

# A Snapshot of Oral Health, Quality of Life, And Lifestyle Factors in Diabetic Patients



<https://doi.org/10.70921/medev.v31i1.1264>

**Ramona Dumitrescu<sup>1,2</sup>, Vanessa Bolchis<sup>1,2,3</sup>, Delia Abrudan-Luca<sup>1,3</sup>,  
Ioan-Alexandru Simerea<sup>1,3</sup>, Ruxandra Sava-Rosianu<sup>1,2</sup>, Doina Chioran<sup>4</sup>,  
Atena Galuscan<sup>1,2</sup>, Balean Octavia<sup>1,2</sup>**

<sup>1</sup>*Translational and Experimental Clinical Research Centre in Oral Health, Department of Preventive, Community Dentistry and Oral Health, University of Medicine and Pharmacy "Victor Babes", 300040 Timisoara, Romania;*

<sup>2</sup>*"Victor Babes" University of Medicine and Pharmacy, Clinic of Preventive, Community Dentistry and Oral Health, Eftimie Murgu Sq. no 2, 300041 Timisoara, Romania;*

<sup>3</sup>*Doctoral School, "Victor Babes", University of Medicine and Pharmacy Timisoara, Eftimie Murgu Square No 2, 300041, Timisoara, Romania*

<sup>4</sup>*Department of Anesthesiology and Oral Surgery, Research Center in Dental Medicine Using Conventional and Alternative Technologies, "Victor Babes" University of Medicine and Pharmacy, Eftimie Murgu Sq. No. 2, 300041 Timisoara, Romania*

*Correspondence to:*

*Name: Ruxandra Sava-Rosianu*

*E-mail address: sava-rosianu.ruxandra@umft.ro*

*Name: Doina Chioran*

*E-mail address: chioran.doina@umft.ro*

*Received: 4 March 2025; Accepted: 21 March 2025; Published: 31 March 2025*

## Abstract

**1. Background/Objectives:** Diabetes Mellitus (DM) is a major public health concern, significantly impacting quality of life (QoL) and increasing the risk of oral health complications. This study aims to explore the relationship between oral health, QoL, and lifestyle factors in diabetic patients, with a focus on Western Romania. **2. Methods:** A total of 60 patients diagnosed with Type 1 or Type 2 diabetes participated in a descriptive observational survey. Data on oral health status, self-care behaviors, dental visit frequency, and lifestyle habits were collected through a structured questionnaire. **3. Results:** A total of 60 patients diagnosed with Type 1 or Type 2 diabetes participated in a descriptive observational survey. Data on oral health status, self-care behaviors, dental visit frequency, and lifestyle habits were collected through a structured questionnaire. Findings revealed poor adherence to oral hygiene practices, with 50% of participants brushing twice daily and only 25% flossing regularly. Additionally, 53.3% visited a dentist in the past year, while a significant proportion sought care only in emergencies. The OHIP-14 scores indicated a moderate impact of oral health on QoL, with psychological and physical discomfort affecting daily activities. Correlation analysis showed a link between oral health knowledge, diabetes duration, and self-care behaviors. **4. Conclusion:** The study highlights the urgent need for improved oral health education within diabetes management programs. Integrating preventive dental care, lifestyle modifications, and patient awareness strategies may contribute to better metabolic control and enhanced QoL in diabetic populations.

**Keywords:** Oral Health, OHIP-14, Lifestyle habits, Diabetes Mellitus

## INTRODUCTION

Diabetes Mellitus (DM) is a chronic condition that impacts approximately 422 million people worldwide, accounting for 8.5% of the global population. Individuals with DM are at a higher risk of developing both microvascular and macrovascular complications, including retinopathy, nephropathy, neuropathy, and cardiovascular diseases [1].

DM encompasses a group of metabolic disorders characterized by hyperglycemia and is generally classified into four main categories: type 1 diabetes, type 2 diabetes, gestational diabetes, and other specific forms of diabetes [2]. DM is a major global public health concern, with its prevalence rising sharply across most countries. Recent estimates project that the number of individuals with DM will surge from 171 million in the year 2000 to 366 million by 2030, highlighting the growing burden of the disease worldwide [3].

Diabetes complications significantly contribute to morbidity among individuals with DM, leading to a substantial decline in quality of life (QoL). The quality of life (QoL) of individuals with type 2 diabetes mellitus (T2DM) is significantly influenced by disease progression and response to medication therapy. Health behaviors are often considered key determinants of health-related quality of life (HRQoL), as they directly impact overall well-being. Diabetes self-care is an ongoing process that involves acquiring knowledge and adapting to the complex nature of T2DM within a social context. Given that the majority of daily diabetes management falls on patients and their families, it is crucial to establish reliable and valid measures for assessing self-management effectiveness. Individuals with diabetes must engage in multifaceted self-care activities, including maintaining a balanced diet, engaging in regular physical activity, monitoring blood glucose levels, practicing foot care, and adhering to medication regimens. Studies indicate that poor adherence to self-care behaviors, such as lack of exercise or inconsistent medication use, is associated with lower HRQoL. Conversely, patients who actively adhere to diabetes self-care routines tend to experience improved HRQoL, emphasizing the critical role of self-management in diabetes care [4].

