Oral Health Knowledge as a Determinant of Periodontitis among the Elderly

Ririn Kurniawati[1], Sunomo Hadi[1], Silvia Prasetyowati [1]
[1]Department of Dental Health, Poltekkes Kemenkes Surabaya, Surabaya, Indonesia
Correspondence: **Sunomo Hadi**: Jl. Pucang Jajar Tengah 56 Surabaya, East Java, Indonesia; sunomohadi@gmail.com

ABSTRACT
Periodontitis is a progressive inflammatory condition affecting the supporting structures of the teeth, often originating from untreated gingival inflammation and potentially leading to tooth loss. This condition represents a significant public health concern, particularly among older adults, due to its impact on oral function, quality of life, and overall health. Limited knowledge regarding oral health is considered a critical contributing factor, as it may hinder preventive behaviors and timely treatment-seeking, thereby increasing the risk of disease progression. Therefore, understanding the role of knowledge in the occurrence of periodontitis is essential. This study aimed to examine the relationship between elderly knowledge of oral health and the incidence of periodontitis. A cross-sectional design was employed, involving 48 elderly participants aged 60–80 years selected using the Slovin formula. Data were collected through questionnaires to assess knowledge and clinical observation to determine the presence of periodontitis. Statistical analysis was conducted using the Chi-square test. The results showed that the majority of respondents had low levels of oral health knowledge, and more than half of the participants experienced periodontitis. Bivariate analysis revealed a statistically significant association between knowledge and the incidence of periodontitis ($p < 0.05$), indicating that lower knowledge levels were correlated with a higher occurrence of the disease. This finding suggests that knowledge plays an important role in influencing oral health status among the elderly. In conclusion, knowledge is a determinant factor in the occurrence of periodontitis among older adults, where inadequate knowledge is associated with an increased risk of the disease.
Keywords: periodontitis; knowledge; elderly

INTRODUCTION
Knowledge is the result of an individual's sensory and cognitive processes in perceiving an object through the five senses—sight, hearing, smell, taste, and touch. It develops from human curiosity in exploring observed phenomena, and individuals may possess different levels and types of knowledge due to variations in perception, experience, and access to information. In the context of oral health, knowledge plays a fundamental role in shaping attitudes and behaviors. Inadequate knowledge may lead to poor oral hygiene practices, such as infrequent tooth brushing, incorrect brushing techniques, and excessive consumption of sugary foods, all of which contribute to the development of oral diseases [1-5]. Consequently, knowledge is not merely a cognitive domain but also a key determinant influencing preventive and health-seeking behaviors.

The global elderly population is increasing rapidly as a result of advancements in healthcare and rising life expectancy. This demographic transition presents significant challenges, particularly in ensuring that older adults maintain optimal health and quality of life. Oral health is an essential component of overall well-being in older age, yet it is often neglected. Enhancing knowledge among the elderly regarding oral hygiene is therefore crucial, as it can foster greater awareness and encourage consistent self-care practices. Educational interventions, especially those focused on personal hygiene, are recognized as effective strategies to improve knowledge, promote healthy behaviors, and support a more comfortable and productive life in older adulthood [6]. Knowledge regarding oral health among the elderly can also be strengthened through continuous education efforts aimed at increasing awareness of proper oral hygiene practices and their long-term benefits [7].

Older adults are particularly vulnerable to various health problems, including those affecting the oral cavity. Physiological changes associated with aging, such as reduced salivary flow, alterations in gingival tissues, and decreased immune response, increase susceptibility to oral infections and dental diseases. These conditions are often exacerbated by chronic illnesses, the use of certain medications, and suboptimal oral hygiene practices. Among the most prevalent oral health issues in this population is periodontitis, a chronic inflammatory disease affecting the supporting structures of the teeth. It typically begins with untreated gingival inflammation and can progress to the destruction of periodontal tissues, ultimately leading to tooth loss if not properly managed [8].

