	17		
		14	14		

Educational status	Cannot Read and Write	2	4	18.68	.001*
	Read and Write	4	7		
	Primary Education	10	4		
	Secondary Education	5	10		
	College and Above	9	51		
BMI	<18.5KG/M2	3	5	.426	.935
	18.5–24.9 KG/M2	15	41		
	25–29.9 KG/M2	11	27		
	>30 KG/M2	1	3		
Monthly income in taka	<15000	19	17	17.957	.000**
	15000-20000	4	9		
	21000-25000	2	11		
	>25000	5	39		

*p<.05, **p<.001

Table 04: Socio-Demographic Characteristics of Respondents

From Table 04, it is clearly visible that there is no significant association between respondent's age and oral health screening status. We also did not find any significant association between respondent's age and status of oral health screening. The same scenario is

visible for marital status and body mass index. The associativity of oral health screening status with respondents' gender, occupational status and monthly income are significant.

characteristic	categories	Oral screening		Chi square test	P-value
		Yes	No		
Diabetes mellitus type	Type 1	20	33	4.64	.071
	Type 2	10	43		
Medication type	Oral	22	45	1.84	.174
	Injection form	8	31		
Duration since diagnosis for DM in years	<5	11	35	11.075	.026*
	5–10	7	22		
	10–15	8	5		
	15–20	2	5		
	>20	2	9		
Family history of diabetes mellitus	Yes	17	54	2.013	.156
	No	13	22		
Tooth brushing	Yes	8	4	9.82	.002*
	No	22	72		
Number tooth brushing per day	2 and more	14	19	12.91	.002*
	Once	7	47		
	Occasionally	9	10		

*p<.05, **p<.001

Table 05: Behavioral and Physical Characteristics of Diabetes Participants

We can see from Table 05 the associativity of oral health screening status with diabetes type, medication type, family history of diabetes mellitus are not significant. We can further notice that duration

since diagnosis for diabetes mellitus, tooth brushing and number of teeth brushing per day are significant.

characteristic	categories	Oral screening		Chi square test	P-value
		Yes	No		
a person with diabetes mellitus has a higher risk of periodontal disease	Yes	18	20	10.61	.001*
	No	12	56		
complication of periodontal disease is dangerous	Yes	19	31	4.39	.036*
	No	11	45		
tooth brushing reduces the risks of periodontal disease	Yes	22	23	16.33	.000*
	No	8	53		
having oral check-up prevents tooth loss	Yes	24	27	17.04	.000*
	No	6	49		
Cost of treatment is high	Yes	16	29	2.028	.154
	No	14	47		
Diabetes don't affect teeth	Yes	18	24	7.26	.007*
	No	12	52		

*p<.05, **p<.001

Table 06: Perception of Diabetes Participants (Based On Full Data, Sample Size=110)

From Table 06 we can see that there is significant relationship between oral health screening status and several perceptions of diabetes patients except the perception of cost of treatment is high.

3.4. Oral Health Screening and Its Predictors (Logistic Regression)

In this study, the oral health screening level was 28.30%, whereas most of the respondents (71.70%) had less than two oral health screens per year (Figure 1).

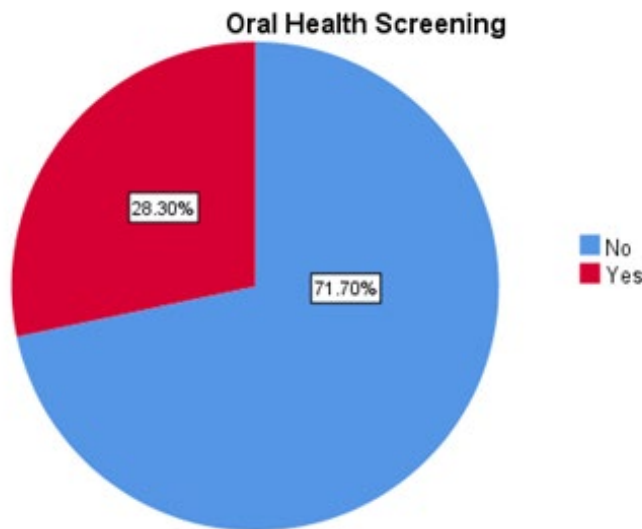


Figure 1: Oral Health Screening Status of Diabetes Participants.