The Oral Health Impact Profile-14 (OHIP-14) elaborated by Slade and Spencer in 1994 is one of the most widely used indicators for assessing subjective oral health status in oral epidemiology. Initially designed to evaluate individuals' perceptions of their oral health, OHIP-14 is frequently employed as a measure of oral health-related quality of life (OHRQoL)[5]. It captures the physical, psychological, and social impacts of oral health conditions, aligning with the World Health Organization's (WHO, 1993)[6] broader definition of quality of life, which considers individuals' well-being within their cultural and personal contexts. When examining the effects of oral health on quality of life, it is crucial to distinguish between disease-specific measures like OHIP-14 and more generic health-related quality of life (HRQoL) assessments.

Studies have demonstrated a strong link between DM and various oral health complications, with periodontitis being the most well-established association. Periodontitis is now recognized as a complication of diabetes, and recent research suggests that its treatment can positively influence glycemic control in type 2 diabetes (T2DM) by improving HbA1c levels, highlighting a bidirectional relationship between the two conditions[7]. Beyond periodontitis, individuals with DM are also at a higher risk for other oral health issues, including dry mouth, *Candida* infections, and even oral cancer. These conditions are likely to negatively impact oral health-related quality of life (OHRQoL), as has been observed in cases of periodontitis and xerostomia (dry mouth)[8]. Additionally, poor self-perceived oral health has been linked to a decline in general health-related quality of life (HRQoL) in T2DM patients. Given these significant implications, international organizations, such as the

International Diabetes Federation (IDF) and the American Diabetes Association (ADA), emphasize the importance of integrating oral health awareness into diabetes care to improve overall well-being in individuals living with diabetes [1].

Lifestyle factors, including physical activity, diet, and stress, play a crucial role in the development and progression of type 2 diabetes (T2DM). Adopting healthier dietary habits and increasing physical activity (such as walking) and exercise (such as running or cycling) are essential components of T2DM management. Clinical guidelines strongly recommend lifestyle modifications for both the prevention and effective management of the disease[9].

In Romania, the PREDATORR study was the first national-level investigation to systematically assess the prevalence of diabetes among adults. The study reported a DM prevalence of 11.6% and a prediabetes prevalence of 16.5%, with higher rates observed in men and the elderly. Regional variations in diabetes prevalence highlight the need for targeted interventions, especially in Western Romania, where lifestyle factors, healthcare accessibility, and awareness about the diabetes-oral health link may vary. Compared to other European countries, Romania's diabetes prevalence falls within a moderate to high range (10-20%), exceeding the global (8.3%) and European (7.9%) prevalence reported by the International Diabetes Federation (IDF) in 2014. These findings emphasize the importance of integrating oral health awareness, quality of life assessments, and lifestyle modifications into diabetes care strategies [10].

### *Aim and objectives*

This study aims to explore the link between oral health, quality of life (OHQoL), and lifestyle factors in diabetic patients, with a focus on the Western Romania region. Given the high prevalence of DM and prediabetes in Romania, understanding how oral health status and self-care behaviors influence the quality of life of diabetic individuals is crucial. Additionally, this study seeks to assess patients' awareness of the bidirectional relationship between diabetes and oral health, as well as their dental care utilization patterns. By identifying gaps in knowledge and self-care practices, the findings can contribute to the development of integrated health strategies aimed at improving both metabolic and oral health outcomes for people living with diabetes.

## **MATERIAL AND METHODS**

This study was a descriptive observational survey conducted on 60 patients diagnosed with diabetes in the Western region of Romania. The research was carried out at the Outpatient Diabetes Care Facility of the Pius Brnzeu County Emergency Hospital in Timisoara, a specialized healthcare facility providing comprehensive diabetes management and multidisciplinary care. The study took place over a defined period, specifically in March 2024, during which eligible patients attending the Diabetes Center's outpatient services were invited to participate. All individuals with Type 1 or Type 2 diabetes, who met the inclusion criteria and sought medical care at the center during the assessment period, were considered for the study. This setting allowed for the collection of relevant clinical and self-reported data regarding oral health status, quality of life, and lifestyle factors in diabetic patients, providing valuable insights into the diabetes-oral health connection in the regional population.

