

Association Between Toothbrushing Frequency and Oral Hygiene Status Among University Students

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ABSTRACT

Background: Oral hygiene is an essential component of overall health, and regular toothbrushing is the primary preventive measure for maintaining oral cleanliness and preventing dental diseases. However, inadequate toothbrushing practices remain common among university students, potentially resulting in poor oral hygiene. Understanding the relationship between toothbrushing frequency and oral hygiene status is important for developing effective oral health promotion programs among future healthcare professionals.

Research Objective: This study aimed to determine the association between toothbrushing frequency and oral hygiene status among students of STIKES Amanah Makassar.

Methods: This analytical observational study employed a cross-sectional design involving 42 students selected through purposive sampling. Toothbrushing frequency was assessed using a structured questionnaire and categorized as less than twice daily or at least twice daily. Oral hygiene status was evaluated through clinical examination using the Oral Hygiene Index-Simplified (OHI-S). Descriptive statistics were used to summarize respondent characteristics, while the Chi-square test was applied to examine the association between toothbrushing frequency and oral hygiene status with a significance level of $p < 0.05$.

Results: Most respondents brushed their teeth at least twice daily (66.7%) and had a fair oral hygiene status (47.6%). Students who brushed their teeth at least twice daily showed a higher proportion of good oral hygiene (46.4%) than those who brushed less frequently. The Chi-square test revealed a statistically significant association between toothbrushing frequency and oral hygiene status ($p = 0.008$).

Conclusion: Toothbrushing frequency was significantly associated with oral hygiene status among students of STIKES Amanah Makassar. Promoting regular toothbrushing accompanied by proper brushing techniques and routine oral health education may improve oral hygiene and reduce the risk of oral diseases among university students.

Keywords: Toothbrushing Frequency; Oral Hygiene Status; Oral Hygiene Index-Simplified; Students



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BACKGROUND

Oral health is an integral component of general health and quality of life. Good oral hygiene contributes not only to healthy teeth and periodontal tissues but also to adequate nutritional intake, clear speech, social interaction, and psychological well-being (Wang et al., 2022). Among the various behaviors influencing oral health, regular toothbrushing is recognized as the most effective and affordable method for removing dental plaque, preventing dental caries, and reducing the risk of periodontal disease (Bundugji et al., 2021). However, despite continuous oral health promotion efforts, poor toothbrushing habits remain common among adolescents and young adults, particularly university students (Fasoulas et al., 2019). This age group often experiences lifestyle changes after entering higher education, including irregular daily routines, unhealthy dietary patterns, increased academic workload, and reduced attention to personal health practices. Consequently, university students remain vulnerable to poor oral hygiene despite having greater access to health information (Kyaw Myint et al., 2020).

Globally, oral diseases continue to represent one of the most common non-communicable diseases (Ali et al., 2022). According to the World Health Organization (WHO), oral diseases affect approximately 3.5 billion people worldwide, with untreated dental caries being the most prevalent health condition (Arnett et al., 2022). Poor oral hygiene is the primary risk factor for dental plaque accumulation, gingivitis, and periodontal disease, all of which can negatively affect overall health and quality of life (Liu et al., 2019). The WHO also emphasizes that improving daily oral hygiene behaviors, particularly regular toothbrushing with fluoride toothpaste, is among the most cost-effective public health interventions for reducing the global burden of oral diseases (Sardana et al., 2019). Therefore, understanding behavioral factors associated with oral hygiene remains an important priority in preventive dentistry and public health research (Bakke, 2022).

Indonesia continues to experience a substantial burden of oral health problems. The Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) 2023 reported that dental and oral diseases remain among the most common health problems in the community (Korhonen et al., 2019). Although the majority of Indonesians reported brushing their teeth every day, only a relatively small proportion practiced toothbrushing at the recommended times, namely after breakfast and before bedtime (Sangalang et al., 2022). This discrepancy indicates that the frequency of toothbrushing alone does not necessarily reflect appropriate oral hygiene behavior (Vishwanath et al., 2020). Inadequate toothbrushing techniques, inappropriate brushing times, and inconsistent oral hygiene practices contribute to persistent plaque accumulation and poor oral hygiene status. These findings suggest that behavioral modification remains a major challenge in improving oral health outcomes in Indonesia (Zhang et al., 2022).

