Knowledge of Betel Chewers as a Predictor of Periodontal Disease

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ABSTRACT
Oral health is essential for overall well-being, as poor dental and oral conditions can interfere with speech, mastication, and aesthetics. In Aceh, the habit of betel chewing is common and may contribute to periodontal disease. This study aimed to determine the association between public knowledge among betel chewers and periodontal disease. This analytic study employed a cross-sectional design conducted in Baroh Village, Montasik Subdistrict, Aceh Besar. Data were collected through questionnaire-based interviews and periodontal examinations. A total of 34 respondents were included using total sampling. Data were analyzed using the Chi-square test. Of the 34 respondents, 23.5% had good knowledge and 76.5% had poor knowledge. Periodontal conditions included 26.5% with calculus, 64.7% with shallow pockets, and 8.8% with deep pockets. The analysis showed a significant association between knowledge and periodontal disease ($p = 0.001$). The findings indicate that knowledge among betel chewers serves as a significant predictor of periodontal disease, where lower knowledge is associated with greater occurrence and severity.
Keywords: knowledge; betel chewing; periodontal disease; predictor; community

INTRODUCTION
Oral and dental health are essential components of overall individual well-being. Poor oral health conditions may interfere with speech, mastication, and aesthetic functions, thereby affecting daily activities. According to the Fédération Dentaire Internationale (FDI), approximately 90% of the global population is at risk of developing oral diseases, ranging from dental caries and periodontal disease to oral cancer. Recent data from the WHO Oral Health Media Center (2012) indicate that 60%–90% of school-aged children and adults worldwide experience oral health problems [1]. According to WHO, the elderly population is categorized into four groups: middle age (45–59 years), elderly (60–70 years), old (75–90 years), and very old (above 90 years) [2].

Knowledge is defined as the result of curiosity obtained through sensory processes, particularly through sight and hearing toward specific objects. It is a crucial domain in shaping behavior, especially open behavior. Knowledge is closely related to education, and individuals with higher educational attainment are expected to have broader knowledge [3].

Dental health approaches should be viewed from multiple perspectives, including environmental factors, knowledge, education, public awareness, and access to dental care services, including prevention and treatment. Government efforts to improve public health require individuals who can effectively communicate dental health information and existing health regulations [4].

In Indonesia, the practice of betel chewing is still maintained among certain ethnic groups, particularly in rural communities, as part of long-standing cultural traditions often associated with ceremonial or religious events [5]. The habit has been widely recognized, and many people believe that betel chewing can strengthen teeth, heal minor oral wounds, eliminate bad breath, stop gum bleeding, and function as a mouthwash. Betel leaves are also known for their antimicrobial properties against *Streptococcus mutans*, a major bacterium responsible for dental caries [6].

Common ingredients used in betel chewing include betel leaves, areca nut, lime, and gambier, with some regions adding tobacco. Areca nut contains phenolic compounds at relatively high levels. During chewing, reactive oxygen species (free radicals) are generated, forming phenolic compounds. The combination of areca nut and lime creates an alkaline pH condition, which accelerates the formation of reactive oxygen species. These substances can damage DNA or genetic material in oral epithelial cells [6].

Betel chewing has effects on teeth, gingiva, and oral mucosa. It is commonly believed to prevent oral diseases, such as toothache and halitosis [7]. However, periodontal disease is one of the two most prevalent oral diseases globally. The World Health Organization (WHO) reports that 10–15% of the global population suffers from periodontal disease, 80% of young individuals experience gingivitis, and nearly all adults have experienced gingivitis, periodontitis, or both. Periodontal disease was ranked as the most common disease worldwide in the 2001 global records [8]. The damaging effects of areca nut on periodontal tissues are associated with increased salivary secretion and calcium deposition, which may lead to damage of the gingiva and periodontal membrane. Additionally, arecoline, the main alkaloid in areca nut, inhibits cell attachment, proliferation, migration, and collagen synthesis [7].

A study by Intan Liana and Andriani (2021) found that among 10 individuals who chewed betel, 80% experienced moderate to severe periodontitis. The study also showed improvements in knowledge, attitudes, and practices after educational interventions, with knowledge increasing from 51.1% (low) to 90.7% (high) in post-test I and 76.8% in post-test II [9]. Another study by Sri Wahyuni Ritonga et al. (2019) demonstrated that higher frequency of betel chewing was associated with increased incidence of periodontitis. Among respondents who chewed betel more than five times daily, 75% experienced periodontitis [10]. A literature review by Fabiana Meijon Fadul (2019) concluded that betel chewing significantly affects periodontal health, causing tissue damage and increasing the risk of gingival recession, bleeding gums, oral lesions, halitosis, difficulty swallowing, and burning sensations in oral soft tissues compared to non-chewing groups [11].

