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ORAL HEALTH RELATED QUALITY OF LIFE OF PATIENTS WITH TYPE 2 DIABETES MELLITUS IN INDONESIA: A SYSTEMATIC LITERATURE REVIEW

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Abstract **Background**: Indonesia is currently facing a public health concern, possessing the fifth-highest prevalence of individuals with Type 2 Diabetes Mellitus (T2DM) worldwide. Type 2 diabetes mellitus (T2DM) is significantly linked to problems with oral health that can greatly lower patients' Oral Health-Related Quality of Life (OHRQoL). Nonetheless, a thorough synthesis of the evidence in the Indonesian context is absent.
Objective: This study aim to comprehensively synthesize the Oral Health-Related Quality of Life of patients with Type 2 Diabetes Mellitus in Indonesia.
Method: A systematic literature review was performed by querying PubMed, Scopus, and Cochrane Library for papers published from January 2004 to December 2025. The search encompassed observational and interventional studies conducted in Indonesia that evaluated OHRQoL in adult T2DM patients utilizing validated measures. A narrative synthesis of the findings was conducted due to methodological heterogeneity.
Results: The review of 6 studies revealed a consistent trend of reduced OHRQoL among Indonesian T2DM patients, despite variations in overall scores among studies. The OHRQoL domains that were most often and most seriously affected were physical pain and functional restrictions, like trouble chewing. Periodontitis, tooth mobility, and xerostomia were some of the most important oral manifestations that caused this effect. Glycemic control, diabetes duration, and lower educational attainment were important factors contributing to reduced OHRQoL.
Conclusion: T2DM substantially detrimentally affects the OHRQoL of patients in Indonesia, chiefly via functional and physical dimensions. These results highlight the pressing necessity of including oral healthcare into national chronic disease management plans to enhance patient-centered outcomes.

Keywords: T2DM; OHRQoL, systematic literature review.

BACKGROUND

Indonesia is currently facing a significant public health challenge driven by the rising incident of Type 2 Diabetes Mellitus (T2DM). In 2024, the nation estimated 20.4 million cases of adults with diabetes. The number is expected to grow to 28.6 million by 2050 (1). The situation is further compounded by the high proportion of individuals with diabetes that present as undiagnosed. An estimated 73.2% of all people with diabetes in Indonesia are not aware of their condition, living with prolonged, uncontrolled hyperglycemia (2). This systemic issue is intrinsically linked to the nation's high prevalence of oral diseases, creating a dual burden where patients with T2DM are significantly more susceptible to a spectrum of oral health complications, including periodontal disease, xerostomia (dry mouth), dental caries, and opportunistic infections such as oral candidiasis (3–5).

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This correlation is not merely coincidental but is rooted in a complex, bidirectional pathophysiology often described as a "vicious cycle" that compromises both systemic and oral health (1). On one hand, T2DM exacerbates periodontal disease. Chronic hyperglycemia induces a pro-inflammatory state, facilitating the formation of advanced glycation end-products (AGEs) and reactive oxygen species (ROS), which make the host's inflammatory response worsen to periodontal pathogens and leading to accelerated destruction of the gums and supporting bone (2). Concurrently, diabetes-induced microvascular changes impair blood flow, weakening the tissues' capacity for repair, while elevated glucose in saliva creates a fertile ground for pathogenic bacteria and fungi (3,6). Conversely, severe periodontal disease, as a chronic low-grade infection, contributes to the body's total systemic inflammatory burden. Pro-inflammatory cytokines such as TNF-α and IL-6 enter the bloodstream, increasing insulin resistance and making it more difficult for patients to maintain stable blood glucose levels (7). This evidence positions oral healthcare not as an additional service, but as a fundamental component of comprehensive diabetes management, with effective periodontal therapy showing potential to improve glycemic control (8).

