

Original Article



Disparities in oral healthcare utilization among diabetic patients in Indonesia

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Abstract

Background: Indonesia's National Health Insurance (NHI) system aims to ensure equitable healthcare access; however, significant oral health disparities persist among individuals with diabetes, a group vulnerable to systemic and oral health challenges. This study examines the influence of sociodemographic factors and oral health conditions on the utilization of dental care services in first-level healthcare facilities (FHF).

Methods: Data from the Indonesia Healthcare and Social Security Agency in 2021, which included 14,242 visits to Family Health Clinics (FHF) by diabetics with oral and dental issues, were analyzed using logistic regression to reveal systemic inequities.

Results: While 81.8% of patients received care from dental care providers (DCP), over 20% of diabetics outside Java-Bali sought care from non-dental providers. The key determinants included age, NHI membership type, diagnosis type, and geographic region. Elderly patients (≥ 55 years) were more likely to receive care from DCPs than younger individuals ($aOR = 1.42$). Subsidized NHI members had a 0.77 lower probability of accessing DCP care, and patients outside Java-Bali were significantly less likely to use DCP services than those residing in Java-Bali ($aOR = 0.55$).

Conclusion: The findings revealed systemic gaps in oral healthcare access for diabetics, emphasizing the need for targeted policy interventions to address regional and demographic disparities and strengthen universal healthcare systems in Indonesia and other LMICs.

Keywords: Diabetes mellitus, Health inequities, National health programs, Oral health

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Introduction

For decades, diabetes has emerged as a significant public health issue in Indonesia, with a prevalence rate of 6.2% and over 10 million people affected.¹ According to the Indonesian Basic Health Research in 2018, unhealthy dietary habits, including a high consumption of sugary foods and beverages, significantly contribute to this increase.¹ Individuals with diabetes are vulnerable to various health complications, including cardiovascular disease, retinopathy, nephropathy (kidney disease), circulatory problems, and delayed wound healing, among others.² Among these, oral health complications have emerged as a significant concern, often referred to as the sixth complication of diabetes.² Poor glycemic control in individuals with diabetes increases the risk of oral health complications, including gum disease, dry mouth, and tooth decay. This is attributed to elevated blood sugar levels impairing immune responses and promoting bacterial growth,¹⁻⁹ ultimately reducing the quality of life.¹⁰ The bidirectional relationship between diabetes and

oral health further complicates diabetes management, emphasizing the importance of regular dental checkups to reduce complications and improve overall health.^{6, 11-13}

On one hand, type 2 diabetes and its complications impose a significant economic burden in Indonesia, with high medical costs.³ On the other hand, preventive dental care can mitigate both oral and diabetes-related health issues while reducing healthcare expenditures.^{4,5} Access to regular dental care is critical for patients with diabetes to manage their health effectively and improve their quality of life.⁶⁻⁹ Efforts to increase access to dental care in Indonesia have been conducted through the National Health Insurance (NHI), or known as *Jaminan Kesehatan Nasional* (JKN). The NHI has expanded healthcare access in Indonesia, with 96% of the population covered as of 2023.¹¹ However, despite this progress, significant disparities persist, particularly among vulnerable groups, such as individuals with diabetes, limiting their access to essential oral healthcare.

Previous studies have highlighted the role of



socioeconomic, demographic, and insurance factors in shaping access to dental care for diabetics.^{14–20} For example, increased age increases the risk of diabetes and other oral problems. The Centers for Disease Control and Prevention (CDC) has reported that people aged ≥ 45 years are at a higher risk of type 2 diabetes.¹⁴ Sociodemographic factors influence healthcare-seeking behaviors and the extent to which individuals benefit from insurance coverage. Previous studies have explored the relationship between diabetes and oral health,¹² and examined healthcare access among individuals with diabetes in different settings.^{13, 15} However, gaps remain in understanding how sociodemographic factors and regional disparities impact the utilization of oral healthcare services for individuals with diabetes within the NHI system. Most prior research has focused on high-income countries or broad clinical contexts, without considering the unique challenges faced by diabetic patients in Indonesia's first-level healthcare facilities (FHF) under the NHI system, which covers a significant proportion of the population.¹¹

