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Effectiveness of Application-Based Motivational Interviewing on Teenagers' Tooth Brushing Practice in Gorontalo City

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ABSTRACT

Improper tooth brushing behavior remains a major contributor to oral health problems among adolescents. Correct Tooth Brushing Practice (TBP) is essential for preventing plaque accumulation and dental caries. Objective: This study aimed to evaluate the effectiveness of application-based Motivational Interviewing (MI) in improving adolescents' toothbrushing practices. A quasi-experimental study with a pretest–posttest control group design was conducted among 100 high school students. Participants were divided into an intervention group (n = 50) that received application-based MI counseling for three months and a control group (n = 50) that received conventional health education. MI counseling was delivered to adolescents three times over the course of three months. At each stage, tooth brushing behavior was assessed, and the results were analyzed using the Wilcoxon test to evaluate within-group changes. Data were collected through direct observation of tooth brushing behavior using a standardized WHO checklist. Results: In the intervention group, correct toothbrushing practice increased from 24% to 88%, while in the control group, it increased from 48% to 68%. Statistical analysis revealed a significant improvement, with the mean TBP score increasing by 5.18 in the intervention group compared to 1.26 in the control group ($p < 0.000$). Application-based Motivational Interviewing (MI) is an effective approach for improving adolescents' toothbrushing behavior. This approach is feasible for integration into school-based oral health programs to promote sustainable healthy habits.

Keywords: TBP; Adolescents; Motivational Interview

INTRODUCTION

Oral health is crucial for overall well-being, and numerous studies have demonstrated the connection between oral health, oral diseases, and systemic complications, including diabetes, digestive disorders, stroke, cardiovascular

diseases, and others (Dörfer et al., 2017; Fu et al., 2025; Zaman et al., 2025). Poor oral health is caused by various factors, including an unhealthy diet, lack of physical activity, tobacco consumption, alcohol, psychological disorders, stress, and poor sanitation (Asiri et al., 2024; Pohjola et al., 2021). The WHO recommends the "Common Risk Factor Approach" for promoting oral health. In addition to socioeconomic factors, lack of knowledge about dental and oral health, limited access to dental health services, and poor dental care behaviors are also obstacles in maintaining dental and oral health (Do et al., 2014; Heilmann et al., 2015; Völker et al., 2024; Watt, 2012).

Proper toothbrushing behavior plays a crucial role in preventing dental caries and periodontal disease (Kumar et al., 2025; Lertpimonchai et al., 2017; Sudan et al., 2023). However, data from the 2018 Basic Health Research (Riskesdas) revealed that only 2.8% of the Indonesian population practiced proper toothbrushing. Among adolescents, establishing this habit is often hindered by low motivation (Ab Mumin et al., 2022; Geraets & Heinz, 2022; Santoso et al., 2021). Application-based Motivational Interviewing (MI) offers potential benefits by helping adolescents identify personal reasons for adopting healthy behaviors, including correct toothbrushing practices (Farghal & Mounir, 2025; Gao et al., 2015; Lassemo et al., 2023; Murariu et al., 2025; Scheerman et al., 2018). The prevalence of dental caries in Indonesia has reached 80% of the population, with a mean caries rate of 6.4% (Anwar et al., 2024). Furthermore, the 2018 Riskesdas oral health survey reported that the national prevalence of carious lesions, as reflected by a Decayed, Missing, and Filled Teeth (DMF-T) index of 4.6, exceeded the WHO standard of 3.5. Caries represents only one indicator of the neglected state of oral health among Indonesians. The national mean OHI-S score was 1.46, which is higher than the national target of ≤ 1.2, indicating a poor oral health status among Indonesian children (Anwar et al., 2020).

Motivational interviewing (MI) is a cognitive therapy. According to Miller and Rollnick (2013), Motivational Interviewing is a counseling technique (Cole et al., 2023; Natanek et al., 2023; Resnicow & McMaster, 2012; Uguz et al., 2023). Motivational Interviewing (MI) aims to encourage intrinsic motivation to find individual solutions, rather than forcing the client to do what the counselor wants. Instead, it motivates the client to discover solutions individually with professional guidance. It is client-centered counseling designed to encourage individuals to explore, overcome ambivalence, and strengthen commitment to behavior change (Akinrolie et al., 2024; Almansour et al., 2023; Miller & Rollnick, 2013; Westra & Aviram, 2013).