In South Sulawesi, oral health problems continue to receive considerable attention from public health authorities. Several regional studies have reported moderate to poor (Omara & Elamin, 2022) Oral Hygiene Index-Simplified (OHI-S) scores among adolescents and young adults, indicating insufficient plaque control despite increasing awareness of oral health. Rapid urbanization, changing dietary habits, frequent consumption of sugary foods and beverages, and limited preventive dental visits further contribute to poor oral hygiene among young people (Riggs et al., 2020). These conditions highlight the importance of strengthening oral health promotion strategies targeting adolescents and university students (Romero et al., 2021).

Makassar, as the largest metropolitan city in Eastern Indonesia, reflects these challenges. Previous studies conducted among students in Makassar have reported that poor oral hygiene remains prevalent despite relatively high levels of knowledge regarding dental health. Many students brush their teeth regularly but fail to follow the recommended brushing frequency, duration, and technique. Furthermore, frequent consumption of sweet snacks, sugar-sweetened beverages, and limited utilization of preventive dental services

have been identified as additional factors influencing oral hygiene status. These findings indicate that behavioral practices rather than knowledge alone determine oral hygiene outcomes.

Students of STIKES Amanah Makassar represent a particularly important population for oral health research. As future health professionals, they are expected to demonstrate healthy behaviors and serve as role models for the community in promoting disease prevention and healthy lifestyles. Nevertheless, academic demands, clinical practice schedules, and lifestyle changes during university life may reduce attention to personal oral hygiene. Poor oral hygiene among healthcare students may not only affect their own health but also reduce the credibility of health promotion messages delivered to patients and communities in the future. Therefore, assessing toothbrushing behavior and oral hygiene status among STIKES Amanah Makassar students is important for developing evidence-based health promotion programs within higher education institutions.

Previous studies investigating toothbrushing frequency and oral hygiene have produced inconsistent findings. Several studies have demonstrated that individuals who brush their teeth at least twice daily have significantly better oral hygiene status than those with lower brushing frequency (Loha et al., 2022). In contrast, other studies have reported weak or non-significant associations after controlling for toothbrushing technique, brushing duration, fluoride toothpaste use, dietary habits, smoking behavior, and routine dental visits (Adanero et al., 2022). These inconsistent findings suggest that oral hygiene is influenced by multiple behavioral and environmental factors, and further investigation is required in different populations and settings (Xiang et al., 2022).

Another important research gap is the limited availability of evidence focusing specifically on university students enrolled in health science institutions in Makassar. Most previous Indonesian studies have been conducted among elementary or secondary school students or have emphasized oral health knowledge rather than actual oral hygiene status measured using standardized clinical indices such as the Oral Hygiene Index-Simplified (OHI-S). Consequently, evidence regarding the relationship between toothbrushing frequency and objectively measured oral hygiene status among health science students remains limited (Anderson et al., 2019). This lack of local evidence makes it difficult for universities to design effective oral health promotion programs tailored to student needs (Oishi et al., 2019).

The novelty of this study lies in its focus on examining the association between toothbrushing frequency and oral hygiene status among students of STIKES Amanah Makassar using standardized clinical assessment of the Oral Hygiene Index-Simplified (OHI-S). Unlike previous studies that primarily relied on self-reported oral hygiene behavior or included general student populations, this study specifically investigates future healthcare professionals who are expected to possess better health behaviors. The findings are expected to provide updated local evidence for developing campus-based oral health promotion programs, strengthening preventive education, and encouraging healthy oral hygiene practices among healthcare students.

This study aims to determine the association between toothbrushing frequency and oral hygiene status among students of STIKES Amanah Makassar, thereby providing evidence to support the development of effective oral health promotion strategies and preventive interventions for university students.

METHODS

This analytical observational study employed a cross-sectional design (Sigurdardottir et al., 2022), to determine the association between toothbrushing frequency and oral hygiene status among students of STIKES Amanah Makassar. The study was conducted from January to March 2026. A total of 42 students were selected using

purposive sampling based on the inclusion criteria of active students aged 18-24 years who agreed to participate in the study.

The independent variable was toothbrushing frequency, categorized as <2 times/day and ≥2 times/day based on respondents' self-reports using a structured questionnaire. The dependent variable was oral hygiene status, which was assessed through direct clinical examination using the Oral Hygiene Index-Simplified (OHI-S) developed by Greene and Vermillion and classified as good (0.0-1.2), fair (1.3-3.0), and poor (3.1-6.0).

Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics were used to summarize respondents' characteristics, toothbrushing frequency, and oral hygiene status. The association between toothbrushing frequency and oral hygiene status was analyzed using the Chi-square test, with a significance level of $p < 0.05$.