Data indicate that periodontitis remains a significant public health concern, with a substantial number of cases reported at both national and regional levels, reflecting its widespread occurrence and impact on community health [9]. Periodontitis develops through a complex process initiated by the accumulation of dental plaque, a biofilm composed of bacteria and food debris adhering to tooth surfaces. If not effectively removed, plaque can mineralize into calculus, which further irritates the gingival tissues and leads to gingivitis. Without appropriate intervention, the infection can extend deeper into the periodontal structures, forming periodontal pockets and causing irreversible damage to connective tissue and alveolar bone. Multiple factors contribute to the onset and progression of periodontitis, including poor oral hygiene, systemic health conditions, and lifestyle factors. Despite its high prevalence, periodontitis often goes unnoticed due to its gradual progression and lack of early symptoms, making it a leading cause of tooth loss among adults [8].

The impact of periodontitis extends beyond oral health, significantly affecting overall quality of life, particularly among the elderly. Tooth loss and oral discomfort can impair chewing ability, leading to inadequate nutritional intake and subsequent deterioration of general health. Furthermore, periodontitis has been associated with systemic conditions such as cardiovascular disease, diabetes mellitus, and respiratory disorders, highlighting the importance of early detection and prevention [10-12]. In this context, primary healthcare facilities play a crucial role in delivering accessible oral health services, including education, screening, and treatment. Strengthening the knowledge of older adults regarding oral health is therefore essential in reducing the risk of periodontitis and improving health outcomes. However, studies specifically examining the relationship between knowledge levels and the incidence of periodontitis among the elderly remain limited.

This study is expected to contribute to the scientific body of knowledge by exploring the association between elderly knowledge of oral health and the occurrence of periodontitis. Practically, the findings may serve as a basis for healthcare providers in primary care settings to design more effective promotive and preventive strategies, as well as to enhance awareness among older adults regarding the importance of maintaining oral health to support a better quality of life in later years. This study aimed to analyze the relationship between the level of oral health knowledge among the elderly and the incidence of periodontitis in the working area of a primary healthcare center in Jombang Regency.

METHODS

This study was conducted in the working area of a primary healthcare center in Jombang Regency, Indonesia, over a period from December 2024 to March 2025. The research employed an observational analytic design with a cross-sectional approach, aimed at examining the relationship between elderly knowledge of oral health and the incidence of periodontitis at a single point in time [13-16].

The study population consisted of elderly individuals aged 60–80 years who were registered at the healthcare center, with a total population of 55 individuals. A sample of 48 respondents was determined using the Slovin formula to ensure adequate representation [17-19]. Participants were recruited using a total sampling approach based on inclusion criteria, which included elderly individuals within the specified age range who were willing to participate and able to communicate effectively. Respondents who met the criteria were informed about the study objectives and procedures before providing consent to participate.

The independent variable in this study was the level of knowledge regarding oral health among the elderly, while the dependent variable was the incidence of periodontitis. Knowledge was measured using a structured questionnaire developed to assess respondents' understanding of oral hygiene practices, causes of oral diseases, and preventive measures. The questionnaire consisted of multiple items with categorized scoring to classify knowledge levels. Meanwhile, the incidence of periodontitis was assessed through direct clinical observation using a dental examination conducted by trained personnel, based on established diagnostic criteria for periodontal conditions. Data collection was carried out through two main procedures: administration of the questionnaire to evaluate knowledge and clinical oral examinations to determine the presence or absence of periodontitis. Prior to data collection, instruments were reviewed to ensure clarity and appropriateness for the target population.

Data analysis was performed in two stages. Descriptive analysis was conducted to describe the distribution of each variable as categorical data, including respondents' characteristics, knowledge levels, and the incidence of periodontitis in the form of frequency and percentage [20-23]. Bivariate analysis was then carried out to examine the relationship between knowledge and periodontitis using the Chi-Square test [24-26], with a significance level set at 5% ($p < 0.05$). Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software.

RESULTS

The characteristics of participants based on age and sex are presented in Table 1. The majority of elderly participants were aged 60–65 years (54.2%), and most respondents were female (60.4%). The level of knowledge among elderly participants regarding oral health is presented in Table 2. The most participants had a poor level of knowledge regarding oral health. The results of intraoral examination to assess periodontal status among the elderly are shown in Table 3. The proportion of elderly individuals with periodontitis (81.2%) was substantially higher than those without periodontitis (18.8%).

Table 4 demonstrates that periodontitis occurred across all knowledge categories; however, its proportion was markedly higher among respondents with poor knowledge. Conversely, those with better knowledge tended to have a lower proportion of periodontitis. The Chi-square test yielded a p-value of 0.023 ($p < 0.05$), indicating a statistically significant relationship between knowledge and the incidence of periodontitis among the elderly. This finding suggests that lower levels of knowledge are associated with a higher likelihood of experiencing periodontitis.