One of the greatest challenges faced by healthcare professionals is helping individuals change behaviors that pose significant health risks (Johnson & May, 2015; Mullan et al., 2022). When healthcare providers offer advice to adopt a healthier lifestyle by reducing or eliminating risky behaviors (such as consuming sweet foods and carbonated drinks) and replacing them with safer practices (such as increasing fruit and vegetable intake and maintaining regular toothbrushing), they may become frustrated if such advice is ignored or challenged by patients (Barnes et al., 2022; Giles et al., 2021; Keyworth et al., 2019; Leggett et al., 2021). The natural response of healthcare professionals in such situations is often to repeat the advice, accompanied by warnings or a more coercive approach in delivering education (Barnes et al., 2022; Cascaes et al., 2014; Gillam & Yusuf, 2019; Ho et al., 2024).

In Gorontalo Province, the prevalence of dental and oral health problems was reported at 30.1%, a figure that remains above the national average. However, only 28.1% of the population accessed dental and oral health services. Among children aged 5–9 years in Gorontalo, the prevalence of dental and oral health problems was 28.9%, while among adolescents aged 10–14 years, the prevalence was 25.2% (Riskesdas, 2013). Furthermore, Riskesdas' 2018 data indicated that the prevalence of dental and oral health problems across all age groups in Gorontalo exceeded 60%, higher than the national average of 57.6%. Based on these findings, dental and oral health problems among adolescents in Gorontalo necessitate innovative and targeted strategies to promote self-awareness and empower them to adopt healthy behaviors that enhance their oral health.

METHOD

This study employed a quasi-experimental design with a pretest–posttest control group. The subjects were 100 adolescents aged 15–18 years in Gorontalo City, divided into two groups: the intervention group (n = 50) received application-based Motivational Interviewing (MI) counseling for three months, while the control group (n = 50) received conventional health education. The instrument used was an observation checklist for toothbrushing behavior based on WHO standards.

MI counseling was conducted using a combination technique initially through face-to-face sessions, followed by online counseling via the MI application. A pilot test and feasibility assessment were conducted by a team of experts to ensure the application's validity and suitability for use. MI counseling was delivered three times over a three-month period. At each stage, adolescents' toothbrushing behavior was measured, and the results were analyzed using the Wilcoxon test to assess within-group changes.

This study received ethical clearance from the Research Ethics Committee of the Faculty of Dentistry, Hasanuddin University (Approval No.: 046/KEPK FKG-RSGMP UH/EE/XI/2024).

RESULTS AND DISCUSSION

Results

Table 1. Analysis of Tooth Brush Practice Variables Before and After Intervention in the Case Group (n=50)

Variable	Criteria	Pre Test		MI Stage (Q1)		MI Stage (Q2)		MI Stage (Q3)	
		n	%	n	%	n	%	n	%
Tooth Brush Practice	Implemented	12	24.0	15	30.0	32	64.0	44	88.0
	Not Implemented	38	76.0	35	70.0	18	36.0	6	12.0

Source: Primary Data, 2025

Table 2. Analysis of Differences in Toothbrushing Behavior in Adolescents Before and After Intervention

Variable		Mean ±SD	
		Cases (Given MI)	**Kontrol (Without MI)**
Tooth Brushing Practice	Pre Test	10.18±2.16	12.14±1.92
	MI Stage 1 (Q1)	11.20±2.05	13.40±2.82
	MI Stage 2 (Q2)	13.08±2.43	
	MI Stage 3 (Q3)	15.36±2.66	
Different Mean		5.18±0.5	1.26±0,9
Z		-6.168	-3.160
P-value		**0.000***	**0.003****

Source: Primary Data, 2025
***Wilcoxon Signed* Ranks Test*
**Paired Sample T Test*

The table demonstrates an improvement in toothbrushing behavior among adolescents following the provision of motivational interviewing (MI). In the intervention group, the mean toothbrushing behavior score increased from 10.18 at pre-test to 15.36 at post-test 3, with a mean difference of 5.18. Statistical analysis yielded a Z value of -6.168 with p = 0.000, indicating a significant improvement. In contrast, the control group showed a smaller increase, from 12.14 to 13.40, with a mean difference of 1.26; the statistical test yielded a Z value of -3.160 and a p-value of 0.003. Thus, it can be concluded that the intervention had a greater effect in improving respondents' toothbrushing behavior compared to the control group.

DISCUSSION

The results presented in the table indicate that prior to the MI intervention delivered through the application, the majority of adolescents (76%) did not practice proper toothbrushing behavior (TBP). Following the initial stage of MI (post-test Q2), the proportion of adolescents not performing TBP decreased to 70%. By the final intervention stage (post-test Q4), this figure further declined to 12%. In contrast, within the control group, 52% of adolescents did not perform TBP correctly at pre-test, which decreased to 32% after receiving conventional health education. These findings suggest that both MI counseling and conventional education had an impact on improving toothbrushing behavior among adolescents. However, the proportional change was greater and more significant in the group receiving MI counseling.