For this study, participants were selected based on specific inclusion and exclusion criteria to ensure the reliability and relevance of the findings. The inclusion criteria required participants to be diagnosed with Type 1 or Type 2 diabetes, regardless of gender, aged 18 or older, and living with the condition for at least six months. Additionally, all participants needed to have at least one natural tooth, as the study aimed to evaluate the impact of oral health on quality of life and diabetes management. Exclusion criteria were set to eliminate

factors that might interfere with the accuracy of the results. Individuals with severe mental or physical disabilities were excluded, as their ability to participate in self-reported assessments and maintain regular oral health care routines might be compromised. Furthermore, medical personnel suffering from diabetes were also excluded to prevent potential bias, as their professional knowledge and access to healthcare resources could influence their oral health behaviors and overall diabetes management in ways that differ from the general diabetic population. By defining these clear inclusion and exclusion parameters, the study ensures that the collected data accurately reflects the oral health status, lifestyle factors, and quality of life of individuals with diabetes, particularly within the general population of diabetic patients. All participants provided informed consent, and none were involved in the study's development. This research was conducted in accordance with the principles of the Declaration of Helsinki (2013 version) and received ethical approval from the Ethics Committee of the University of Medicine and Pharmacy "Victor Babeş" in Timisoara, Romania (Approval No. 05/30.01.2024).

A questionnaire was developed in Romanian to assess diabetic patients' knowledge, attitudes, and habits, along with relevant demographic, medical, and oral health factors. The 18 multiple-choice, closed-ended questions covered various aspects, including social background (age, gender, education, and place of residence), medical history (diabetes type, duration, treatment, and other health conditions), and oral health knowledge, particularly awareness of the diabetes-oral health connection. Additionally, the questionnaire explored dental care utilization, evaluating the frequency of dental visits, reasons for avoiding dental care, and access to professional treatment. To assess oral hygiene behaviors, participants reported their toothbrushing frequency, use of fluoride toothpaste, and interdental cleaning practices. Oral health complaints such as oral pain, dry mouth (xerostomia), and bad breath were also recorded. The data collected provided valuable insight into oral hygiene practices, access to dental care, and perceived oral health issues among diabetic individuals, contributing to a better understanding of the relationship between diabetes and oral health-related quality of life. At the end of the survey, participants received general oral health education, emphasizing the impact of diabetes on oral health and promoting better self-care practices.

Oral health-related quality of life (OHRQoL) was assessed using the validated Romanian version of the short-form Oral Health Impact Profile (OHIP-14-RO), a self-administered questionnaire. Participants responded to 14 items, rated on a scale from 0 (never) to 4 (very often), covering seven subdomains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. The total OHIP-14-RO score ranged from 0 to 56, with higher scores indicating a greater negative impact on oral health-related quality of life. Additionally, responses were dichotomized, with a threshold of "occasionally" or more indicating an impact on OHRQoL. Only fully completed questionnaires were included in the final analysis. This validated tool has been implemented in Romania to evaluate the effect of oral health conditions on quality of life in diabetic patients.

The study was designed as a questionnaire-based survey, collecting information on oral health, lifestyle, and quality of life in diabetic patients without any dental intervention or oral examination. Participation was entirely voluntary, and all respondents provided written informed consent before completing the questionnaire, ensuring ethical compliance and respect for participants' autonomy.

Participants were classified based on their diabetes type (Type 1 or Type 2), while glycated hemoglobin (HbA1c) levels were categorized as <5.7% (good glycemic control), 5.7-6.4% (moderate control), and >6.5% (poor control). The study also assessed behavioral factors, including smoking status, by categorizing participants as smokers or non-smokers. Self-care

behaviors related to oral hygiene were evaluated, including brushing techniques, brushing frequency, and interdental cleaning habits using aids such as dental floss. Additionally, participants reported on their utilization of available dental services, specifying the frequency and type of dental care accessed, as well as any existing oral health conditions. To assess knowledge and attitudes toward oral health and diabetes, the questionnaire included cognitive components examining participants' understanding of the link between diabetes and periodontal disease. Their perception of oral health importance was measured using a Likert scale, with response options ranging from "completely agree" to "totally disagree". This comprehensive approach provided valuable insights into oral health behaviors, service utilization, and awareness levels among diabetic patients, helping to better understand their quality of life and self-care practices.

Data analysis was conducted using SPSS statistical software (version 23, Chicago, IL). Descriptive statistics, including means, standard deviations, and percentages, were used to summarize demographic variables since the data followed a normal distribution. Frequency tables were generated for all variables, providing a clear overview of the dataset. To examine the associations between categorical variables, the chi-square test was applied, while Student's t-test and ANOVA were used to compare means across different groups. A  $p < 0.05$  level of significance was set for all statistical analyses.