Although clinical indicators such as the Decayed, Missing, and Filled Teeth (DMFT) index are essential for diagnosis, they inadequately represent the human impact of these oral conditions. To address this, Oral Health-Related Quality of Life (OHRQoL) has arisen as an essential patient-centered outcome measure (1). OHRQoL is a multidimensional construct reflecting an individual's subjective evaluation of how their oral condition affects their daily life, including functional, emotional, and social well-being (2). By assessing domains such as comfort when eating, self-esteem, and social interaction, OHRQoL provides a more holistic understanding of the disease's true burden from the patient's perspective. Validated instruments like the Oral Health Impact Profile (OHIP) and the Geriatric Oral Health Assessment Index (GOHAI) are widely used to quantify these impacts (9–11). Given the scale of Indonesia's T2DM epidemic and the profound link between the disease and oral health, a clear understanding of its impact on the OHRQoL of Indonesian patients is paramount. However, a systematic synthesis of evidence from this specific population has been lacking, a knowledge gap this review aims to fill. This study aim to comprehensively synthesize the Oral Health-Related Quality of Life of patients with Type 2 Diabetes Mellitus in Indonesia.

METHODS

Subject and Outcome Variable of the Study

This review focused on adult patients (18 years and older) diagnosed with Type 2 Diabetes Mellitus in Indonesia. The principal outcome variable was Oral Health-Related Quality of Life (OHRQoL), assessed using a validated, multi-item psychometric tool.

Literature Search

Three electronic databases were used to do a systematic search of the literature in PubMed/MEDLINE, Scopus, and the Cochrane Library. The search aimed to find all relevant articles that were published between January 2004 and October 2025. The search approach integrated Medical Subject Headings (MeSH) terms and free-text keywords pertaining to three fundamental concepts including the disease (T2DM), the outcome (OHRQoL), and the place (Indonesia). The search strings used to retrieve the articles for PubMed were (("Diabetes Mellitus, Type 2"[Mesh] OR "T2DM" OR "Non-Insulin-Dependent Diabetes Mellitus") AND ("Oral Health"[Mesh] OR "Periodontal Diseases"[Mesh] OR "Xerostomia"[Mesh] OR "Tooth Loss"[Mesh]) AND ("Quality of Life"[Mesh] OR "Oral Health Related Quality of Life" OR "OHRQoL" OR "OHIP" OR "GOHAI") AND ("Indonesia"[Mesh] OR "Indonesia")). Similar search strings were modified for the other databases.

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Selection Criteria and Study Screening

The studies were considered acceptable for inclusion if they met the following criteria:

1. Population aged 18 and up who had been diagnosed with Type 2 Diabetes Mellitus were part of the study.
2. The study was conducted in Indonesia.
3. The study examined the impact of oral health on quality of life utilizing a validated questionnaire, specifically the Oral Health Impact Profile (OHIP) or the Geriatric Oral Health Assessment Index (GOHAI).
4. The study design was an original research article with an observational (cross-sectional, case-control) or interventional design.
5. The article was written in either English or Indonesian.

The studies were excluded if they met the following criteria:

1. The study design was review articles, meta-analyses, case reports, editorials, and conference abstracts.
2. The research focusing solely on type 1 diabetes, gestational diabetes, or pediatric cohorts.

The selection method for the studies adheres to PRISMA guidelines. Two reviewers examined the titles and abstracts of all identified records to identify potentially valuable papers. Subsequently, the full texts of these articles were gathered and evaluated against the inclusion criteria to determine their continued eligibility. In the event of a disagreement between the two reviewers, they engaged in discussion or sought assistance from a third reviewer.

Extracting Data

A standardized data extraction form has been developed and employed to collect relevant information systematically from each included study. The extracted data included first author and publication year, study location (province and city), study design, sample size and key demographic characteristics (e.g., mean age, gender distribution), OHRQoL instrument employed, notable clinical oral health findings (e.g., prevalence of periodontitis, xerostomia), and the primary OHRQoL outcomes, comprising mean scores and identified significant determinants.

Data Synthesis and Analysis

Due to the expected variability across the included studies on the specific OHRQoL instruments utilized, population characteristics, and outcome reporting, a quantitative meta-analysis was considered unsuitable. A narrative synthesis strategy was utilized instead. The results from the included studies were aggregated, topically structured, and synthesized to offer a thorough overview of the existing knowledge base. The synthesis concentrated on three principal themes: (1) the general OHRQoL status and prevalence of oral impacts among T2DM patients in Indonesia; (2) the impact of oral manifestations on various OHRQoL domains; and (3) factors that influence OHRQoL such as clinical, socio-demographic, and behavioral.