This study also highlights that inadequate toothbrushing skills among adolescents are influenced by multiple factors. Adolescents not only display behaviors characterized by negligence and lack of motivation, but many of them have already developed dental caries, primarily due to poor oral hygiene practices and insufficient knowledge of proper toothbrushing techniques (Cui et al., 2023; Eidenhardt et al., 2021). These findings also indicate that, prior to receiving toothbrushing training, adolescents exhibited reluctance to maintain oral hygiene and lacked the necessary skills, which may have stemmed from a lack of knowledge and understanding (Allen-Revoredo et al., 2022; He et al., 2024; Nazari et al., 2025; Sbricoli et al., 2022). In contrast, only 12 respondents (34.3%) demonstrated proper toothbrushing behavior. Such behavior reflects the responses and actions of adolescents, consistent with the concept introduced by Notoatmodjo (2014), which emphasizes that health behavior is the result of interactions among knowledge, attitude, and practice that evolve through learning and experience.

Changes in health behavior, including toothbrushing practices, can be explained through several theoretical frameworks. According to the Theory of Planned Behavior (TPB), behavior is influenced by intention, which is shaped by individual attitudes, subjective norms, and perceived behavioral control. The more positive adolescents' attitudes toward oral hygiene, the stronger the support from peers and family, and the higher their perceived behavioral control, the greater the likelihood that proper toothbrushing behavior will be adopted and practiced

consistently (McEachan et al., 2016; Rajeh, 2022). Furthermore, MI enhances behavioral intention by helping individuals resolve ambivalence and strengthen intrinsic motivation through personalized dialogue (Miller & Rollnick, 2013).

The results of this study demonstrate that interventions delivered to adolescents, whether in the form of motivational interviewing (MI) for the intervention group or conventional education for the control group, had a significant impact on improving proper toothbrushing behavior, with p-values of 0.000 in the intervention group and 0.003 in the control group. However, the mean change in the MI group was substantially higher, increasing from 10.18 before the intervention to 15.36 after the final session, compared to the control group, which only improved from 12.14 to 13.40. The difference in mean change in toothbrushing behavior was greater in the MI group (5.18 ± 0.5) than in the control group (1.26 ± 0.9). Therefore, it can be concluded that MI had a significant effect on promoting proper toothbrushing behavior among adolescents.

These findings are consistent with previous research conducted by Gao et al. (2015), which reported that schoolchildren aged 12–13 years in China who received MI interventions demonstrated significant improvements in regular toothbrushing behavior (Gao et al., 2015). Similarly, Uguz et al. (2023) found that adolescents who received MI-based counseling over a three-month period showed greater improvements in oral health knowledge and hygiene-related behaviors, as well as a more substantial reduction in OHIS scores, compared to those who received conventional health education (Uguz et al., 2023). This evidence reinforces the effectiveness of repeated and structured MI sessions, which enable ongoing reinforcement of motivation and self-efficacy —key determinants of sustained behavioral change (Lundahl et al., 2010).

The present study aligns further with research by Ghaffari et al. (2022), which highlighted that MI interventions tailored to individual readiness stages yielded better oral hygiene outcomes among adolescents (Adames-Vargas et al., 2024; Kim & Lim, 2024; Rigau-Gay et al., 2020). The use of mobile or application-based MI delivery, as adopted in this study, adds further value by providing reminders, personalized feedback, and easier accessibility, which have been shown to improve adherence and engagement in digital health interventions (Wu et al., 2022).

These results underscore the importance of interactive, individualized, and technology-assisted health education models. Unlike conventional approaches, MI promotes self-awareness and responsibility for personal oral hygiene behavior. It encourages adolescents to identify intrinsic motivations and goals, which increases the sustainability of their behavioral improvements. However, challenges such as unequal access to digital tools and variability in adolescents' technological literacy must still be addressed to maximize the reach and effectiveness of interventions (Lassemo et al., 2023; Rubak et al., 2005; Wu et al., 2022).

Overall, the findings affirm that integrating MI within school-based oral health programs and leveraging digital technology can substantially enhance behavioral outcomes. Long-term implementation supported by teachers, parents, and health workers is essential to maintain motivation and reinforce consistent toothbrushing practices.

CONCLUSION

Application-based motivational interviewing (MI) is effective in improving toothbrushing skills (TBP) among adolescents in Gorontalo City.

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