NHI membership in Indonesia provides financial protection, ensuring that beneficiaries have access to a wide range of healthcare services, including preventive and curative oral care. However, despite the financial security offered by NHI membership, regional disparities in healthcare access persist, with some areas facing significant barriers to service utilization. This underscores the need to investigate how sociodemographic factors, such as age, income, geographic location, and insurance coverage, affect equitable access to oral healthcare for diabetics. Although several studies have identified socioeconomic barriers to care,^{13, 15} few have addressed the specific issue of financial coverage through the NHI and its role in promoting access to oral health services for individuals with diabetes in Indonesia.

By focusing on the intersection of NHI membership, geographic disparities, and oral health needs, this study fills a critical gap in understanding systemic barriers to care in low- and middle-income countries with universal health coverage. This study examined oral healthcare utilization patterns among patients with diabetes in Indonesia's first-level healthcare facilities, focusing on how sociodemographic factors and oral health conditions impact access to care within the NHI system. This study provides valuable insights into the structural factors that influence access to oral health services, offering targeted policy recommendations aimed at addressing regional and demographic inequities in Indonesia's primary healthcare facilities. These findings will inform strategies to address regional and demographic disparities in oral healthcare access, ultimately contributing to the goal of achieving equitable healthcare delivery for all Indonesians.

Methods

This study employed a quantitative approach using

existing datasets from the Indonesia Healthcare and Social Security Agency (BPJS Kesehatan), which include data on beneficiaries of the NHI program and utilization of FHF, or known as *Fasilitas Kesehatan Tingkat Pertama* (FKTP). These datasets were obtained from the official website of BPJS Kesehatan with explicit authorization for research purposes. The datasets were merged into a unified dataset containing contextual information on individuals diagnosed with diabetes mellitus (DM). Specifically, the data cover NHI program participants diagnosed with ICD-10 codes E10 and E11 who utilized healthcare services at either FHF or Advanced Referral Healthcare Facilities (ARHF), or known as *Fasilitas Kesehatan Rujukan Tingkat Lanjutan* (FKRTL) in 2019 and received services in 2021. The BPJS Kesehatan Diabetes Mellitus dataset was selected using a stratified sampling design with three criteria for forming strata: 1) district/city, 2) type of diabetes mellitus (DM type 1 or type 2), and 3) type of healthcare facility where participants received DM services (FHF, ARHF, or both FHF and ARHF). The unit of sampling was an individual participant in the NHI program. The sample size for each stratum was determined semi-proportionally, meaning that strata with a larger population had a larger sample size than those with a smaller population. However, the final proportion of each stratum in the sample may not necessarily match the proportion in the population. If a stratum contained fewer than 30 participants, the entire population of that stratum was included in the sample. If a stratum contained 30 or more participants, the minimum sample size was 30. As a result, a total sample of 143,496 patients with DM was obtained, with 1,188,324 visits to FHF. This approach necessitated data weighting, and thus the sample data included weight variables for analysis.¹⁶ For this study, we targeted 107,146 DM patients with 1,187,116 visits that met the inclusion criteria: DM patient visits to FHF by individuals who were ≥ 18 years old and had complete information. The exclusion criteria for this study were incomplete information on DM patient visits (Figure 1). To minimize potential bias, certain observations were excluded because of missing data on specific variables. After exclusions, the final dataset included 107,146 patients who made 1,187,116 visits.