RESULT AND DISCUSSION

Results of search and Selection

The initial search identified a total of 225 studies. After screening of the titles, abstracts and full texts, 6 studies were included in the present review (Figure 1).

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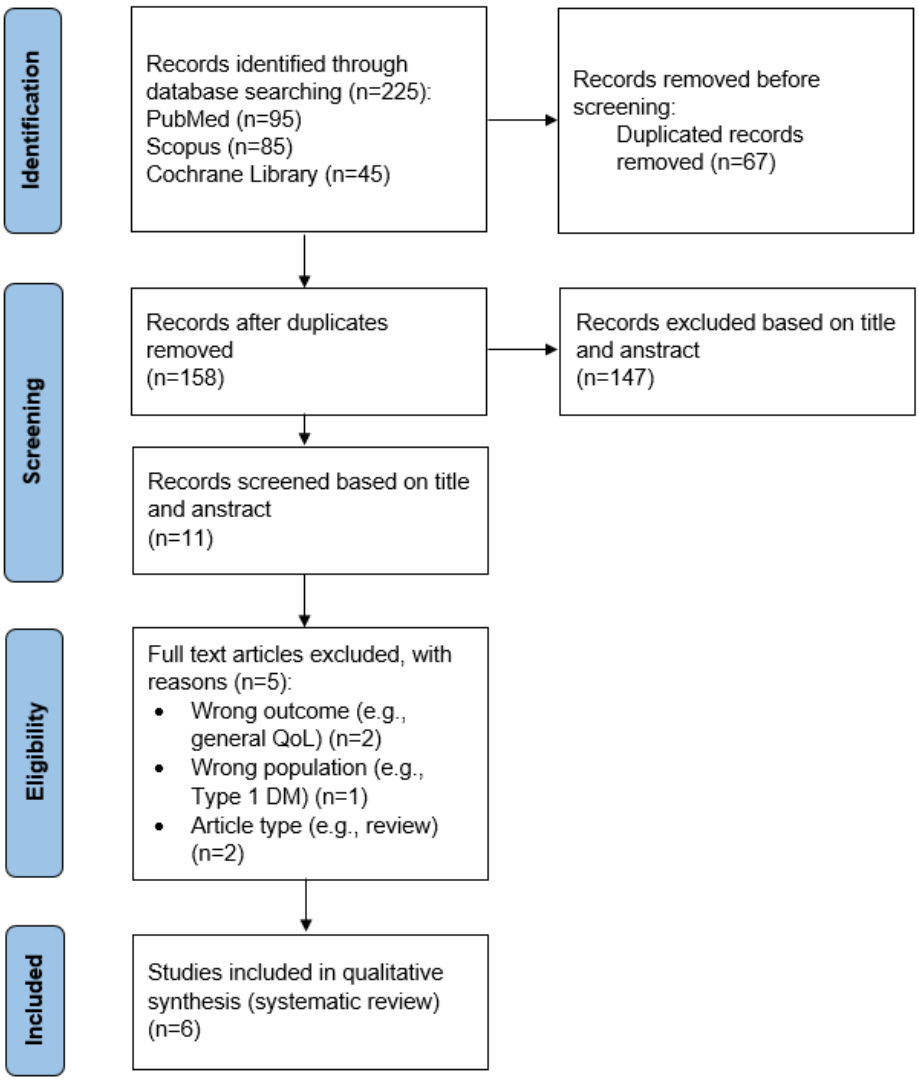
Figure 1. PRISMA Flow Diagram



The systematic search revealed several research examining the relationship among T2DM, dental health, and quality of life throughout different regions of Indonesia. These studies, despite their diverse techniques, collectively present a convincing depiction of the obstacles encountered by this patient population.