In Aceh Province, the prevalence of oral health problems reaches 55.3%. The prevalence of periodontitis in Indonesia is reported at 74.1%, while the proportion of treatment for periodontitis cases in Aceh Besar is only 0.32% [12]. Preliminary interviews with betel-chewing communities revealed that the practice is considered a long-standing cultural tradition from the Aceh Sultanate era. Perceived positive effects include stronger teeth, absence of bad breath, and prevention of digestive problems. However, negative effects reported include numbness of the tongue, tooth discoloration, darkened gums, and oral tissue damage. The community in Baroh Village still lacks awareness and understanding of proper oral health care and the importance of regular dental check-ups.

Based on the aforementioned background, which highlights the high prevalence of oral health problems, the cultural persistence of betel chewing, and the potential impact of knowledge on health behavior, this study aimed to determine the relationship between the level of knowledge among betel-chewing communities and the occurrence of periodontal disease in Baroh Village, Montasik Subdistrict, Aceh Besar. Furthermore, this study sought to assess how variations in knowledge levels may influence the severity of periodontal conditions among individuals who practice betel chewing as part of their daily habits.

METHODS

This study employed an analytic survey with a cross-sectional design to examine the relationship between knowledge among betel-chewing communities and periodontal disease. The research was conducted from February 20 to 26, 2023, in Baroh Village, Montasik Subdistrict, Aceh Besar. The study population consisted of all individuals who practiced betel chewing in the study area, totaling 34 respondents. The sampling technique used was total sampling, whereby all members of the population were included as the study sample, resulting in a final sample size of 34 respondents.

The variables measured in this study included an independent variable and a dependent variable. The independent variable was the level of knowledge among betel chewers, while the dependent variable was periodontal disease status. Knowledge was assessed using a structured questionnaire administered through face-to-face interviews. The questionnaire consisted of items related to the understanding of oral health, the effects of betel chewing, and periodontal disease. Responses were scored and categorized into levels (e.g., good and poor knowledge) based on predetermined criteria. Periodontal disease status was measured through a direct clinical examination using a periodontal probe to assess conditions such as calculus, shallow pockets, and deep pockets, following standard periodontal assessment procedures.

Data collection was carried out by combining interview-based questionnaires and clinical oral examinations to ensure both subjective and objective measurements. Prior to data collection, the instrument underwent validity and reliability testing using SPSS software. Validity was assessed using the Pearson Correlation Coefficient (r), while reliability testing ensured the internal consistency of the questionnaire items. Data analysis was performed using the Chi-square test to determine the association between knowledge level and periodontal disease.

RESULTS

Based on Table 1, the majority of respondents had a poor level of knowledge (76.5%). This finding indicates that most betel-chewing community members in the study area have limited understanding of oral health and periodontal disease. As shown in Table 2, the most prevalent periodontal condition among respondents was shallow pocket (64.7%), followed by calculus (26.5%), while deep pocket was the least common condition at 8.8%. These results suggest that periodontal disease is highly prevalent among betel chewers, with most cases already progressing beyond the early stage.

Table 1. Distribution of of knowledge levels among betel-chewing community in Baroh Village, Montasik Subdistrict, Aceh Besar

No	Knowledge levels	Frequency	Percentage
1	Good	8	23.5
2	Poor	26	76.5

Table 2. of periodontal disease among betel-chewing community in Baroh Village, Montasik Subdistrict, Aceh Besar

No	Periodontal disease	Frequency	Percentage
1	Calculus	9	26.5
2	Shallow Pocket	22	64.7
3	Deep Pocket	3	8.8

Table 3. Association between knowledge level and periodontal disease among betel-chewing community in Baroh Village, Montasik, Aceh Besar

No	Knowledge level	Periodontal disease								P Value
		Calculus		Shallow Pocket		Deep Pocket		Total		
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
1	Good	6	75.0	1	12.5	1	12.5	8	100	
2	Poor	3	11.5	21	80.8	2	7.7	26	100	0.001

Table 3 demonstrates the distribution of periodontal disease based on knowledge level. Among respondents with good knowledge, the majority (75.0%) experienced calculus, while smaller proportions had shallow pockets (12.5%) and deep pockets (12.5%). In contrast, respondents with poor knowledge predominantly experienced shallow pockets (80.8%), followed by calculus (11.5%) and deep pockets (7.7%). These findings indicate a pattern in which lower knowledge levels are associated with more severe periodontal conditions, particularly the higher prevalence of shallow periodontal pockets among respondents with poor knowledge. The chi-square statistical test yielded a p-value of 0.001, indicating a statistically significant association between knowledge level and periodontal disease. It can be concluded that there is a significant relationship between knowledge among betel-chewing communities and periodontal disease in Baroh Village, Montasik Subdistrict, Aceh Besar.

DISCUSSION

Based on the results of the data analysis, it was found that there is a significant relationship between the level of knowledge among betel-chewing communities and periodontal disease in Baroh Village, Montasik, Aceh Besar. Referring to these findings, the authors assume that betel chewing has become a daily habitual practice, particularly as many respondents reported that chewing betel is commonly performed in the morning before breakfast and even prior to tooth brushing. This habitual behavior reflects a lack of awareness regarding proper oral hygiene practices.