## RESULTS

A total of 60 patients were invited to participate in this survey, all of whom successfully completed it, resulting in a 100% response rate. Participants ranged in age from 28 to 85 years, with an average age of 62.1 years (SD =  $\pm 11.4$ ), and the most frequently reported age was 64 years. In terms of gender distribution, 31 participants (51.7%) were female, while 29 (48.3%) were male. The majority of participants (60.5%) resided in urban areas, while 39.5% lived in rural areas. Regarding educational background, the largest proportion of participants (49.7%) had completed 10 grades of school, followed by 21.8% who had finished high school, and 12.2% who held a university degree.

Most participants (82.3%) were diagnosed with Type 2 diabetes, with 22.4% having been diagnosed within the past 1 to 5 years, followed by 17.8% who had been living with diabetes for 6-10 years. A smaller proportion (16.4%) had been diagnosed for less than one year. The number of participants gradually decreased with longer disease duration, with 14.4% diagnosed for 10-14 years, 11.6% for 15-19 years, and 12.3% for 20-24 years. Very few participants had been diagnosed for 25-29 years (2.1%) or more than 30 years (2.7%) (Figure 1).

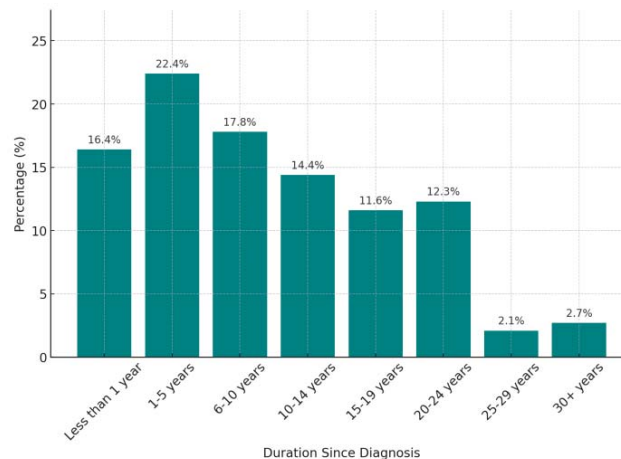


Figure 1. Distribution of Type 2 Diabetes Diagnosis Period

In the study sample of 60 patients, the majority, 45 participants (75%), were diagnosed with Type 2 diabetes, while 11 (18.3%) had Type 1 diabetes. A small proportion, 2 patients (3.3%), were uncertain about their diabetes type (Figure 2).

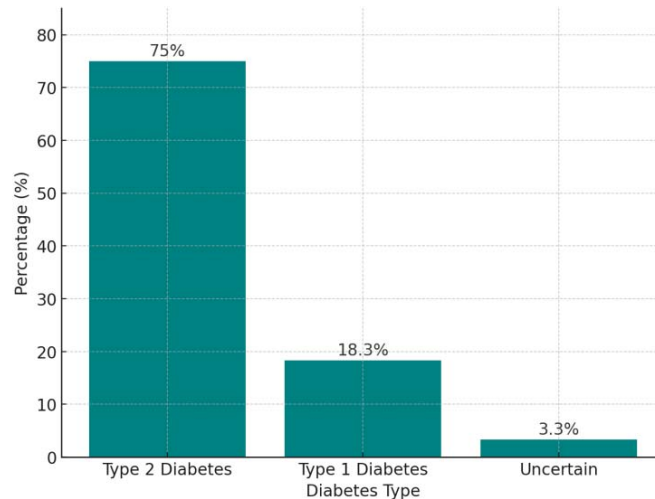


Figure 2. Diabetes Type Distribution Among Study Participants

Regarding dental visit frequency, a significant number of participants, 24 (40%), reported that they never visit the dentist, while 18 (30%) attended once a year. Only 6 patients (10%) visited the dentist twice a year, whereas 1 patient (1.7%) reported going three times a year. Meanwhile, 11 participants (18.3%) stated that they visited the dentist four or more times a year, indicating a small group with higher dental care engagement (Figure 3).