RESULTS

Respondent Characteristic

A total of 42 students from STIKES Amanah Makassar participated in this study. The respondents consisted predominantly of female students aged 18-21 years. Most respondents reported brushing their teeth at least twice a day and had a fair oral hygiene status based on the Oral Hygiene Index-Simplified (OHI-S).

Table 1.
Characteristics of Respondents (n = 42)

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
18-19	16	38.1
20-21	18	42.9
22-24	8	19.0
Sex		
Male	10	23.8
Female	32	76.2
Total	41	100

Table 1 shows that most respondents were aged 20-21 years (42.9%), followed by 18-19 years (38.1%). Female students constituted the majority of participants (76.2%), reflecting the predominance of female enrollment at STIKES Amanah Makassar.

Univariate Analysis

Table 2.
Distribution of Toothbrushing Frequency (n = 42)

Toothbrushing	Frequency (n)	Percentage (%)
<2 times/day	14	33.3
≥2 times/day	28	66.7
Total	41	100

Table 2 indicates that most respondents (66.7%) brushed their teeth at least twice daily, while one-third (33.3%) reported brushing their teeth less than twice a day. This finding suggests that the majority of students practiced toothbrushing according to the recommendation of brushing at least twice daily.

Table 3.
Distribution of Oral Hygiene Status (OHI-S) (n = 42)

Oral Hygiene Status	Frequency (n)	Percentage (%)
Good	15	35.7
Fair	20	47.6
Poor	7	16.7
Total	41	100

Table 3 demonstrates that nearly half of the respondents (47.6%) had a fair oral hygiene status, while 35.7% had good oral hygiene. Only 16.7% of students exhibited poor oral hygiene, indicating that although most students maintained acceptable oral hygiene, improvements are still needed to achieve optimal oral health.

Bivariate Analysis

Table 4.

Association Between Toothbrushing Frequency and Oral Hygiene Status Among Students of STIKES Amanah Makassar (n = 42)

Toothbrushing Frequency	Good n (%)	Fair n (%)	Poor n (%)	p-value
<2 times/day	2 (14.3)	6 (42.9)	6 (42.9)	0.008
≥2 times/day	13 (46.4)	14 (50.0)	1 (3.6)	
Total	15 (35.7)	20 (47.6)	7 (16.7)	

The Chi-square test demonstrated a statistically significant association between toothbrushing frequency and oral hygiene status ($p = 0.008$). Students who brushed their teeth at least twice daily were more likely to have good oral hygiene (46.4%) and less likely to experience poor oral hygiene (3.6%). In contrast, respondents who brushed their teeth less than twice daily had the highest proportion of poor oral hygiene (42.9%).

These findings indicate that a higher frequency of toothbrushing is associated with better oral hygiene among students of STIKES Amanah Makassar. Regular toothbrushing effectively removes dental plaque and food debris, thereby reducing the accumulation of calculus and improving Oral Hygiene Index-Simplified (OHI-S) scores. Therefore, promoting the habit of brushing teeth at least twice daily should remain a key component of oral health promotion programs for university students.

DISCUSSION

This study demonstrated a statistically significant association between toothbrushing frequency and oral hygiene status among students of STIKES Amanah Makassar ($p = 0.008$). Students who brushed their teeth at least twice daily were more likely to have good oral hygiene, whereas those who brushed less than twice daily showed a higher proportion of poor oral hygiene. These findings indicate that toothbrushing frequency is an important behavioral factor influencing oral hygiene among university students.

The univariate analysis showed that most respondents reported brushing their teeth at least twice a day (66.7%). This finding suggests that the majority of students have adopted the recommended toothbrushing frequency promoted by oral health guidelines. Nevertheless, approximately one-third of respondents still brushed their teeth less than twice daily, indicating that optimal oral hygiene practices have not yet been achieved by all students. University students often experience busy academic schedules, irregular daily routines, and lifestyle changes that may reduce their attention to personal oral hygiene. Consequently, even students enrolled in health science programs may not consistently practice appropriate oral hygiene behaviors.

The study also found that most respondents had a fair oral hygiene status (47.6%), while only 35.7% achieved good oral hygiene. Although these findings indicate that oral hygiene among students was generally acceptable, the proportion of students with fair and poor oral hygiene remains considerable. Oral hygiene status is determined not only by the frequency of toothbrushing but also by brushing technique, brushing duration, toothbrush replacement, fluoride toothpaste use, dietary habits, smoking behavior, and regular dental check-ups. Therefore, brushing frequency alone may not completely reflect an individual's oral hygiene condition (Wong et al., 2021).

