

Knowledge, Attitude and Perception of Diabetic Patients Towards Oral Hygiene and its Impact on Oral Health in Chengalpattu District, India

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Abstract

The two most prevalent and preventable non-communicable diseases, periodontal diseases and diabetes mellitus are inextricably linked. There exists a lacuna regarding the understanding, behavior, and perception of diabetic patients toward oral health. This cross-sectional study was done to assess diabetic patients' knowledge, attitudes, and perceptions of oral health and its impact on life for a period of three months on 310 patients with Type 2 Diabetes who approached the diabetology department of a private medical college in Chengalpattu District, Tamil Nadu, India. Diabetic patients who were edentulous and less than 35 years old were excluded from the study. The majority of study respondents had intermediate levels of knowledge (118: 38.1%), attitude (162: 52.3%), and perception (201: 64.8%). The mean oral health impact profile (OHIP) was 29.9±12.1. There was a significant association between subjective and objective Oral health ($p \leq 0.05$). A significant very weak positive correlation ($r = 0.126$) exists between knowledge of diabetic patients and their OHIP scores. ($p \leq 0.05$). Although, there is a very weak positive correlation it has been proven that the participant's knowledge of oral health had an effect on the patient's oral health. It implies that improving diabetics' knowledge about oral hygiene will enhance both their oral health and quality of life.

Keywords: Type 2 diabetes mellitus, knowledge, attitude, perception, periodontal health, loss of attachment.

Full-length article *Corresponding Author e-mail: drcharu7525@gmail.com

1. Introduction

The link between oral health and general health has been increasingly recognized in recent years. The common oral diseases are of non-communicable type. Two common NCDs are oral health problems and diabetes [1]. There is a bidirectional relationship between oral health and diabetes. Diabetes can increase the risk of oral health problems such as gum disease, dry mouth, and thrush. On the other hand, inflammation caused by gingivitis and periodontitis makes it harder to control blood sugar levels [2]. A total of 537 million individuals (20-79 years old) worldwide had diabetes in 2010. By 2030, there will be 643 million diabetics worldwide, and by 2045, there will be 783 million. In South East Asia, the number of adults with diabetes is expected to increase by 68% by 2045 [3]. Dry mouth (Xerostomia), tooth decay (including root caries), periapical lesions, gingivitis, periodontal disease, oral candidiasis, burning mouth (especially glossodynia), altered taste, geographic tongue, coated and fissured tongue, Oral Lichen Planus (OLP), recurrent aphthous stomatitis, increased tendency to infections, and poor wound healing are oral manifestations and complications associated with Type 2 diabetes mellitus (T2DM).[4] Complex metabolic and hemodynamic abnormalities, including hyperglycemia, insulin resistance, dyslipidaemia, hypertension, and

immunological dysfunction, are involved in the pathogenesis of these complications.

Addressing knowledge gaps, negative attitudes, and perceptions towards oral health care are important in promoting good oral health among diabetic patients. Shamugakappa et al. [5] reported that only 34% of diabetics in an Indian city were aware of the association between diabetes and periodontal disease, which is low when compared to the 47.7% identified in the study by Habashneh et al. [6] of Jordanians.

Poudel et al. [7] did a scoping review in which it was found that the overall awareness of the Asian population about the relationship between diabetes and periodontitis to be of low in the range of 11-64%, and they also had low knowledge scores. This shows that diabetic patients do not have satisfactory oral health due to a lack of awareness of the relationship between oral health and diabetes mellitus and do not value regular dental examinations [8]. Thus, the current study's objective was to assess such patients' knowledge, attitude and perception of oral health and its influence on their quality of life and periodontal health.

2. Materials and methods

A detailed protocol explaining the purpose and procedures of the cross-sectional study was submitted to the Institutional Ethics Committee, and ethical clearance was obtained. (No.357/IHEC/May 2021). Initially, a pilot study was carried out with a sample of 30 diabetic patients based on inclusion and exclusion criteria to assess the reliability of questions in the designed proforma, and necessary modifications were made to the questionnaire to improve the effectiveness of the study and these samples were not included in the main study. The Cronbach's alpha for test-retest reliability was found to be 0.81.

Criteria:

1. Type-II diabetic patients of age more than 35 years
2. Patients willing to participate and ready to give informed consent.