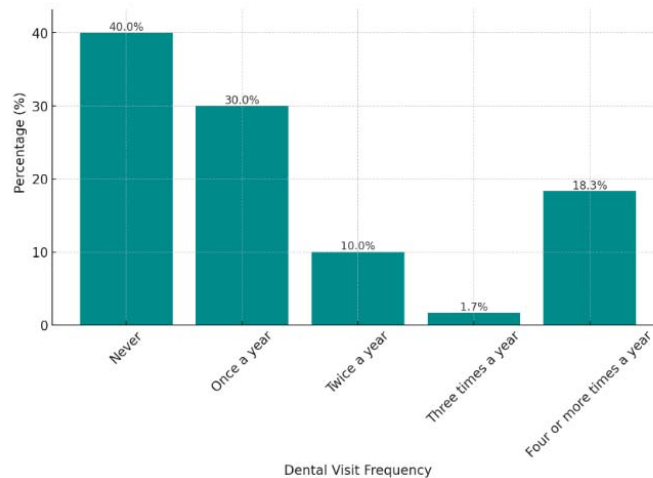


Figure 3. Distribution of Dental Visit Frequency by Percentage of Respondents

Hemoglobin A1c (HbA1c) levels, which indicate glycemic control, were recorded for all participants. As shown in the analysis, 45.2% of patients had an HbA1c level of  $\geq 6.5\%$ , suggesting poor glycemic control. The reported HbA1c values were based on participants' medical evaluation records.

Among the 60 participants in this study, many reported comorbidities frequently associated with diabetes. Arterial hypertension was the most common, affecting 24 individuals (40%), posing an additional cardiovascular risk when combined with diabetes.

Thyroid disorders were present in 4 participants (6.7%), potentially complicating metabolic control and diabetes management. Additionally, 2 participants (3.3%) had ischemic cardiopathy, further highlighting the increased prevalence of cardiovascular diseases in diabetic individuals. Other reported conditions included respiratory diseases, glaucoma, and gastrointestinal disorders, underscoring the multiple health challenges faced by people living with diabetes.

Regarding exercise frequency, defined as any form of sustained physical activity, the majority of participants, 30 individuals (50%), reported being inactive. Among those who engaged in physical activity, 14 participants (23.3%) exercised 1-2 times per week, 10 participants (16.7%) reported exercising 3-4 times per week, while 6 participants (10%) engaged in physical activity 5 or more times per week (Figure 4).

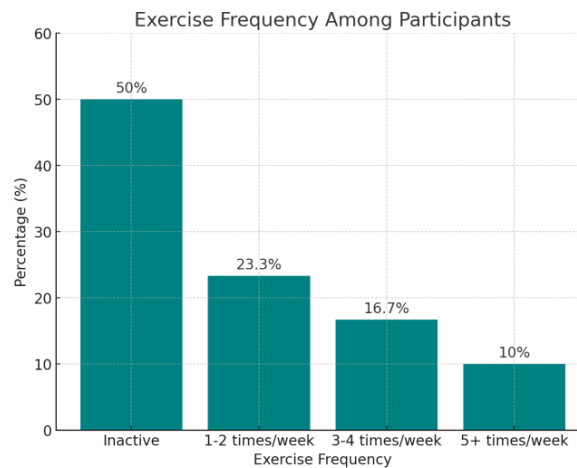


Figure 4. Exercise Frequency Among Participants

For the 60 participants in this study, the mean OHIP-14 score was recalculated at approximately 0.55, reflecting the general oral health-related quality of life (OHRQoL) in this diabetic population. Regarding speech and taste disturbances, 70.8% of participants reported never having pronunciation difficulties, while 18.6% experienced them occasionally. Taste disturbances were slightly more common, with 58.4% reporting no issues and 15% experiencing them occasionally. About 63.7% of participants never reported mouth pain, while 18.6% occasionally experienced it. Similarly, 57.5% had no discomfort while eating, but 23% felt it occasionally. Nearly 48.7% of participants never felt self-conscious due to oral health, though 23% experienced occasional discomfort. Additionally, 57.5% never reported distress related to oral appearance, but 21.2% occasionally did. For daily activities, 61.9% had no limitations, while 18.6% reported occasional difficulties. Eating or speaking discomfort affected 18.6% of participants occasionally, while 62.8% reported no issues. Feelings of frustration or helplessness were uncommon, with 66.4% reporting no psychological impact, though 19.5% experienced occasional distress. Most participants (62.8%) reported no social restrictions due to oral health, but 20.4% occasionally faced challenges in social interactions. Feelings of disadvantage due to oral health were never reported by 63.7% of participants, though 20.4% occasionally experienced this issue.

The nonparametric correlation analysis identified several significant relationships regarding age, education, environment, oral health status, and specific oral health impacts among diabetic patients. A negative correlation was found between education level and diabetes duration ( $Rho = -0.07, p < .05$ ), suggesting that individuals with higher education levels tend to have been diagnosed with diabetes more recently. Additionally, a positive

correlation was observed between age and poor diet due to dental problems ( $Rho = 0.09$ ,  $p < .05$ ), indicating that older participants are more likely to experience dietary difficulties related to oral health issues. Lastly, a negative correlation was found between irritability caused by dental problems and frequency of dental visits ( $Rho = -0.08$ ,  $p < .05$ ), implying that individuals who experience oral health-related discomfort tend to visit the dentist infrequently, typically once or twice a year.