To obtain the sample, the type of visit data was categorized based on the diagnosis recorded in the FKP14 variable. This variable revealed the kind of diagnosis made during patient visits. We identified three distinct categories of visits: oral and dental visits for diagnoses falling under the K00-K014 category, healthy visits for individuals without any diagnosis, and visits for non-oral and dental diagnoses. As shown in Table 1, patients with DM diagnosed with oral and dental issues numbered 5,192, with a total of 14,242 visits. Although patients could visit the FHF for oral and dental health more than once, this study utilized the frequency of FHF visits by patients with DM as the sample. Therefore, the total sample in this study included

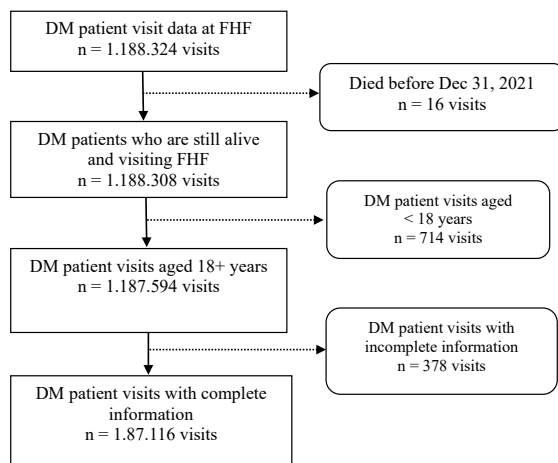


Figure 1. Sampling scheme

14,242 FHF visits by patients with DM with oral dental diagnoses.

The dependent variable was derived from FKP11, which examined the classification of healthcare professionals responsible for treating patients diagnosed with oral and dental complaints. Patients receiving treatment from dental care providers (DCP) were assigned a code of 1, whereas those treated by non-dental care providers (NDCP) were assigned a code of 0. Moreover, several independent variables were considered, including sociodemographic characteristics and categories of oral and dental diagnosis. To facilitate more efficient analysis of oral and dental health, the oral and dental diagnoses were further divided into three groups: caries, pulp and periapical diseases (K01 and K02), gingival and periodontal diseases (K05 and K06), and other oral and dental conditions (K00, K03, K07, K08, K09, K10, K11, K12, K13, and K14). Caries, pulp, and periapical diseases refer to oral conditions of the teeth, whereas gingival and periodontal diseases refer to gum diseases. Moreover, this study analyzed the treatment types for each oral and dental health condition, including referrals for outpatient care (referral) and outpatient care for FHF (outpatient care).

Sociodemographic aspects included age, sex, marital status, insurance membership, and region. The age variable was constructed by including the date of the health insurance visit (FKP03) and the date of birth (PSTV03). Subsequently, the age variable was divided into two groups: 18–54 and 55+, as at the age of 55, Indonesians start to experience diabetes mellitus.¹⁷ Marital status was determined using the PSTV06 variable and grouped into married and non-married status. Insurance types were created based on PSTV08 and classified as either subsidy or non-subsidy recipients. Finally, the regions were categorized into two groups: Java-Bali and outside the Java-Bali region, as the sample was centered in the Java-Bali region. Regions outside Java-Bali include Sumatra, Kalimantan, Sulawesi, Nusa Tenggara, Maluku, and Papua.

Table 1. Distribution of the number of patients with diabetes mellitus and visits to FHF by diagnosis

Diagnosis	DM patients who visited FHF	%	Frequency of FHF visits	%
Checkup visit	7,769	7.25	232,352	19.73
Other	94,185	87.9	940,522	79.06
Oral and dental	5,192	4.85	14,242	1.21
Total	107,146	100.00	1,187,116	100.00

The results of the data analysis are presented in tabular and graphical formats. Data analysis employed intricate weighting techniques, as per the BPJS *Kesehatan* guidelines for sample data processing.¹⁶ Logistic regression was employed to identify the factors linked to the involvement of specific health personnel in treating patients diagnosed with oral and dental diseases. The analysis was conducted at the national and regional levels. A 95% confidence interval was used to determine the odds ratio. All data analyses were performed using STATA 15.1.