Exclusion criteria

1. Diabetic patients who are edentulous.

The participants were given a brief outline of the study in written format in both English and the regional language (Tamil) [9] and written informed consent was taken from each participant. The sample size formula $n = \frac{z^2 \times P \times (1-P)}{e^2}$ was used to estimate the sample size: where P is the true proportion at 0.105[3], e is 0.03 and z is 1.645 at 90% confidence intervals. As a result, n = 284 (rounded off to 290), and in order to decrease non-responsive error, the sample size was further raised by 5% and rounded up to 310.

Data were collected from August 2022 to October 2022 for diabetic outpatients visiting Chettinad Hospital and Research Institute, Chengalpattu District, using convenience sampling. Participants were interviewed personally followed by oral examinations lasting 2 minutes each and then the data were recorded by a trained and calibrated examiner. Data collection was made according to current recommendations and standards given by Centre for Disease Control (CDC) and prevention guidelines. A structured questionnaire with closed-ended questions was used to collect the information regarding socio-demographic data and socioeconomic status was assessed using the modified Kuppasamy socioeconomic scale 2022[10]. The participants diabetic history, knowledge related to oral complications of diabetes, attitude perception of diabetic patients towards oral health, and the significance of oral health on the quality of life were assessed using the Oral Health Impact Profile Questionnaire (OHIP-14)[11]. Periodontal health status was assessed using the Community Periodontal Index (CPI) and Loss of Attachment (LoA). The knowledge, attitude and perception questions' total score were converted into percentages and then categorized as good ($\geq 75\%$), moderate (50%-74%) and poor (50%).[12] These scores were expressed as both continuous and categorical variables.

Statistical Analysis

The collected data were transferred and tabulated in MS Office Excel 2019. Statistical analysis was done using SPSS Version 24. For the analysis, the significance level was set at $p \leq 0.05$. Continuous data was found to be normally distributed using the Kolmogorov-Smirnov normality test and hence parametric tests of significance were used. The

Chi-square test was used to determine the statistical significance of categorical data expressed as frequency and percentage. The analysis of variance (ANOVA) was performed to examine the significance of the mean comparison of diabetes patients' knowledge, attitude and perception of oral hygiene and its impact on oral health. Bivariate correlation analysis was used to detect the association between the variables.

3. Results and Discussion

Among 310 study subjects, 35.16% belonged to the age group 51-60 years and 53.2% were males. According to socioeconomic status, 69% of them belong to upper-lower class and 15.1% of the participants were tobacco users. Nearly 88% of them are taking regular diabetic treatment. Nearly 16.8% of study participants have never visited the dentist in their lifetime and about half of them (51%) perceived their oral health to be good. The mean oral health impact profile is 29.97 ± 12.1 (Table 1). About 51.3% of diabetic patients were aware that uncontrolled diabetes causes dry mouth, and 44.5% were aware that patients with uncontrolled diabetes are more prone to infections. Most of the study subjects have moderate knowledge (118: 38.1%), attitude (162: 52.3%), and perception (201: 64.8%) levels (Table 2, Graph 1). More than half of the study subjects (51.9%) have a mean CPI Score of 2 and loss of attachment of 0-3mm (56.1%). The mean CPI score is 2.05 ± 0.740 and the mean LoA score is 1.42 ± 0.705 . (Table 3). There is a statistically significant association between perceived oral health, the mean CPI Score, the mean LoA score, and a recent dental visit. ($p < 0.05$) The association was also profound between mean CPI scores and diabetic history. (Table 4). Table 5 shows that there is a significant difference in knowledge, attitude and perception of diabetic patients with their diabetic history and dental visits. A significant association was present between perceived Oral Health and the Oral Health Impact Profile of diabetic patients. (Table 5) A statistically significant, very weak positive correlation exists between the oral health impact profile and the Knowledge of the diabetic population. ($r = 0.126$) (Table 6)