To further explore the impact of oral health knowledge on quality of life, participants were grouped based on their self-reported understanding of the diabetes-oral health link. Two groups were formed: a high-knowledge group (participants rating their knowledge as "Good" or "Very Good") and a low-knowledge group (participants rating their knowledge as "Satisfactory" or "Poor"). The mean OHIP-14 score for the high-knowledge group was 2.73, while the low-knowledge group had a mean score of 3.82. Although the results indicate a trend where greater knowledge was associated with better oral health-related quality of life (reflected by lower OHIP-14 scores), a t-test comparison produced a p-value of 0.20, suggesting that the observed difference was not statistically significant. However, these findings highlight a potential relationship between increased awareness of oral health risks and improved quality of life, which should be further explored in future studies with larger sample sizes.

## DISCUSSIONS

This study highlights that the majority of diabetic patients experienced one or more dental issues, yet did not receive a dental referral or visit a dentist for routine check-ups, seeking care only in cases of severe pain or emergencies. This pattern suggests that oral health concerns are often overlooked in diabetes management, despite the fact that diabetic individuals require greater dental care attention compared to non-diabetic patients. Similar findings have been reported in previous research, emphasizing the need for greater integration of oral health into diabetes care. These observations reinforce the importance of preventive measures and the promotion of oral hygiene practices among diabetic individuals. Some studies have advocated for the implementation of healthcare programs aimed at improving oral health monitoring, routine check-ups, and treatment accessibility for diabetic patients. Moreover, research has shown that oral health problems share common risk factors with other non-communicable diseases such as obesity, cardiovascular diseases, stroke, and diabetes, suggesting a link between lifestyle habits and systemic health complications.

A key finding of this study was that most diabetic patients lack awareness of the relationship between diabetes and oral health complications. Additionally, more than half of the participants had insufficient knowledge regarding the impact of diabetes on oral health. These findings are in line with research conducted both in Romania and internationally, where diabetic individuals often remain unaware of the potential oral health risks associated with their condition. However, a subset of patients recognized that diabetes contributed to dry mouth and had negative effects on periodontal health, reinforcing the need for better patient education and awareness campaigns.

The findings of this study indicate that most individuals with diabetes have limited awareness of the bidirectional relationship between diabetes and periodontal disease and lack sufficient knowledge about their increased risk for oral health complications. As expected, a higher level of awareness regarding oral health risks was significantly associated with better oral hygiene practices and oral care habits. However, the majority of people with diabetes do not receive adequate information about the impact of diabetes on oral health or guidance on oral care from their diabetes care providers. This aligns with evidence from a recent scoping review [11], which highlighted that diabetes care providers rarely discuss oral health in



clinical settings. The main barriers identified include insufficient knowledge of the diabetes-oral health link, lack of structured oral health assessment tools and guidelines, and the absence of clear referral pathways for oral health care. These findings underscore the need for integrating oral health education and preventive strategies into diabetes management to improve overall health outcomes.

The findings indicate that individuals with diabetes in this study had low adherence to oral hygiene practices and dental visits. Less than half, 30 participants (50%), reported brushing their teeth twice daily, while flossing was even less common, with only 15 participants (25%) using dental floss daily for interdental cleaning. Additionally, only 32 participants (53.3%) had visited a dentist in the past 12 months, reflecting a pattern of inadequate dental care engagement among diabetic individuals. Comparatively, large national studies have shown that people with diabetes seek dental care less frequently than those without diabetes. These figures are notably lower than those observed in high-income countries, such as England, where 75% of adults brush twice daily and 73% visit the dentist annually, and the United States (64%) and Australia (60.3%), where a significantly higher proportion of the general population reports regular dental visits. This delay in seeking dental care among people with diabetes is particularly alarming, given that periodontal disease can worsen glycemic control and contribute to diabetes-related complications [11]. These findings emphasize the need for targeted oral health education and preventive measures within diabetes care to improve both oral and overall health outcomes for individuals living with diabetes.

The ambiguity regarding patients' uncertainty about their diabetes classification, often arises due to the complexities in distinguishing between diabetes types, particularly in adults. For instance, individuals initially diagnosed with type 2 diabetes based on phenotypic characteristics may later exhibit clinical features or undergo further analyses that prompt a re-evaluation and subsequent reclassification to type 1 diabetes. This scenario is not uncommon; studies have shown that more than 40% of type 1 diabetes diagnoses occur after the age of 30, leading to frequent misclassification as type 2 diabetes due to overlapping symptoms and the higher prevalence of type 2 diabetes in adults. Additionally, some patients initially diagnosed with type 2 diabetes may develop clinical signs suggestive of secondary diabetes, necessitating further investigations to accurately determine the diabetes type. This underscores the importance of continuous monitoring and comprehensive evaluation in diabetes care to ensure accurate diagnosis and appropriate management [12,13].

