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(REVIEW ARTICLE)

# The relationship between oral health behavior and oral hygiene in diabetes

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## Abstract

**Background and aim**: Diabetes mellitus is a systemic disease that is closely related to oral manifestations because it is related to oral hygiene which is influenced by behavior in maintaining oral health. The purpose of this review is to find the relationship between oral health behavior and oral hygiene in diabetes.

**Purpose**: Determine the relationship between oral health behavior and oral hygiene in diabetes.

**Methods**: Literature searches and reviews were conducted through various scientific journal databases using the phrases "diabetes mellitus", "oral hygiene", and "oral health behavior" were used to search studies that had been published since 2021 and examined oral manifestation on diabetes mellitus disease patients.

**Result**: Oral health behaviors are closely linked to oral hygiene, as people with diabetes mellitus experience poor oral manifestations due to uncontrolled blood glucose levels. This condition is caused by a blockage in the oxygen supply to the oral tissues, creating an environment conducive to bacterial growth and decreased salivary flow can trigger plaque buildup.

**Conclusion**: By 16 journals reviewed, oral health is closely related to systemic conditions, especially glycemic control or the severity of diabetes mellitus because the occurrence of diabetic angiopathy and decreased salivary flow causes more plaque buildup.

**Keywords:** Oral Manifestation; Diabetes Mellitus; Oral Hygiene; Oral Health Behavior

## 1. Introduction

Diabetes mellitus is a systemic disease characterized by increased blood glucose levels due to impaired insulin production or utilization [1]. Blood glucose levels in diabetes mellitus sufferers are directly proportional to the oral manifestations that appear. This condition is caused by the obstruction of oxygen supply to the oral cavity tissue, thus creating an acidic environment that supports bacterial growth and plaque buildup [2]. Decreased saliva and increased glucose levels in saliva will facilitate the growth of plaque and biofilm, thereby reducing the ability of saliva to neutralize acids that can inhibit the healing process of periodontal tissue [3]. Biofilm growth in diabetes mellitus sufferers will increase and is difficult to stop due to a reduced immune or inflammatory response, making them more susceptible to periodontal tissue damage [4].

Oral health behavior is related to oral hygiene because behaviors such as the frequency and time of brushing, the type and method of brushing, and the frequency of visits to dental health facilities can prevent the accumulation of oral plaque [5]. Good behavior can maintain the balance of normal flora in the oral cavity by suppressing the proliferation of pathogenic bacteria and maintaining a neutral salivary pH [6]. People with diabetes mellitus have difficulty

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maintaining oral hygiene due to physical limitations such as neuropathy or impaired mobility, low awareness regarding maintaining oral health, and lack of motivation [7]. Oral hygiene is created due to the physiological manifestations of regular and measured oral health behaviors. Good behaviors result in a healthy oral cavity, while poor behaviors will accelerate plaque accumulation and create oral cavity disorders [8].

### 1.1. Research Purpose

The objective of this article review is to determine the relationship between oral health behavior and oral hygiene in diabetes.

## 2. Research methods

### 2.1. Research Strategy

In August 2024, a literature search was conducted across various scientific journal databases, particularly PubMed, ScienceDirect, Google Scholar, and BPPT's OJS. The search using the phrases “diabetes mellitus”, “oral hygiene”, and “oral health behavior” were used to search studies that had been published since 2021 and examined oral manifestation on diabetes mellitus disease patients. The search results yielded 16 articles linking oral hygiene behavior to oral hygiene conditions in individuals with diabetes mellitus.

### 2.2. Inclusion Criteria

This study established a number of inclusion criteria, including: articles must be available in fully accessible PDF format; written in Bahasa and English; freely accessible through open access; be articles that have been published or accepted for publication; involve human participants; and cover a wide age range of diabetes mellitus sufferers.

### 2.3. Exclusion Criteria

This study established a number of exclusion criteria, including: articles that were not available in full text or did not have open access were excluded; literature written in languages other than Bahasa and English was excluded from the review; and studies that did not involve human participants were not included.

### 2.4. Data Analysis and Quality Assessment

Literature obtained from the initial keyword search results was first screened through a review of titles and abstracts to assess their compliance with the established inclusion and exclusion criteria. Following this initial stage, the full texts of identified studies were analyzed in depth to determine final inclusion or exclusion decisions. During the evaluation phase, literature written in languages other than English, as well as articles lacking full text or not available for open access, were excluded in accordance with the applicable exclusion criteria.

## 3. Research result

Based on the literature search results, sixteen studies were found relevant to the keywords in this research. All of these studies identified a link between oral health behaviors and oral hygiene. A summary of the data analysis results from these sixteen studies is presented in Table 1.