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Table 1. Summary of Included Studies on OHRQoL of Patients with T2DM in Indonesia

Author(s) and Year	Study Location	Study Design	Sample Size and Characteristics	OHRQoL Instruments	Key Findings
Setijanto RD, et al. (2024)[12]	Surabaya	Cross-sectional	80 elderly patients with T2DM at Menur Public Health Center.	Not specified (Questionnaire)	No significant correlation found between oral health care behavior and overall quality of life. Patients prioritized other health facets over oral health.
Agustina D, et al. (2021)[13]	Yogyakarta	Cross-sectional	82 T2DM outpatients (40-81 years old) at Yogyakarta General Hospital.	Geriatric Oral Health Assessment Index (GOHAI)	Majority of patients (59.8%) had poor OHRQoL. Poor OHRQoL was significantly associated with having fewer than 20 teeth.
Aprista S, et al. (2023)[5]	Kendal	Cross-sectional	92 T2DM patients (46 controlled, 46 uncontrolled).	Xerostomia-related Quality of Life Scale (XeQoLs)	Xerostomia was prevalent in both groups. No significant effect of xerostomia on quality of life was found between controlled and uncontrolled T2DM patients.
Putri FA, et al. (2021)[14]	Semarang	Cross-sectional	42 patients (21 T2DM, 21 non-DM) at RSND(15) hospital.	Oral Health Impact Profile-14 (OHIP-14)	T2DM patients had significantly worse oral hygiene (OHI-S) and poorer OHRQoL (higher OHIP-14 scores) compared to non-DM controls ($p<0.001$).
Rahardjo A, et al. (2018)[16]	Jakarta	Cross-sectional	70 T2DM patients at Cipto Mangunkusumo Hospital.	OHIP-20	OHRQoL was not significantly affected by diabetic status or oral health status. 97.1% reported good quality of life despite high prevalence of caries and BOP.
Effendi, et al. (2019)[4]	Not Specified	Cross-sectional	85 pre-elderly and elderly T2DM patients (≥ 45 years).	Geriatric Oral Health Assessment Index (GOHAI)	62.4% of subjects had poor OHRQoL. Tooth mobility was the most significant oral condition negatively impacting OHRQoL ($p=0.035$).

Synthesis on OHRQoL Status of Patients with T2DM in Indonesia

Research conducted across Indonesia region offers a complex and diverse representation of OHRQoL in patients with T2DM. Numerous studies of research findings demonstrate a significantly diminished oral health related quality of life. A cross-sectional study conducted in Semarang demonstrated that T2DM patients had markedly higher OHIP-14 scores, indicating poorer OHRQoL, relative to their non-diabetic peers (14). Similarly, a study in Yogyakarta employing the GOHAI instrument revealed that a significant majority (59.8%) of T2DM outpatients experienced suboptimal OHRQoL (15). A study focused on pre-elderly and elderly individuals revealed that around two-thirds (62.4%) reported suboptimal OHRQoL (4).

On the other hand, some studies present a different perspective. A study conducted at a leading tertiary hospital in Jakarta demonstrated that 97.1% of T2DM patients experienced an excellent quality of life, suggesting no significant association between diabetic status and OHRQoL scores (16). This apparent disparity in the research may be attributed to variations in study demographics, healthcare settings (primary care versus tertiary institutions), and the specific tools employed. Nonetheless, a thorough evaluation indicates

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that a singular composite score may insufficiently reflect the actual influence of T2DM on OHRQoL. Even in studies showing no overall significant difference, a more thorough analysis sometimes uncovers that patients with diabetes encounter greater challenges in particular areas. An aggregate score combines the effects from different areas, such as physical, mental, and social. When the adverse symptoms of T2DM primarily manifest in one or two domains, such as physical discomfort or functional limitation, while being less pronounced in others, such as social dysfunction, the total assessment may be distorted, hiding clinically significant issues (17). Thus, the primary investigation concerns not only the effect on OHRQoL but also the characteristics of that effect, necessitating a concentrated analysis of the patient experience.

Impact of Oral Manifestations on Oral Health-Related Quality of Life

The literature consistently highlights several oral issues as primary factors contributing to reduced OHRQoL in Indonesian T2DM patients.