Results

This study showed that among 14,242 FHF visits of DM patients with oral and dental diagnoses, 62% had caries, pulp, and periapical diseases, 21% had gingival periodontal disease, and 17% had other oral and dental health conditions. Moreover, this study found that more patients with DM with oral and dental health conditions were treated at FHF (84–88%). The remaining patients were directed to specialist referral facilities or hospitals. Detailed information on the flow of oral and dental treatments among patients with DM is presented in Figure 2.

This study revealed a significant increase in the prevalence of oral and dental conditions in individuals with DM. Specifically, the proportion of patients with DM affected by oral and dental conditions increased from approximately 3% in the age group below 39 years to 29% in the age group ≥ 65 years. It is important to highlight that among individuals with DM < 59 years of age, the percentage of female patients diagnosed with oral and dental problems exceeded that of their male counterparts. However, in the age group ≥ 65 years, the percentage of male patients diagnosed with oral and dental problems surpassed that of female patients (Figure 3).

The type of dental care that patients with DM receive during FHF visits is classified as dental or other medical care. At the national level, approximately 19% of DM patients with oral and dental issues sought treatment from the NDCP at the FHF. Except for Java and Bali, all other regions reported that more than 20% of patients with oral and dental complaints received treatment from the NDCP. Notably, in Sumatra, a significant proportion of patients with oral and dental problems (28.25 %) sought treatment from the NDCP, as depicted in Figure 4. Furthermore, the study revealed a significant disparity in the distribution of