**Table 1** Result of Article Review

| Author | Year | Title | Result of Article Review |
|---|---|---|---|
| Izzati and Reca | 2024 | The relationship between the behavior of diabetes mellitus sufferers and the status of dental and oral hygiene | Poor behaviors such as not brushing regularly and poor oral hygiene contribute to poor oral hygiene in people with diabetes. This study recommends that patients with diabetes improve their oral hygiene practices, maintain stable blood sugar levels, and have regular dental checkups. |
| Luo *et al.* | 2022 | Oral health, diabetes, and inflammation: effects of oral hygiene behaviour | Individuals with STL and DM are 1.92 times more likely to experience elevated CRP than those without both. Tooth loss and oral hygiene practices influence the body's inflammation levels, while flossing acts as a mediator that reduces the risk of inflammation in people with DM and oral health problems. |

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| Ismaturrahmi and Reca | 2024 | The relationship between dental and oral health maintenance behavior in patients with diabetes mellitus II | Univariate analysis showed that 56.7% of respondents had poor oral health practices, while 36.6% experienced moderate gingivitis. Patients with poor oral health practices tended to experience more severe gingivitis. Factors such as high blood sugar levels, unhealthy diet, and poor dental hygiene exacerbated gingival conditions. |
| Siregar and Nur | 2025 | The relationship between dental and oral health maintenance measures and the dental and oral hygiene status of diabetes mellitus patients at the Medan Sungal Community Health Center | The study showed that 81.6% of respondents practiced poor oral health care practices, and 55.3% had poor oral hygiene. Chi-square analysis indicated a significant relationship between oral health practices and oral hygiene status. The poorer the oral health practices and behaviors, the higher the likelihood of oral hygiene disorders in diabetic patients. |
| Jubaedah *et al.* | 2024 | The relationship between motivation to maintain dental and oral health and oral hygiene of elderly people with diabetes mellitus in the Prolines group at the Kejaksan Community Health Center, Cirebon City | The study showed that 42.9% of respondents had moderate motivation, while 59.5% of respondents had poor oral hygiene status. The correlation test showed a significant and unidirectional relationship with a moderate level of correlation between motivation to maintain dental and oral health and oral hygiene status in elderly people with diabetes mellitus. Good motivation plays an important role in maintaining dental and oral hygiene in elderly people with diabetes, and that lack of motivation is one of the factors that worsens oral hygiene conditions. |
| Agustina *et al.* | 2024 | Dental and oral health maintenance behavior with periodontal status of elderly people with diabetes mellitus at Prolanis Tanjung Kerta Health Center, Sumedang Regency | The study showed that 56.3% of respondents had poor oral health practices, and 65.6% had deep periodontal pockets. The Spearman Rank test showed a significant relationship between oral health practices and the periodontal status of elderly people with diabetes mellitus. Poor oral health practices contribute to the increased severity of periodontal disease in diabetic patients. This condition is exacerbated by low levels of knowledge, uncontrolled blood sugar levels, and a lack of regular dental checkups. |
| Astuti and Cinthara | 2025 | Oral hygiene status and oral care motivation in elderly chronic disease management program (PROLANIS): a cross-sectional study | The study showed that most respondents had good motivation for dental and oral care (41.8%), and moderate oral hygiene status (41.8%). Gamma correlation statistical tests showed a significant relationship between motivation for dental and oral care and oral hygiene status in Prolanis elderly. Intrinsic and extrinsic motivations, such as personal encouragement, family support, and social environment, influence elderly dental and oral care behavior. Furthermore, education and knowledge levels also contribute to awareness of oral hygiene. |
| Puspasari *et al.* | 2023 | Overview of Oral Health Status in Patients with Diabetes Mellitus: Literature Review | Research shows that children with good knowledge about oral health have better oral hygiene than those with low knowledge. Most respondents with high knowledge scored in the good oral hygiene index (OHI-S), while those with low knowledge scored in the moderate to poor OHI-S. Behavioral factors and regular brushing habits, especially before bed, play a crucial role in preventing plaque buildup. Children who brush their teeth twice daily consistently have better oral hygiene scores. |
| Santoso *et al*. | 2021 | Association between Oral Hygiene and Metabolic Syndrome: A Systematic Review and MetaAnalysis | This study confirms that chronic inflammation due to periodontal disease may be a biological mechanism linking poor oral hygiene to metabolic disorders. Pathogenic microorganisms and a prolonged inflammatory response are |