Logistic regression was applied based on the factors found to be significantly associated in the chi-square test. We represent only those factors in Table 07 which were statistically significant during the logistic regression analysis. Results of binary logistic regression analysis showed that participants with an educational level of college and above were more likely to have oral health screening than those who cannot read and write (OR=1.733). Moreover, the odds of having had an oral health screening were less likely who had monthly income between 21000 and 25000 taka and greater

than 25000 taka compared to those who had monthly salary less than 15000 taka (OR=.163 and .115 respectively). The odds of people who brush their teeth two or more times a day were more likely to have oral screening against those who brush their teeth once a day (OR=0.202). Participants who knew diabetes affect the teeth were three times higher to have oral screening than their counterparts (OR=3.250) whereas those who knew oral check-up prevents tooth loss were more prone to go for oral screening than their counterparts (OR=0.138).

Variables	Coefficient	Odds ratio
Educational status		
Cannot Read and Write	Ref	Ref
Read and Write	1.041	2.833
Primary Education	1.175	3.238
Secondary Education	2.651	14.167
College and Above	1.041	1.733*
Monthly income		
<15000	Ref	Ref
15000-20000	-.922	.398
21000-25000	-1.816	.163*
>25000	-2.165	.115**
Number tooth brushing per day		
2 and more	Ref	Ref
Once	-1.559	.202*
Occasionally	.200	1.221
oral check-up prevents tooth loss		
Yes	Ref	Ref
No	-1.982	.138
Diabetes don't affect teeth		
Yes	Ref	Ref
No	1.179	3.250*

*p<.05, **p<.001

Table 07: Predictors Associated With Oral Health Screening Of Diabetes Participants from Binary Logistic Regression.

4. Discussion

People with diabetes are more likely to have various types of oral health problems. Nowadays, it becomes important to visit dental surgeon regularly in order to escape from different dangerous diseases as diabetes cause various oral and dental complications.

This study focuses on the status of screening of oral health in people who have diabetes. Another aim of this study is to determine the factors which are responsible for oral health screening among Bangladeshi diabetes patients. According to the results of this study, 28.3% of diabetes patients reported having had two or more oral health screenings per year. These findings were lower than the previous study i.e. 55% in France,[16] 79% in England,[17], 58.6% in the US,[13] 63.8% in Brazil,[18] and 85.1% in Sweden [19]. These variations might be result from lower levels of oral health coverage, knowledge and awareness in Bangladesh. Oral health screening status of this study was 28.3%. Evidence from several studies shows the consistency with this finding. In India 27%, [20] in Malaysia 33.3% [21, 22]. The level of oral health screening in Saudi Arabia was 12.6% and 15.1% and in Jordan 10%. This study also presents, the level of oral health screening of this study was higher than the previous studies. [11, 23-24].

This study demonstrated that the respondents with higher studies

(college-level and above) was associated with more oral health screening than those who cannot read and write. It should be noted findings from previous study was in line with this study's findings [25]. The previous study confirmed that a higher educational status was associated with more frequency of oral screening than their counterparts [25]. This study also showed that higher frequency of tooth brushing per day was associated with a higher oral health screening status than once a day tooth brushing, and was supported by a study that shows tooth brushing at least twice per day was associated with a higher frequency of dental visits [26].

5. Conclusion

Dental care is particularly important for people with diabetes because they face higher risk of oral health problems due to poorly controlled blood sugars. The less well controlled blood sugar, the more likely oral health problems will arise. There are several reasons that people do not want to go to the dental clinic. Although Bangladesh is a developing country, awareness regarding dental care is quite low. According to the study the prevalence of oral health screening is low in Bangladesh. The findings of the study also suggest that higher educational level, lower monthly income and higher frequency of tooth brushing per day are significantly associated with higher frequency of oral health screening among the people of Bangladesh. Now-a-days, oral health complications

are very common among diabetes patients. If this issue cannot be managed and resolved, nobody will be able to do away with it. Researchers were recommended to undertake a large-scale community-based study. Policy makers and health professionals were also recommended to work jointly to enhance the oral health screening of diabetes patients.

Limitations

The data were collected during Covid-19 pandemic. For this reason, it was unable to collect data from hospitals. Hence, we were compelled to collect data through online survey. It is recommended to do further study by collecting data from any hospitals which will give better result.

Declarations

Ethics Approval and Consent to Participate

Not applicable as the study entirely conducted on online. All study participants were informed about the study and provided their consent in writing to participate. The informed consent was obtained from all subjects and/or their legal guardian(s). It is also confirmed that all methods were carried out in accordance with relevant guidelines and regulations.

Consent for Publication

N/A

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no Competing of interest.

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Authors' Contributions

SA was primarily responsible for the concept, design and implementation of the work. SA also analysed the participant data while MKA assisted in interpretation of the data and was major contributors in writing the manuscript along with SA.

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