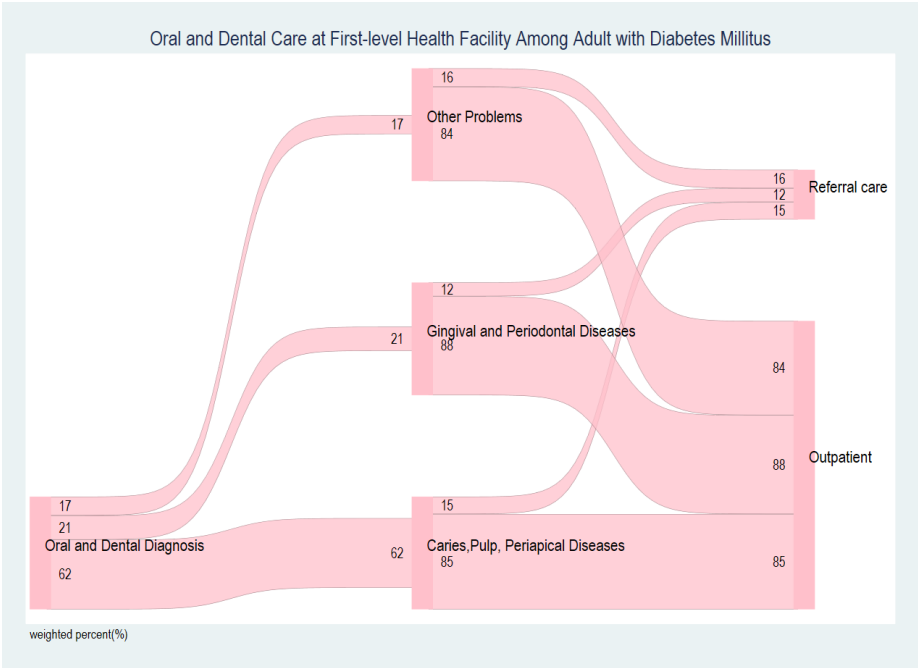


Figure 2. The proportion of oral and dental care utilization at FHF

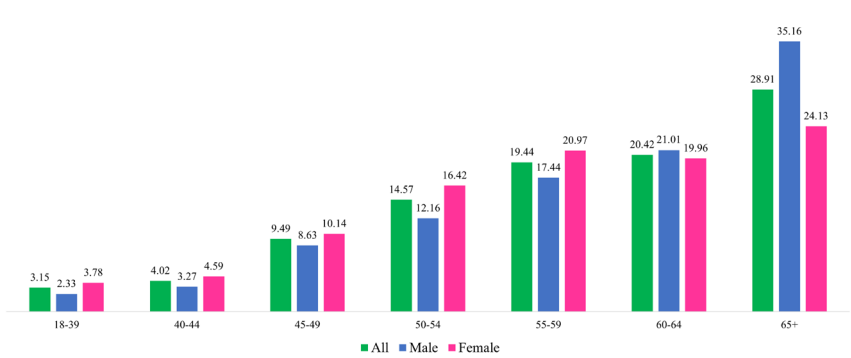


Figure 3. The proportion of oral and dental diagnosis visits by age group and sex

dental care in the FHF across different regions, with Java and Bali being the most prominent areas, accounting for approximately 70% of the overall provision (Figure 4). Table 2 shows the results of a logistic regression that explains the factors related to DCP services in the FHF. Age, type of membership status, type of diagnosis status, and region were significantly related to DCP service among patients with DM during FHF visits. The elderly population aged ≥ 55 years was more likely to receive treatment from DCP than younger individuals (aOR = 1.42). Patients who were beneficiaries of subsidies had a 0.77 lower probability of receiving treatment from a DCP than their non-subsidized counterparts. Patients with gingival and periodontal diseases, as well as those with caries, pulp, and periapical diseases, were more likely to receive treatment from DCP than patients with other oral and dental problems (aOR = 2.21; aOR = 2.53, respectively). Patients outside Java-Bali were less likely to receive treatment from the DCP than those in Java-Bali

(aOR = 0.55).

Discussion

This study examined the pattern of dental health services received by diabetic patients with NHI at the FHF level. The findings of this study included sociodemographic characteristics and specific oral and dental health issues that may affect the utilization of oral and dental treatment among patients with diabetes and NHI in primary healthcare institutions. This study found that most patients with diabetes enrolled in the NHI program had caries, pulp, and periapical diseases and received outpatient care at the FHF level. Evidence from other countries has shown that people with diabetes have a significantly higher prevalence of severe periodontitis, which could increase their risk of developing new and recurrent dental caries.¹² Treating both periodontal diseases and dental caries will not only prevent tooth loss among diabetes patients but also treat diabetes by improving the glycated hemoglobin

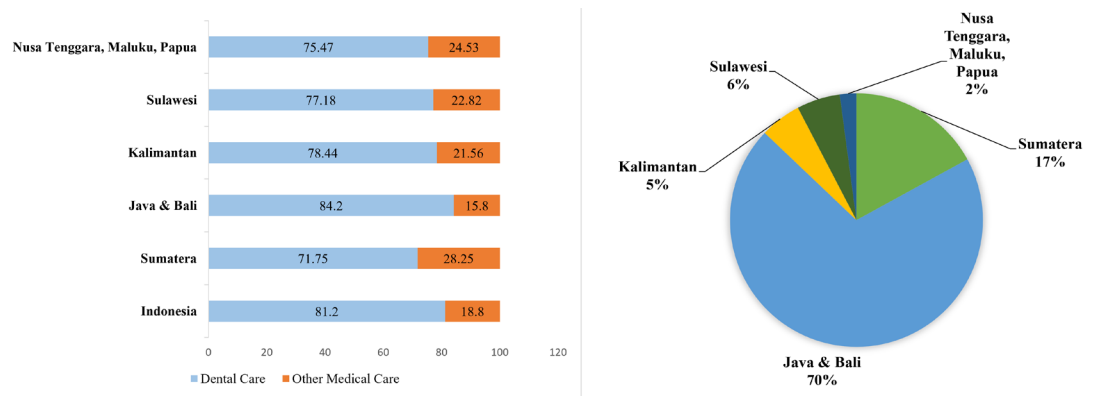


Figure 4. Distribution of oral and dental care by region and the proportion of oral and dental visits distribution at FHF by unit care and region