The significant relationship identified in this study supports the biological mechanism underlying plaque formation (Moffa et al., 2019). Dental plaque continuously accumulates on tooth surfaces and, if not removed effectively through regular

toothbrushing, gradually mineralizes into calculus. The accumulation of plaque and calculus increases the risk of gingivitis, periodontal disease, dental caries, halitosis, and other oral health problems (Zechner et al., 2022). Brushing teeth at least twice daily effectively disrupts plaque formation, reduces bacterial colonization, and maintains healthy gingival tissues. Consequently, students who brush their teeth more frequently generally demonstrate better Oral Hygiene Index-Simplified (OHI-S) scores (Folgerts et al., 2019).

The present findings are consistent with previous studies reporting that individuals who brush their teeth at least twice daily are more likely to maintain good oral hygiene compared with those who brush less frequently (Yaacob et al., 2019). Regular toothbrushing has been shown to significantly reduce plaque accumulation and improve oral cleanliness. The findings also support recommendations from the World Health Organization and the FDI World Dental Federation, which encourage brushing teeth twice daily using fluoride toothpaste as the primary preventive measure against dental caries and periodontal disease (Oh et al., 2019).

Despite the significant association observed, several respondents who brushed their teeth at least twice daily still exhibited fair or poor oral hygiene (Rosa et al., 2021). This finding indicates that brushing frequency alone is insufficient to guarantee optimal oral hygiene. Improper brushing techniques, inadequate brushing duration, failure to clean all tooth surfaces, and irregular toothbrush replacement may reduce the effectiveness of plaque removal. In addition, frequent consumption of sugary foods and beverages, poor dietary habits, and limited utilization of preventive dental services may contribute to persistent plaque accumulation despite regular toothbrushing (Martell et al., 2020).

Conversely, a small number of respondents who brushed their teeth less than twice daily still had good oral hygiene. This condition may be explained by other favorable oral health behaviors, including effective brushing techniques, lower consumption of cariogenic foods, routine dental scaling, and the use of adjunctive oral hygiene measures such as dental floss or mouthwash. Therefore, oral hygiene is influenced by multiple behavioral and environmental factors rather than toothbrushing frequency alone (Chen et al., 2021).

Students of STIKES Amanah Makassar are prospective healthcare professionals who are expected to become role models in promoting healthy behaviors within the community. Their personal oral hygiene practices are important because healthcare professionals who practice healthy behaviors themselves are more likely to provide credible health education to patients. The findings of this study indicate that oral health promotion should not only emphasize the importance of brushing teeth twice daily but should also include education regarding correct toothbrushing techniques, appropriate brushing duration, routine dental examinations, healthy dietary habits, and the use of additional plaque control methods (Zachar et al., 2020).

The results of this study have important implications for university-based health promotion programs. Institutions should strengthen preventive oral health activities by integrating regular oral health education, periodic oral examinations, and practical demonstrations of proper toothbrushing techniques into student health programs. Collaboration between educational institutions and dental healthcare providers may further enhance students' awareness and improve long-term oral hygiene behaviors.

This study has several limitations. First, the cross-sectional design does not permit conclusions regarding causality between toothbrushing frequency and oral hygiene status. Second, the relatively small sample size from a single institution limits the generalizability of the findings. Third, other factors affecting oral hygiene, such as brushing technique, dietary habits, dental visits, fluoride toothpaste use, smoking behavior, and socioeconomic status, were not evaluated. Future studies should include larger multicenter samples and additional behavioral and clinical variables to obtain a more comprehensive understanding of determinants influencing oral hygiene among university students.

Overall, this study confirms that toothbrushing frequency is significantly associated with oral hygiene status among students of STIKES Amanah Makassar. Encouraging students to brush their teeth at least twice daily, combined with education on proper toothbrushing techniques and regular dental check-ups, may improve oral hygiene and contribute to better oral health outcomes among future healthcare professionals.

CONCLUSION

This study found a significant association between toothbrushing frequency and oral hygiene status among students of STIKES Amanah Makassar ($p = 0.008$). Students who brushed their teeth at least twice daily were more likely to have good oral hygiene than those who brushed less frequently. These findings indicate that regular toothbrushing plays an important role in maintaining oral hygiene and preventing oral diseases. Therefore, universities should strengthen oral health promotion programs by providing continuous education on proper toothbrushing practices, encouraging routine dental check-ups, and fostering healthy oral hygiene behaviors among students. Future studies are recommended to include larger sample sizes and additional factors, such as toothbrushing technique, dietary habits, and dental service utilization, to obtain a more comprehensive understanding of the determinants of oral hygiene status.

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