Furthermore, the level of education may influence patients' understanding of their diabetes status. Individuals with lower educational attainment might have limited health literacy, affected their comprehension of medical information and contributed to uncertainty regarding their diagnosis. Research indicates that patients with lower education levels often have less knowledge about diabetes management, which can impact their ability to effectively engage in self-care and understand their condition [14, 15].

Recent research highlights the crucial role of oral health awareness and lifestyle factors in improving oral health-related quality of life (OHRQoL) among diabetic patients. A study by Oluwatoyin et al. (2024) [16] found that individuals with greater awareness of oral health risks reported better OHRQoL scores on the OHIP-14 scale. This connection was further validated through clinical assessments of oral hygiene and mucosal health, demonstrating that oral health education and proactive self-care behaviors can significantly enhance quality of life. Similarly, Poudel et al. (2020) [17] examined diabetic patients in Australia and found that those who better understood the link between diabetes and oral health reported lower OHIP-14 scores, indicating fewer oral health-related challenges and improved overall well-being. Beyond oral health knowledge, lifestyle factors such as diet, physical activity, and smoking habits also play a key role in maintaining both oral and systemic health in diabetic

individuals. Unhealthy habits can exacerbate oral health complications, while an active lifestyle and a well-balanced diet may contribute to better glycemic control and reduced oral disease burden.

This study has several limitations that should be acknowledged. Its cross-sectional design limits the ability to determine causal relationships between diabetes and oral health outcomes. Additionally, reliance on self-reported data may introduce reporting bias, as participants could either overestimate or underestimate their oral health status and behaviors.

To enhance the validity and reliability of future findings, research should incorporate objective oral health assessments conducted by dental professionals. Evaluations of periodontal status (PPD, CAL, BOP), dental caries (DMFT index), and salivary flow rates would provide a more accurate and comprehensive analysis of oral health in diabetic patients. Integrating both self-reported and clinically assessed data could strengthen the evidence base and contribute to more targeted interventions aimed at improving oral health outcomes in this population. Another limitation is the absence of a control group, which restricted direct comparisons between diabetic and non-diabetic individuals. This lack of comparative data prevents a clearer understanding of how diabetes uniquely affects oral health and quality of life. Future studies should include a non-diabetic control group to assess differences more precisely and strengthen the findings on the interaction between diabetes, oral health, and lifestyle factors.

## CONCLUSIONS

This study underscores the significant impact of oral health on the quality of life of diabetic patients, revealing low adherence to dental hygiene and preventive care. Many participants lacked awareness of the diabetes-oral health connection, which was associated with poorer self-care behaviors and reduced dental service utilization. The findings reinforce the importance of integrating oral health education and preventive strategies into diabetes care protocols. Future research should include larger samples and objective oral health assessments to further investigate this relationship and promote comprehensive diabetes management strategies that address both systemic and oral health needs.

### *Conflicts of Interest*

The authors declare no conflict of interest.

## REFERENCES

- [1] Verhulst M, Teeuw W, Gerdes V, Loos B. Self-reported oral health and quality of life in patients with type 2 diabetes mellitus in primary care: a multi-center cross-sectional study. *DMSO* [Internet]. 2019 Jun [cited 2025 Feb 23]; Volume 12:883-99. Available from: <https://www.dovepress.com/self-reported-oral-health-and-quality-of-life-in-patients-with-type-2-peer-reviewed-article-DMSO>
- [2] American Diabetes Association. 2. Classification and Diagnosis of Diabetes. *Diabetes Care* [Internet]. 2017 Jan 1 [cited 2025 Feb 23];40(Supplement\_1): S11-24. Available from: [https://diabetesjournals.org/care/article/40/Supplement\\_1/S11/36898/2-Classification-and-Diagnosis-of-Diabetes](https://diabetesjournals.org/care/article/40/Supplement_1/S11/36898/2-Classification-and-Diagnosis-of-Diabetes)
- [3] Wild S, Roglic G, Green A, Sicree R, King H. Global Prevalence of Diabetes. *Diabetes Care* [Internet]. 2004 May 1 [cited 2025 Feb 23];27(5):1047-53. Available from: <https://diabetesjournals.org/care/article/27/5/1047/27412/Global-Prevalence-of-DiabetesEstimates-for-the>