Table 1. Distribution demographic characteristics of respondent

Demographic characteristics	Frequency	Percentage
Age		
60–65	26	54.2
66–70	12	25.0
71–74	7	14.6
76–80	3	6.2
Sex		
Male	19	39.6
Female	29	60.4

Table 2. Level of elderly knowledge on oral health

Knowledge	Frequency	Percentage
Good (76–100)	8	16.3
Moderate (56–75)	10	20.4
Poor (<56)	30	61.2

Table 3. Distribution of periodontitis status

Indicator	Frequency	Percentage
No periodontitis	9	18.8
Periodontitis	39	81.2

Table 4. Statistical test results of the relationship between knowledge and periodontitis status

Knowledge	Periodontitis status				p-value
	No periodontitis		Periodontitis		
	Frequency	Percentage	Frequency	Percentage	
Good	3	37.5	5	62.5	0.023
Moderate	4	40.0	6	60.0	
Poor	2	6.7	28	93.3	

DISCUSSION

The findings of this study indicate that the majority of elderly participants demonstrated a low level of knowledge regarding oral health. Many respondents had limited understanding of proper toothbrushing techniques, appropriate frequency and timing of brushing, dietary patterns affecting oral health, the importance of regular dental check-ups, and appropriate actions when experiencing oral or dental problems. This lack of knowledge may lead to inadequate oral hygiene practices, which in turn can negatively affect periodontal tissues and increase the risk of developing periodontitis [6].

Knowledge is closely associated with an individual's level of education; generally, higher educational attainment is linked to broader knowledge. However, low formal education does not necessarily equate to poor knowledge, as other factors—such as social environment, personal experience, and access to both formal and informal sources of information—also play significant roles in shaping knowledge. Individuals may acquire knowledge through various channels, including health education programs, media exposure, and interpersonal communication. Additionally, both physical and social environments contribute to how knowledge is developed and applied in daily life [27].

In this study, inadequate knowledge among the elderly emerged as a key risk factor contributing to poor periodontal health. Many respondents lacked awareness of essential preventive practices, including correct brushing techniques, maintaining proper oral hygiene routines, adopting a balanced diet, and seeking regular dental care. These gaps in knowledge can lead to plaque accumulation, inflammation of the supporting tissues of the teeth, and ultimately the development of periodontitis. Therefore, improving knowledge through structured educational interventions is essential.

Continuous and targeted oral health education programs, particularly for elderly populations, are necessary to enhance awareness and promote healthier behaviors. Preventive and promotive efforts delivered through primary healthcare services play a critical role in empowering

older adults with the knowledge needed to maintain oral hygiene. Such interventions are expected to contribute not only to improved oral health outcomes but also to enhanced overall quality of life among the elderly.

The results of this study also revealed that most elderly experienced periodontal disease. This condition is likely influenced by insufficient knowledge regarding oral hygiene practices, including improper brushing techniques, inadequate brushing frequency, poor dietary habits, and a lack of awareness about the importance of routine dental examinations. These factors collectively contribute to the emergence of various oral health problems, including periodontitis. These findings are consistent with previous research, which reported that dental visit rates among the Indonesian population remain relatively low despite recommendations for routine dental check-ups every six months. Proper toothbrushing plays a vital role in removing plaque from tooth surfaces, and toothbrushes should be replaced regularly, ideally every three months [8].

The majority of respondents exhibited advanced periodontal conditions, often characterized by the accumulation of debris and calculus, accompanied by tooth loss. These conditions are influenced by a combination of limited knowledge, unfavorable habits, and a lack of concern for oral hygiene. Periodontal disease typically begins with improper brushing habits, leading to plaque formation, which can progress into gingivitis and eventually periodontitis if left untreated. In addition, limited knowledge regarding diet and its impact on oral health further increases the risk of periodontal disease. Diets high in sugary and acidic foods can exacerbate dental and gingival conditions. Many elderly individuals may not fully understand the relationship between dietary choices and oral health, which contributes to the progression of oral diseases [8].