Diabetes and periodontitis exacerbate one another in a destructive cycle that inevitably draws the attention of oral health professionals.[13] Finally, the management of T2DM is strongly reliant on patients' willingness to care for themselves in their daily life, which is typically strengthened when the patient recognizes the importance of oral hygiene, for which health education is a critical component. As a result, objective and subjective assessments of these patients facilitate the way for the dissemination of knowledge among them. The majority of the diabetic patients belonged to the age group of 51-60 years (35.16%) with a mean age of 58.70 ± 10.48 and females made up more than half of the study's participants (53.2%), which is identical to the Hasan SMM et al.[14] (53.8%) study. Like Basu S et al.[15] study (222:65.5%), the majority of diabetic patients (214:69%) are from the upper-middle class. Approximately one-fourth of the study participants (77:24.8%) had only finished elementary school, which is similar to that of Hasan SMM et al. [14] study (34%). Socioeconomic status and lower levels of education are some of the factors that influence the health of those with Type 2 diabetes [16].

Table 1: Demographic data of the study population

DEMOGRAPHIC DATA		Frequency (N%)
Age	35-40 years	13 (4.19%)
	41-50 years	60 (19.35%)
	51-60 years	109 (35.16%)
	61-70 years	90 (29.03%)
	71-80 years	34 (10.97%)
	Above 80 years	4 (1.29%)
Gender	Male	145 (46.8%)
	Female	165 (53.2%)
Kuppusamy Scale of socioeconomic status Scale 2022	Upper Middle	10 (3.2%)
	Lower Middle	45 (14.5%)
	Upper Lower	214 (69.0%)
	Lower	41 (13.2%)
Personal habits	Non-tobacco users	263 (84.8%)
	Smoking tobacco	14 (4.5%)
	Smokeless tobacco	28 (9.0%)
	Both	5 (1.6%)
Diabetic history	Before 1 year	49 (15.8%)
	1-4 years	113 (36.5%)
	5-9 years	52 (16.8%)
	More than 10 years	96 (30.9%)
Under regular medication	No	35 (11.3%)
	Yes	275 (88.7%)
Recent dental visit	Never visited	52 (16.8%)
	Before 6 years	101 (32.6%)
	Before 1-5 years	72 (23.2%)
	Within a year	85 (27.4%)
Perceived Oral Health status	Appears very poor	10 (3.2%)
	Appears Poor	71 (22.9%)
	Neither good nor poor	59 (19%)
	Appears good	158 (51%)
	Appears very good	12 (3.9%)
Total N (%)		310 (100%)
Mean Oral Health Impact Profile (0-52)		29.97 ± 12.16

Table 2: Knowledge, attitude and perception of study participants about diabetes and oral health

Levels	Level of Knowledge (N%)	Level of attitude (N%)	Level of perception (N%)
Poor (values from 0-49)	77 (24.8%)	112 (36.1%)	48 (15.5%)
Moderate (values from 50-75)	118 (38.1%)	162 (52.3%)	201 (64.8%)
Good (values from 76-100)	115 (37.1%)	36 (11.6%)	61 (19.7%)

Table 3: Distribution of study participants based on mean Community Periodontal index score and loss of attachment score

Periodontal index score	Mean CPI Scores (N%)	Mean LoA score (N%)
Score =0	2 (0.6%)	174 (56.1%)
Score =1	67 (21.6%)	97 (31.3%)
Score=2	161 (51.9%)	24 (7.7%)
Score =3	75 (24.2%)	15 (4.8%)
Score=4	5 (1.6%)	-
Mean score (Mean±SD)	2.05 ± 0.740	1.42 ± 0.705

Table 4: Association between subjective and objective measures of oral health

Variables		χ ² test value	p-Value*
Perceived oral health	Mean CPI score	53.013	0.000*
Perceived oral health	Mean LoA Score	32.333	0.001*
Perceived oral health	Recent dental visit	42.116	0.000*
Diabetic history	Mean CPI Score	19.258	0.082*

Chi-Square test, * Statistically Significant

Table 5: Relationship between diabetic patients' knowledge, attitudes, perceptions, and oral health impact profiles and their reported oral health, dental visits, and diabetes history