The low level of knowledge among respondents appears to be closely associated with the occurrence of periodontal disease, as insufficient knowledge may lead to poor awareness and inadequate implementation of oral health maintenance behaviors. In addition, factors such as low educational attainment, limited motivation, and deeply rooted habits contribute to this condition. The majority of respondents had only completed primary education, which may influence their understanding of oral health. Furthermore, many respondents perceived dental problems as minor conditions that do not pose serious health risks, thereby reducing their motivation to seek preventive care or treatment.

The researchers also assume that the habit of betel chewing can be categorized as a harmful practice, as it contributes to the deterioration of periodontal tissues, particularly through the formation of calculus, which may lead to periodontitis. The negative effects are primarily attributed to the composition of betel quid, especially the mixture of areca nut and lime. Areca nut contributes to plaque accumulation, while lime increases the alkalinity (pH) of the oral environment, accelerating plaque deposition and calculus formation [13]. Prolonged exposure to these substances results in an alkaline salivary condition, which further exacerbates periodontal tissue damage. Individuals with long-term betel-chewing habits have been shown to experience more severe periodontal destruction compared to non-chewers [14].

Betel chewing typically involves a mixture of betel leaves, areca nut, and lime, which are chewed for several minutes. While some positive effects have been suggested, such as inhibiting dental caries formation, the negative effects are more prominent, including tooth staining, gingival damage, and the development of periodontal disease [1,15]. Many individuals believe that betel chewing provides a pleasurable sensation similar to smoking. However, this belief is not supported by adequate knowledge of oral health, which contributes to the progression of dental and periodontal damage. Common complaints reported by betel chewers include gum pain, tooth discoloration, and tooth mobility [16].

Although lime is sometimes considered to have benefits for periodontal tissues, its form and usage in betel chewing may instead cause harm. The powder form of lime contributes mechanically to calculus formation, leading to inflammation of periodontal tissues and increased tooth mobility [11]. The frequency of betel chewing further intensifies these effects, as repeated exposure increases contact between oral mucosal tissues and harmful substances such as lime. This condition is often compounded by poor oral hygiene (OHI-S) and the replacement of tooth brushing habits with alternative practices such as rubbing betel residue on the teeth. Consequently, the risk of gingivitis and more severe periodontal disease increases significantly. If this habit persists over a long period, it may also increase the risk of developing oral cancer [10].

In terms of post-chewing behavior, most respondents reported rinsing their mouths with water as a cleaning method. This practice is likely chosen because it is simple, quick, and convenient. However, rinsing alone is insufficient to remove plaque and calculus effectively, thereby limiting its protective effect on oral health [17]. Previous studies by Sri Wahyuni Ritonga et al. (2019) also demonstrated a significant relationship between the frequency of betel chewing and the incidence of periodontitis, indicating that frequency, duration, and composition of betel chewing play important roles in the development of periodontal disease [10].

Similarly, research by Bida et al. (2022) emphasized that betel chewing is a long-standing cultural practice among various ethnic groups in Indonesia, particularly in rural communities, where it has been passed down through generations [14]. Lime is a key component of betel chewing, must be carefully considered due to its potential to induce pathological changes in the oral cavity, including precancerous conditions. Its high alkalinity can react with saliva to form plaque deposits on teeth, tongue, and oral mucosa, leading to structural and functional alterations [7].

It should be noted that this study focused solely on examining the relationship between betel chewing and periodontal disease. Other potential oral health outcomes, such as oral cancer, xerostomia, and additional oral diseases, were not assessed within the scope of this research. In addition, several limitations should be considered. First, the cross-sectional design limits the ability to establish causal relationships, as the data were collected at a single point in time [18-20]. Second, the relatively small sample size (n=34) and the use of total sampling within a single village may limit the generalizability of the findings to broader populations. Third, the measurement of knowledge relied on self-reported responses, which may be subject to information bias [21]. Fourth, potential confounding variables such as dietary patterns, smoking habits, socioeconomic status, and access to dental care were not controlled in this study. Lastly, clinical assessment was limited to periodontal examination without incorporating more comprehensive diagnostic tools or longitudinal follow-up. Therefore, future research is recommended to use larger and more diverse samples, longitudinal or cohort designs, and more comprehensive variables to better understand causal pathways and strengthen the evidence regarding the impact of betel chewing and knowledge on oral health outcomes.

CONCLUSION

Based on the results and discussion presented above, it can be concluded that knowledge among betel chewers is a significant predictor of periodontal disease, where lower levels of knowledge are associated with a higher occurrence and greater severity of periodontal conditions in Baroh Village, Montasik Subdistrict, Aceh Besar.

It is therefore recommended that the community improve their knowledge regarding both the positive and negative effects of betel chewing, particularly the impact of areca nut and lime mixtures on oral health. This can be achieved by increasing access to reliable information sources and fostering greater self-awareness of the importance of maintaining proper oral hygiene and dental care practices.

Ethical consideration, competing interest and source of funding

-This study adhered to ethical research standards and obtained ethical approval with the reference number LB.02.03/009/2023. All respondents were informed about the purpose of the study, and their participation was voluntary, with confidentiality of personal data strictly maintained throughout the research process.
-There is no conflict of interest related to this publication.
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