Based on findings, strengthening oral health education is crucial, particularly among the elderly. Educational efforts should emphasize correct toothbrushing techniques, the importance of maintaining a balanced diet, and the necessity of regular dental visits. A holistic approach involving healthcare providers, families, and communities is essential to support behavioral change and improve oral health outcomes in this population.

The analysis demonstrated a significant relationship between oral health knowledge and the incidence of periodontitis. Knowledge plays a crucial role in the prevention and control of periodontal disease. The findings suggest that lower levels of knowledge are associated with suboptimal self-care behaviors, such as irregular toothbrushing, infrequent dental visits, and limited awareness of the importance of oral hygiene. This study is consistent with previous research, which identified a significant correlation between oral health knowledge and periodontal disease among elderly populations. Adequate knowledge is essential for encouraging preventive behaviors, while insufficient knowledge may result in neglect of oral health and increased susceptibility to disease [28].

Educational interventions are therefore essential and should be implemented continuously through families, communities, and healthcare facilities. Dental health professionals play a vital role in delivering accurate and accessible information tailored to the needs of older adults, who may experience limitations in processing new information due to age-related factors. From a theoretical perspective, according to L. Green's behavioral theory, behavior change in health is influenced by three main factors: predisposing, enabling, and reinforcing factors. Knowledge is categorized as a predisposing factor, meaning it provides the basis for behavior formation. However, the findings of this study indicate that although knowledge is significantly associated with periodontitis, it may not be sufficient on its own to prevent the disease. This suggests that other factors—such as access to healthcare services, social support, and habitual behaviors—also play important roles. Therefore, interventions should not only focus on improving knowledge but also address enabling and reinforcing factors to achieve more effective behavioral change.

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to establish causal relationships between knowledge and periodontitis; the results only indicate an association at a single point in time. Consequently, it cannot be determined whether low knowledge leads to periodontitis or whether existing oral health conditions influence knowledge levels [29-31]. Second, the relatively small sample size and the use of participants from a single healthcare center limit the generalizability of the findings. The results may not fully represent the broader elderly population with different socio-demographic and cultural backgrounds [32-34]. Third, the measurement of knowledge using a self-reported questionnaire introduces the potential for information bias, including recall bias and social desirability bias, where respondents may provide answers they perceive as favorable rather than accurate [35]. Additionally, clinical assessment of periodontitis, although conducted through direct observation, may be subject to observer variability if standardized calibration is not strictly maintained. Fourth, this study did not include several potential confounding variables that may influence the occurrence of periodontitis, such as systemic diseases (e.g., diabetes), smoking habits, medication use, and socioeconomic status. The omission of these variables may affect the comprehensiveness of the analysis.

In terms of methodological robustness, while the study design and procedures are relatively simple and feasible to replicate in similar primary healthcare settings, variations in instruments, examiner skills, and population characteristics may influence reproducibility. Future studies are recommended to employ longitudinal or cohort designs to better establish causal relationships, include larger and more diverse samples, and incorporate additional relevant variables to enhance the validity and generalizability of findings [36-38].

CONCLUSION

This study demonstrates that most elderly individuals have a low level of oral health knowledge and a high prevalence of periodontitis. Statistical analysis confirms a significant relationship between knowledge and the incidence of periodontitis, indicating that knowledge is an important determinant of periodontal health. Elderly individuals with lower levels of knowledge tend to have a higher risk of developing periodontitis, highlighting the critical role of knowledge in shaping preventive behaviors and oral health outcomes.

It is recommended that primary healthcare providers strengthen promotive and preventive programs through continuous oral health education targeting the elderly, with emphasis on proper toothbrushing techniques, healthy dietary habits, and routine dental check-ups. In addition, involving families and communities in supporting behavioral change is essential to improve adherence to oral hygiene practices. Future research is suggested to include a larger and more diverse population, as well as additional variables such as systemic conditions and lifestyle factors, and to apply longitudinal designs to better explore causal relationships.

Ethical consideration, competing interest and source of funding

-Ethical considerations were strictly observed throughout the study. Ethical clearance was obtained from the Health Research Ethics Committee of Poltekkes Surabaya, with approval number EA/3695/KEPK-Poltekes_Sby/V/2025. Participants were provided with clear information regarding the study and their rights, including voluntary participation, confidentiality, and the option to withdraw at any time without any consequences.
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