Periodontitis and Tooth Mobility

Periodontitis, sometimes termed the sixth consequence of diabetes, is a huge contributor to diminished OHRQoL (18). The chronic inflammation, bleeding gums, and persistent halitosis associated with the condition can induce considerable psychological discomfort and social stigma (19). As the disease advances, the degradation of supporting bone results in tooth mobility, recognized as a particularly severe symptom. A study of elderly Indonesian patients with type 2 diabetes mellitus found tooth movement as the principal factor adversely affecting their oral health-related quality of life (4,13). Mobile teeth directly impede vital oral functions, complicating and creating discomfort during mastication, potentially leading to dietary restrictions and nutritional deficits. This functional limitation is a persistent issue and a major source of distress for individuals (20).

Xerostomia (Dry Mouth)

Xerostomia is a prevalent and troublesome condition for those with type 2 diabetes, affecting up to 52.2% of those with inadequate glycemic control (21). The subjective sensation of xerostomia impedes the ability to articulate, masticate, and ingest desiccated foods (22). The deficiency of saliva's preventive and lubricating functions increases the likelihood of dental cavities and opportunistic infections such as oral candidiasis (thrush), exacerbating the oral health burden (6). A study conducted in Indonesia by Aprista et al. (2023) found no statistically significant effect of xerostomia on the quality of life between controlled and uncontrolled T2DM groups, but the condition's prevalence and its direct impact on daily functions suggest it remains a clinically important factor affecting patient well-being (5,23). The validation of an Indonesian version of the Summated Xerostomia Inventory (SXI-ID) provides a reliable tool for future research in this area (24).

Tooth Loss and Denture Utilization

Tooth loss is the final stage of untreated periodontitis and dental caries, which T2DM patients are more likely to get (25,26). Losing teeth, especially more than one, has a big detrimental effect on OHRQoL. It significantly impairs masticatory function, influences aesthetics, and may result in psychological distress and social withdrawal (27). A study conducted in Yogyakarta underscored this by revealing a robust correlation between possessing fewer than 20 remaining teeth and suboptimal OHRQoL scores (13,15). Dentures can partially restore function and aesthetics. However, they often pose obstacles such as discomfort, instability, and cleaning difficulties, which may negatively affect quality of life (28,29).

Factors Influencing Oral Health-Related Quality of Life in the Indonesian Context

In the Indonesian setting, multiple factors have been identified that modify the relationship between T2DM and OHRQoL.

1. Clinical factor influenced OHRQoL, the level of glycemic control is a crucial

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determinant. Individuals with inadequately managed diabetes, as evidenced by elevated HbA1c levels, typically have more severe oral consequences, including periodontitis and xerostomia, which subsequently result in diminished oral health-related quality of life (22,30).1 The duration of diabetes is a crucial issue; longer-term exposure to hyperglycemia elevates the cumulative risk of problems, as evidenced by a study in Jakarta that identified a strong association between diabetes duration and the existence of periodontal pockets (22,31).

2. Socio-demographic factors is one of determinance which influence OHRQoL. Consistent with comprehensive quality of life research in Indonesia, diminished educational attainment is significantly associated with negative health outcomes, including OHRQoL (31–33). Individuals with less education may exhibit diminished health literacy, have heightened barriers to receiving care, and engage in fewer preventative health practices. Age and gender are critical determinants, with some studies suggesting that female patients endure a heightened symptom burden and reduced quality of life (34,35).
3. Behavioral factor is one of determinance which influence OHRQoL. Oral hygiene practices are a significant mediating factor. Inadequate self-care, prevalent among T2DM patients, directly facilitates the onset and advancement of oral illnesses that diminish OHRQoL (36,37). A study in Surabaya revealed no significant correlation between oral health practices and quality of life, finding that senior individuals may prefer the management of systemic diabetes over dental health issues (12). This underscores a possible disconnect in which patients may not completely recognize the significance of oral health in their comprehensive diabetes care.

Implications for the Indonesian Healthcare System: A Call for Integration

The results of this analysis have significant implications for the Indonesian healthcare system, which is characterized by a structural division between general medical and dental services. The findings strongly supports a paradigm change towards an integrated care model. Indonesia's national health insurance, BPJS Kesehatan, covers basic dental services including examinations, simple extractions, and fillings at primary care facilities (38). However, the system uses a tiered referral process, and coverage for more complicated treatments like advanced periodontal therapy or high-quality prosthetics is limited. This could make potential barriers for T2DM patients to get the require of comprehensive care (39).