Table 2. Logistic Regression Analysis of Dental and Oral Problems in Diabetes Patients at FHF

Characteristics		OR	95% CI	P value
Age group	18-54	1		
	55 +	1.42	1.24-1.62	0.000
Sex	Male	1		
	Female	1.01	0.89-1.14	0.923
Marital Status	Other	1		
	Married	1.19	0.97-1.44	0.089
Type of NHI Membership	Non-Subsidies	1		
	Subsidies	0.77	0.64-0.92	0.005
Type of diagnosis	Other Problems	1		
	Gingival and Periodontal Diseases	2.21	1.88-2.59	0.000
	Caries, Pulp, Periapical Diseases	2.53	2.20-2.91	0.000
Region	Java Bali	1		
	Outside Java Bali	0.55	0.49-0.62	0.000

level.^{2,12} Outpatient care for most oral and dental health issues experienced by diabetic patients with NHI indicates that facilities at the FHF level and the DCP are capable of treating patients without referring to the secondary or tertiary level.

This study also revealed that not every diabetes patient with NHI was treated by a DCP at the FHF level, and non-dental providers treated a small number of patients. The number of patients using NHI treated by NDGP at the FHF level was higher among patients living outside the Java-Bali Islands, indicating disparities in the resources of dental health services at the primary healthcare level. This study demonstrated that the place of residence influences the likelihood of diabetes patients being treated by DCP in FHF. Dental care received by patients differed across Indonesia owing to the availability of DCP in FHF. The findings showed that dental care services in Java Bali accounted for approximately 70% of the overall dental care in Indonesia, leaving 30% of dental care services across the rest of the islands, including four large islands (Sumatra, Borneo, Sulawesi, and Papua), and many more archipelagos.

This study showed that older adults in Java and Bali

were handled more by DCP at the FHF level. This pattern suggests that oral and dental health development in Java and Bali is superior to that in other regions. Since half of Indonesia's population resides in this region, infrastructure development has been prioritized, resulting in improved healthcare access compared to other areas.¹⁸ These facilities, which include oral and dental health services, challenge the government to provide equitable dental health facilities and a dental workforce, considering the growth of older people and the increasing prevalence of diabetes mellitus. Over half of Indonesia's population (57.6%) has oral and dental conditions, but only 10.2% receive dental health services from dental medical professionals.¹ The distribution of dental health services by dental medical professionals between regions in Indonesia is also unequal, with the three highest proportions in the DKI Jakarta (16.4%), DIY (16.4%), and Bali (16.2%) regions, and the lowest in the East Nusa Tenggara region (5.1%).¹ Disparities in oral and dental service provision in Indonesia occur because dentists' distribution and availability are correlated. Hence, the utilization of dental services in the NHI program needs to be evaluated.¹⁹ Increasing the resources of dental care services across

Indonesian regions will promote healthcare equality and enable universal access to the healthcare the population needs.

Overall, this study revealed that patients with diabetes mellitus who were over 55 years old, living in the Java Bali region, did not receive subsidies from the NHI program, and had dental caries, pulpitis, and periapical inflammation, tended to be treated by DCP at the FHF level. This study found that the prevalence of oral and dental health problems increases with age. Patients with diabetes aged ≥ 55 years were 1.42 times more likely to be treated with DCP than those in the younger age group (18-55 years). Studies have also revealed that older adults are at a higher risk of developing periodontal disease and root caries, with two-thirds of the elderly with oral health problems having a history of systemic diseases, including diabetes mellitus.^{20, 21} The combination of diabetes mellitus and oral diseases that older people suffer adds complications to the treatment of oral diseases and increases their likelihood of utilizing health care services.