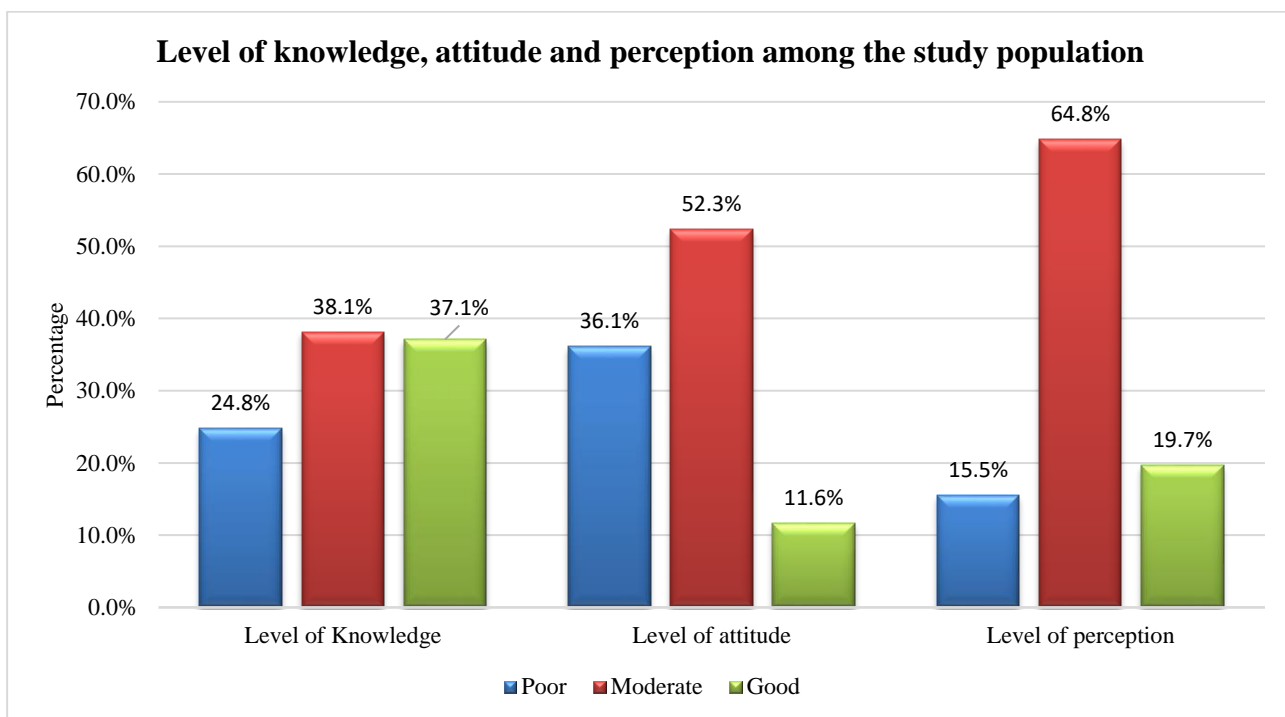
Variables		F value	p-Value*
Perceived oral health	OHIP	5.516	0.000*
	Knowledge	1.675	0.156
	Attitude	1.473	0.210
	Perception	5.516	0.005*
Dental Visit	OHIP	3.867	0.156
	Knowledge	2.746	0.043*
	Attitude	22.31	0.000*
	Perception	41.835	0.000*
Diabetic history	OHIP	1.911	0.128
	Knowledge	8.914	0.000*
	Attitude	3.539	0.015*
	Perception	3.862	0.010*

One way ANOVA, *Statistically significant, OHIP-Oral Health Impact Profile

Table 6: Correlation between the oral health impact profile score and the study population's knowledge, attitude and perception

Variables N= 310	OHIP	Knowledge	Attitude	Perception
OHIP	1	.126*	-0.109	-0.063
Knowledge	.126*	1	.209*	.252*
Attitude	-0.109	.209*	1	.466*
Perception	-0.063	.252*	.466*	1

*Statistically significant, OHIP-Oral Health Impact Profile



Graph 1: Level of knowledge, attitude, and perception among the study population

In the Mirza et al. [17] study, 30% of diabetic patients smoke, however, in the current study, it was 4.5%. Similarly, the Eldarrat AH [18] study found that 36% of diabetics smoke. In the present study, most of the patients had diabetes mellitus for the past 1-4 years (36.5%) similar to that of the study done in Egypt [19] (25.3%). In developing nations, there has been an increase in newly diagnosed diabetic patients as a result of increased public knowledge of diabetes mellitus and its complications over the previous decade. Similarly, raising awareness about diabetes-related oral disorders aids with prompt diagnosis and treatment. Among the study population, 11.3% of them are not under any medication. Thus, the diabetic patient’s awareness about their health status and the importance of taking medication was not emphasized to a greater extent. Less than half of the study participants (44.5%) were aware that patients with uncontrolled diabetes mellitus are more prone to infections whereas in Talpur N et al. [8] study only 6.9% were aware. Only 39% of the study participants were aware that diabetes causes periodontal infections whereas the study conducted by Eldarrat AH [18] states that 60% of study population were aware of periodontal infections.