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| | | | thought to trigger insulin resistance, endothelial dysfunction, and oxidative stress. Good oral hygiene can be an additional preventive strategy against the risk of metabolic syndrome and other systemic diseases. Therefore, public health interventions should consider oral hygiene education as part of promotional and preventive efforts against non-communicable diseases. |
| Yiying *et al.* | 2021 | Associations of oral hygiene with incident hypertension and type 2 diabetes mellitus: A population-based cohort study in Southwest China | Brushing your teeth at least twice a day has been shown to reduce the risk of hypertension and type 2 diabetes, compared to those who rarely brush their teeth. The protective effect against hypertension is more pronounced in Han Chinese individuals or those living in urban areas. Furthermore, participants under 60 years of age or without pre-existing hypertension were more likely to develop type 2 diabetes if they brushed their teeth less than twice a day. In general, regular tooth brushing is associated with a reduced risk of developing hypertension and type 2 diabetes later in life. |
| Ruth *et al.* | 2023 | A scoping review of the relation between toothbrushing and diabetes knowledge, glycemic control, and oral health outcomes in people with type 2 diabetes | In various survey studies reviewed, higher toothbrushing frequency in patients with type 2 diabetes was consistently associated with better self-reported glycemic control and was also frequently associated with better oral health based on clinical examinations by dentists. Meanwhile, in intervention studies, providing oral health coaching or mentoring has been shown to improve glycemic control. Furthermore, health coaching has been shown to be more effective than traditional health education in improving glycemic control and patient-reported toothbrushing behavior. |
| Sairat *et al.* | 2024 | Factors associated with oral health care behavior of people with type 2 diabetes mellitus: A hospitalbased, cross-sectional study | People with type 2 diabetes generally exhibit fairly good oral health. However, those with low levels of oral health knowledge, attitudes that are less supportive of oral health care, and infrequent use of dental services tend to have suboptimal oral health care habits. Therefore, low levels of literacy, attitudes, and access to dental services can increase the likelihood of poor oral health practices in patients with T2DM. |
| Bolchis *el al.* | 2025 | Associations Between Lifestyle Factors, Oral Health Behaviors, and Glycemic Control in Type 2 Diabetic Patients | The results of this study indicate that oral health care and lifestyle changes should be part of diabetes management, as this can help improve the health and quality of life of people with diabetes. |
| Putri *et al.* | 2021 | Perbedaan Indeks Kebersihan Mulut dan Kualitas Hidup Terkait Kesehatan Rongga Mulut pada Pasien Diabetes Melitus Tipe 2 dan Non-Diabetes Melitus | Significant differences were found between patients with type 2 diabetes mellitus and non-diabetics in terms of oral hygiene index and oral health-related quality of life. This study underscores the importance of regular oral health monitoring for people with diabetes and the need for oral hygiene education as part of comprehensive patient management. |
| Fadjeri *et al.* | 2024 | The relationship between dental health behavior and dental health status in patients with diabetes mellitus | There is a significant relationship between dental health behaviors and dental health status in patients with diabetes mellitus. Poor knowledge, attitudes, and dental care practices contribute to high rates of caries, poor oral hygiene, and increased periodontal disease. Researchers emphasize the importance of ongoing dental health education for people with diabetes to prevent complications and improve quality of life. |

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| Sohal *et al.* | 2025 | Oral health-related knowledge, attitudes, and practices of diabetic patients in Tanzania | Approximately half of people with diabetes have good knowledge about oral health. While most demonstrate good adherence to oral health, only a small number actually implement optimal oral care practices. Education level and previous experience with dental referrals or treatment play a role in improving patient knowledge about oral health. |

## 4. Discussion

Oral and dental health is closely related to systemic conditions, particularly diabetes mellitus [6]. Patients with diabetes tend to experience more severe oral health problems than non-diabetics, such as caries, periodontitis, and xerostomia, which directly impact quality of life [9]. Other studies have shown that poor dental health behaviors, such as low tooth brushing frequency and frequent visits to the dentist, are significantly associated with poor oral health status in patients with diabetes mellitus [10].

In addition to individual behavior, glycemic control also plays a crucial role in oral health. Studies have found that patients with diabetes mellitus have significantly worse OHI-S and OHIP-14 scores than those without diabetes [18]. Chronic hyperglycemia affects salivary gland function, leads to periodontal inflammation, and increases the colonization of pathogenic bacteria, leading to decreased oral hygiene and quality of life [19]. Similar findings confirm a bidirectional relationship between oral hygiene and blood glucose control, where poor oral health can increase systemic inflammation, while high blood glucose levels worsen periodontal conditions [11].

However, other research has found that many diabetes patients have good knowledge and attitudes about oral health, but are inconsistent in implementing these behaviors in their daily lives [21]. This indicates a gap between knowledge and practice [12].

The factors that influence this behavior are oral health literacy, attitudes, and access to services that determine oral hygiene practices in diabetes mellitus patients [13]. These findings also support research showing that oral hygiene behaviors such as brushing and regular dental checkups are associated with better glycemic control [20]. Therefore, maintaining oral hygiene is part of diabetes mellitus self-management [14]. Another literature review found similar findings that oral health education interventions can increase tooth brushing behavior and potentially improve glycemic control [15]. Brushing teeth at least twice a day is associated with a reduced risk of diabetes and hypertension, suggesting that good oral hygiene has broader systemic impacts [16].

Other research conducted in Indonesia also demonstrated the relevance of the relationship between behavior, motivation, and dental hygiene status [21]. That indicates knowledge and positive behavioral attitudes are closely related to dental hygiene status in diabetes mellitus patients [8]. Other researchers added that good dental care practices can significantly reduce plaque accumulation in patients with diabetes mellitus at the Medan Sungal Community Health Center [17].

## 5. Conclusion

The conclusion of this narrative review is that oral health is closely related to systemic conditions, especially glycemic control or the severity of diabetes mellitus. Oral hygiene behavior plays a role in diabetes self-management.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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