The Program Pengelolaan Penyakit Kronis (PROLANIS) presents a substantial although predominantly unexploited opportunity for integration. BPJS Kesehatan runs this national program, which gives primary care doctors a structured way to deal with T2DM and high blood pressure. PROLANIS activities usually include regular medical checkups, health education, exercise sessions, and lab tests. Currently, oral health is not part of this framework. The evidence synthesized here showing that poor dental health is a prevalent and serious comorbidity that can even make it harder to control blood sugar levels, makes a strong case for reform. A feasible and scalable policy recommendation would be the formal integration of an oral health component into the national PROLANIS recommendations (40). This could involve simple and low-cost intervention such as:

1. Integrated education, which adding lessons about the correlation between diabetes and oral health to regular PROLANIS patient education sessions.
2. Routine screening, by teaching primary health care nurses or doctors to perform simple visual oral screens (such as looking for symptoms of gum inflammation, severe decay, or dry mouth) during routine PROLANIS check-ups.
3. Streamlined Referrals, could perform by establishing an efficient referral pathway for people in the PROLANIS program to see a dentist at the same Puskesmas or a private practitioner who has signed a contract with the program for a full checkup and any needed treatment.

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By using the current PROLANIS infrastructure, Indonesia can connect medical and dental care for million citizens. This will help meet the large unmet needs found in this review and ultimately improve their overall health and quality of life.

Limitation and Future Research Direction

This review points out some of the problems with the current body of literature. Most studies are cross-sectional, which means they can show a link between two things but not prove that one caused the other. It is uncertain if inadequate oral health results in diminished OHRQoL, or if individuals with a lower quality of life are less inclined to participate in self-care practices. Additionally, the utilization of several OHRQoL instruments (e.g., OHIP-14, GOHAI, XeQoLs) in different research complicates the direct comparison of scores. Most studies have been undertaken in urban centers such as Jakarta, Yogyakarta, and Surabaya, which restricts the generalizability of the findings to the extensive rural and remote populations of Indonesia, who may encounter distinct obstacles regarding healthcare access and health literacy.

Future research should emphasize longitudinal studies to monitor temporal variations in OHRQoL and to better the causal relationships among T2DM, oral health status, and patient-reported outcomes. There is essential to conduct interventional studies that develop and evaluate the efficacy of integrated care models within the PROLANIS framework. These types of studies could give us the strong proof we need to change national policy. Finally, research should be expanded to include diverse geographic and socioeconomic populations to guarantee that health policies are just and cater to the needs of all Indonesians with T2DM.

CONCLUSION

This systematic literature review shows that Type 2 Diabetes Mellitus has a significant and detrimental impact on the Oral Health-Related Quality of Life of people in Indonesia. The total effect size may range among various populations and contexts. However, the data consistently indicates a significant burden, especially in the dimensions of physical discomfort and oral function, caused by oral health problems such as periodontitis, tooth mobility, and xerostomia. Several factors also make the impact getting worse, such as poor glycemic control, term of disease duration, and poorer education levels.

The results underscore a significant deficiency in the current healthcare paradigm, as oral health often receives attention without considering systemic disease. To improve OHRQoL, it is necessary to include oral healthcare in national chronic disease management plans. The healthcare system needs to provide patient-centered care to achieve impactful outcomes. The national PROLANIS program should also come out with oral health screening, education, and easier referral channels to Indonesia's current chronic illness management system. This kind of program would be a practical, scalable, and evidence-based way to deal with a major comorbidity, make patients feel better, and advance diabetes management in the country closer to its overall goals.

COMPETING INTERESTS

All authors had none to declare.

AUTHOR'S CONTRIBUTION

Siti Fatimah conceived of the presented idea, data collecting and analysis, and writing manuscript; Yonan Heriyanto was performed data analysis, review and editing manuscript; Deru Marah Laut was in charge of data visualization and review manuscript. All authors contributed to the final manuscript.

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