- [4] Jannoo Z, Wah YB, Lazim AM, Hassali MA. Examining diabetes distress, medication adherence, diabetes self-care activities, diabetes-specific quality of life and health-related quality of life among type 2 diabetes mellitus patients. *Journal of Clinical & Translational Endocrinology* [Internet]. 2017 Sep [cited 2025 Feb 23];9:48–54. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S2214623717300108>
- [5] Locker D, Allen F. What do measures of ‘oral health-related quality of life’ measure? *Comm Dent Oral Epid* [Internet]. 2007 Dec [cited 2025 Feb 23];35(6):401–11. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1600-0528.2007.00418.x>
- [6] Study protocol for the World Health Organization project to develop a Quality of Life assessment instrument (WHOQOL). *Qual Life Res*. 1993 Apr;2(2):153–9.
- [7] D’Aiuto F, Gkranias N, Bhowruth D, Khan T, Orlandi M, Suvan J, et al. Systemic effects of periodontitis treatment in patients with type 2 diabetes: a 12 month, single-centre, investigator-masked, randomised trial. *The Lancet Diabetes & Endocrinology* [Internet]. 2018 Dec [cited 2025 Feb 23];6(12):954–65. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S221385871830038X>
- [8] Verhulst MJL, Loos BG, Gerdes VEA, Teeuw WJ. Evaluating All Potential Oral Complications of Diabetes Mellitus. *Front Endocrinol* [Internet]. 2019 Feb 18 [cited 2025 Feb 23];10:56. Available from: <https://www.frontiersin.org/article/10.3389/fendo.2019.00056/full>
- [9] Chen L, Pei JH, Kuang J, Chen HM, Chen Z, Li ZW, et al. Effect of lifestyle intervention in patients with type 2 diabetes: A meta-analysis. *Metabolism* [Internet]. 2015 Feb [cited 2025 Feb 23];64(2):338–47. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0026049514003126>
- [10] Mota M, Popa SG, Mota E, Mitrea A, Catrinou D, Cheta DM, et al. Prevalence of diabetes mellitus and prediabetes in the adult Romanian population: PREDATORR study: PREDATORR. *Journal of Diabetes* [Internet]. 2016 May [cited 2025 Feb 23];8(3):336–44. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/1753-0407.12297>
- [11] Poudel P, Griffiths R, Wong VW, Arora A, George A. Knowledge and practices of diabetes care providers in oral health care and their potential role in oral health promotion: A scoping review. *Diabetes Research and Clinical Practice* [Internet]. 2017 Aug [cited 2025 Feb 23];130:266–77. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0168822716317648>
- [12] Harding JL, Wander PL, Zhang X, Li X, Karuranga S, Chen H, et al. The Incidence of Adult-Onset Type 1 Diabetes: A Systematic Review From 32 Countries and Regions. *Diabetes Care* [Internet]. 2022 Apr 1 [cited 2025 Feb 23];45(4):994–1006. Available from: <https://diabetesjournals.org/care/article/45/4/994/144901/The-Incidence-of-Adult-Onset-Type-1-Diabetes-A>
- [13] Thomas NJ, Lynam AL, Hill AV, Weedon MN, Shields BM, Oram RA, et al. Type 1 diabetes defined by severe insulin deficiency occurs after 30 years of age and is commonly treated as type 2 diabetes. *Diabetologia* [Internet]. 2019 Jul [cited 2025 Feb 23];62(7):1167–72. Available from: <http://link.springer.com/10.1007/s00125-019-4863-8>
- [14] Al-Rasheedi AAS. The Role of Educational Level in Glycemic Control among Patients with Type II Diabetes Mellitus. *IJHS* [Internet]. 2014 Apr [cited 2025 Feb 23];8(2):177–87. Available from: <http://Platform.almanhal.com/CrossRef/Preview/?ID=2-52659>
- [15] Sacerdote C, Ricceri F, Rolandsson O, Baldi I, Chirlaque MD, Feskens E, et al. Lower educational level is a predictor of incident type 2 diabetes in European countries: The EPIC-InterAct study. *International Journal of Epidemiology* [Internet]. 2012 Aug 1 [cited 2025 Feb 23];41(4):1162–73. Available from: <https://academic.oup.com/ije/article-lookup/doi/10.1093/ije/dys091>
- [16] Oluwatoyin AE, Arinola E, Olufemi OE, Jokotade A. Self-reported oral health and oral health-related quality of life among patients with diabetes mellitus in a tertiary health facility. *BMC Oral Health* [Internet]. 2024 Feb 4 [cited 2025 Feb 23];24(1):181. Available from: <https://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-023-03336-w>
- [17] Poudel P, Griffiths R, Wong VW, Arora A, Flack JR, George A. Oral health care among patients with diabetes in Australia: A snapshot. *European Journal of Public Health* [Internet]. 2020 Sep 1 [cited 2025 Feb 23];30(Supplement\_5): ckaa166.1105. Available from: <https://academic.oup.com/eurpub/article/doi/10.1093/eurpub/ckaa166.1105/5915364>