Moreover, subsidized recipients in all regions of Indonesia were less likely to seek oral and dental care from professionals. This finding is consistent with those of studies conducted in Indonesia on healthcare utilization among subsidized NHI members. Subsidized members use health services less frequently (inpatient and outpatient care) than non-subsidized members, which is influenced by factors such as whether health complaints interfere with daily activities, education, household economic conditions, and ease of access to health service facilities.^{22, 23} However, a study using NHI claim data from 2015-2016 found that subsidized NHI members tend to use primary healthcare compared to non-subsidized members who used secondary and tertiary healthcare levels.²³ While subsidized NHI members who used secondary and tertiary healthcare already experienced severe health problems compared to non-subsidized NHI members, this shows inequity in healthcare access in those two groups.^{22, 24} The experience of subsidized participants experiencing unsatisfactory treatment and quality of service at health facilities makes them reluctant to seek outpatient treatment and look for other treatment alternatives.²⁵ Reusing services at the first health facility correlates with service quality.²⁶ A lack of understanding of the flow and procedures of NHI services may hamper access to services at the first health institution. Dental experts do not treat many subsidized patients because of the lack of dental practitioners in community health institutions, particularly in rural areas. The NHI program has improved the average healthcare utilization in the community, even though inequity in dental care access may remain.²⁷

Strengths and Limitations

This study had both strengths and limitations. The study's

strength lies in its use of representative data on NHI users, offering insights into their dental care utilization. The results can help academics and policymakers identify other aspects of health equality and individuals' health needs more effectively. The limitations of this study are primarily related to obtaining the sample, owing to the nature of the BPJS data and the inaccuracy of documentation of the diagnosis. Several factors require careful consideration regarding visits by individuals with diabetes to primary healthcare facilities. The relatively infrequent occurrence of health visits, including oral and dental health visits, among patients with DM at the primary healthcare level may suggest a lack of emphasis on regular checkups and oral health. This conclusion is supported by data indicating that the primary reason for these visits is often related to complaints of other ailments that can be attributed to the underlying diabetic condition. However, this observation may be influenced by data recording issues, particularly in accurately documenting diagnoses of diabetic patients during visits to the FHF.

Conclusion

This study highlights significant regional disparities in the utilization of oral and dental care services by patients with diabetes in Indonesia's FHF. The most common oral and dental diagnoses in patients with diabetes often contribute to chronic periodontitis, underscoring the complex interplay between diabetes and oral health. Older age and specific oral and dental diagnoses increase the likelihood of receiving care from DCP; however, subsidy status and regional disparities reduce it. Subsidized NHI recipients exhibit unique patterns in seeking oral care at FHF, with the majority being treated by NDCP, particularly outside Java-Bali.

The bidirectional relationship between diabetes and oral health conditions, including caries and pulp, periapical, gingival, and periodontal diseases, reinforces the critical need for the early detection and proactive management of oral complications in patients with diabetes. Equitable access to dental care is essential to ensure that all patients with diabetes, irrespective of region, socioeconomic status, or NHI membership type, receive timely and appropriate treatment from DCP. Our findings indicate the need for targeted policies that ensure equitable access to dental care across all regions and demographic groups, focusing on improving infrastructure, workforce availability, and tailored support for vulnerable populations. Moreover, routine oral health checks should be integrated into diabetes management protocols under the National Health Insurance system to enhance early detection and consistent care for all patients. Finally, it is crucial to conduct further studies on oral healthcare utilization from other perspectives, such as illness perception, knowledge, economic barriers, prior experiences, and availability of dental resources at FHF.

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Writing- original draft: Riza Fatma Arifa, Wisnu Fadila, Marya Yenita Sitohang.

Writing- review & editing: Riza Fatma Arifa, Wisnu Fadila, Marya Yenita Sitohang.

Competing Interests

The authors declare no competing interests.

Data Availability Statement

The data used are available by request at <https://e-ppid.bpjs-kesehatan.go.id/>

Ethical Approval

Not applicable as the data used in this study is publicly available and does not include any personal identifiers.

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