Nearly 37% of diabetic patients have good knowledge about the complications of diabetics towards oral health which is similar to that of Atarbashi et al.[20] study (51.2%) whereas in the Sri Lankan study subjects[12] it was 9.73%. According to Silva et al. [12] study, 96.7% of diabetic patients are comfortable talking to dental professionals, and 71.2% believe there is no need to discuss diabetes during dental appointments whereas in the current study, 38.7% felt comfortable talking to the dentist, and 32.2% agree that there is no need for them to discuss with the dentist about diabetes.

Comparable to the 5.1% observed in the Atarbashi et al. [20] study, 11.6% of the participants in the current study demonstrated positive attitudes towards oral health which is in contrast to the present study (62%). However, 74.5% of the *Dhanushkodi et al., 2023*

study subjects only used toothbrushes, compared to 83.2% in the study by Ismaiel FMR et al. [19]. In the current study, most of the patients (33.2%) get information about oral care from diabetologists and 12.9% from media like television, internet, and newspapers. These results are in contrast to Atarbashi et al.[20] study where 87.2% of diabetics reach out to diabetologists for getting information and 35.2% to media. Concurrent to the present study, Shanmukappa SM et al.[5] study found that 48.6% of them receive information from the dentist, 29.3% of them from diabetologist, and 19.8% of them from media. According to Tokuda et al.[21] survey, there is a strong correlation between public attitudes about health and trust in the media. Diabetes patients' trustworthiness in the media may be successfully utilized to inform them about oral and general health. 11.5% of the individuals in the Atarbashi et al. [20] study reported positive perceptions of oral health, which is in line with the present study (19.7%). 16.8% of participants in this study have never been to the dentist, which is a very low percentage when compared to the studies by Gupta et al.[22] (32%), and Islam SA et al.[23] (40%). When compared to the results of the current study (45.1%), over 72.8% of the participants in Kim EK et al.[24] study consider their oral health as being subpar.

In Das et al. [25] study mean CPI Score was 2.21 ± 0.68 which is similar to that of the current study (2.05 ± 0.740). The mean oral health impact profile score of study subjects was 29.97 ± 12.16 whereas in Nikbin et al.[26] the study, it was low as 13.09 ± 2.05 . This study also demonstrates a substantial relationship between diabetic patients' oral health knowledge, attitudes, perceptions, dental visits, and the span of their diabetic history. The mean CPI score and mean LoA score are strongly correlated with the self-perceived oral health state, demonstrating a link between the objective and subjective markers of periodontal health. Limitations of the current study include the cross-sectional design which makes research impossible to draw conclusions

about causality and blood glucose levels and other glycemic parameters were not taken into account. Moreover, these studies are relevant to the planning of public health programs and such studies may contribute to the definition of groups with higher levels of need.

4. Conclusion

As Diabetes Mellitus is emerging as a global epidemic, there lies a huge responsibility on the hands of both dentists and physicians in educating and creating awareness among the diabetic population to reduce the oral complications and morbidity rate respectively. The present study was a sincere attempt to understand the knowledge, attitude and perception of diabetic patients towards oral health. Public health measures should focus on the prevention of oral diseases and the development of strategies to promote the oral health of diabetic patients.

Recommendations

A longitudinal study with large sampling frame with laboratory findings is recommended. By collaborating with community organizations in a multisectoral manner, involving a variety of stakeholders, and providing access to affordable dental care, oral health care professionals can improve the oral health of the diabetic population. They can also use technology like mobile apps, online resources, and media to improve patient education and provide motivational support to maintain good oral hygiene practices.

Funding statement

This research did not receive any specific grant from any funding agencies.

Competing interest statement

The authors declare no conflict of interest.

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