

Knowledge Regarding Oral and Dental Health Maintenance Influences Tooth Loss in the Elderly

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ABSTRACT

Tooth loss remains a major dental and oral health problem among older adults, particularly those residing in community-based health service settings. The high prevalence of tooth loss in this population affects essential physiological and psychosocial functions, including mastication, facial aesthetics, and speech articulation, which collectively diminish the overall quality of life of the elderly. Understanding the determinants of tooth loss, especially modifiable factors such as oral health knowledge, is crucial for designing effective and sustainable oral health promotion strategies. This study aimed to analyze the influence of knowledge regarding dental and oral health maintenance on tooth loss among elderly individuals at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency. An observational analytic design with a cross-sectional approach was employed. The study involved 56 elderly respondents selected using purposive sampling. Data collection consisted of a structured questionnaire assessing dental and oral health knowledge and an observation sheet documenting the degree of tooth loss. Data were analyzed using the Chi-Square statistical test with a significance level of $\alpha = 0.05$. The findings showed that most elderly participants had poor knowledge of dental and oral health, and the majority experienced moderate levels of tooth loss. Statistical analysis yielded a p-value of 0.008 ($p < 0.05$), indicating a significant association between oral health knowledge and tooth loss. Elderly individuals with lower levels of knowledge were more likely to experience greater tooth loss compared to those with better knowledge. In conclusion, oral health knowledge significantly influences tooth loss among the elderly. These results highlight the importance of strengthening oral health literacy through continuous education, counseling, and community-based health promotion programs. Improving knowledge and awareness may help reduce the burden of tooth loss and enhance the overall well-being of older adults.

Keywords: knowledge; dental and oral health; tooth loss; elderly

INTRODUCTION

The high incidence of tooth loss among older adults at Posyandu Tunas Bangsa in Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency reflects a persistent and complex public health problem that continues to affect the elderly population in rural Indonesia. Tooth loss is not merely a dental condition; it represents a multifactorial health issue that disrupts essential oral functions such as mastication, speech articulation, and facial aesthetics, ultimately diminishing nutritional intake, social participation, psychological well-being, and overall quality of life among older adults [1]. The consequences of tooth loss extend beyond physical impairment, influencing emotional stability, self-confidence, and interpersonal communication. Many elderly individuals with missing teeth experience embarrassment when speaking, difficulty consuming a variety of foods, and reduced willingness to engage in social activities, all of which contribute to a decline in their overall functional independence.

These challenges are often compounded by limited access to dental care, inadequate preventive practices, and insufficient awareness of proper oral hygiene techniques. In rural communities, dental services are frequently scarce, irregular, or financially inaccessible, causing many older adults to rely solely on self-care practices that may be insufficient or incorrect. Furthermore, cultural beliefs, misconceptions about aging, and low prioritization of oral health often lead to delayed treatment-seeking behaviors. As a result, tooth loss becomes both a biological and behavioral phenomenon shaped by long-term habits, environmental conditions, and the level of oral health literacy possessed by the elderly [2]. Biological factors such as cumulative exposure to dental caries, periodontal disease, systemic illnesses (e.g., diabetes), and medication side effects interact with behavioral factors including poor brushing habits, infrequent dental check-ups, and high consumption of cariogenic foods. Over time, these combined influences accelerate the progression of oral diseases and increase the likelihood of tooth loss.

The complexity of tooth loss among older adults is further heightened by age-related physiological changes. Salivary flow tends to decrease with age, reducing natural cleansing mechanisms and increasing susceptibility to plaque accumulation and dental caries. Gingival recession, diminished manual dexterity, and impaired vision may also hinder effective tooth-brushing, making elderly individuals more vulnerable to oral health deterioration. In addition, psychological factors such as low motivation, depression, or cognitive decline may reduce adherence to oral hygiene routines. When these biological, behavioral, and psychosocial factors converge, they create a cumulative burden that significantly elevates the risk of tooth loss in older adults.

Environmental and socioeconomic conditions also play a substantial role. Elderly individuals living in rural areas often face barriers such as limited transportation, low income, and minimal availability of dental professionals. These constraints reduce opportunities for preventive care and early treatment, allowing minor oral health problems to progress into severe conditions that ultimately result in tooth extraction. Moreover, educational attainment and health literacy levels in rural communities tend to be lower, which directly influences the ability of older adults to understand, interpret, and apply oral health information. Oral health literacy is therefore a critical determinant of tooth loss, as individuals with limited knowledge may not recognize early signs of dental disease, may underestimate the importance of routine dental visits, or may engage in harmful practices such as using abrasive substances to clean teeth or relying on traditional remedies that lack scientific support.

Taken together, these factors illustrate that tooth loss among the elderly is not an isolated dental issue but a reflection of broader systemic, behavioral, and environmental determinants. Addressing this problem requires a comprehensive understanding of the interplay between oral health knowledge, preventive behaviors, access to care, and the unique vulnerabilities associated with aging. Strengthening oral health literacy among older adults is therefore essential to mitigate the progression of oral diseases and reduce the burden of tooth loss in rural communities.

Dental and oral health constitute an essential component of general health, influencing an individual's physical, functional, and psychosocial well-being throughout the life course [3]. Older adults represent a vulnerable population that is disproportionately affected by oral health problems, particularly tooth loss, whose prevalence increases progressively with age due to cumulative exposure to dental caries, periodontal disease, systemic health conditions, and behavioral risk factors [4]. Global data from the World Health Organization indicate that only 31.4% of individuals

aged 65 years and above retain a functionally adequate number of teeth, highlighting the widespread nature of this issue and its implications for global aging populations [5]. Local preliminary examinations conducted at Posyandu Tunas Bangsa further reinforce this concern, revealing that approximately 70% of elderly participants possess fewer than 20 remaining teeth. This finding underscores the severity of tooth loss in the study area and signals the need for targeted interventions that address both preventive and promotive aspects of oral health.

Tooth loss can be categorized into mild, moderate, and severe levels, each associated with escalating functional limitations and greater impacts on oral health-related quality of life [6]. As the number of missing teeth increases, the ability to chew effectively declines, speech becomes less clear, and facial structure may change, contributing to reduced confidence and social withdrawal. These functional impairments may lead to dietary restrictions, decreased nutrient intake, and increased susceptibility to systemic diseases, thereby creating a cycle in which oral health deterioration contributes to broader health challenges among older adults. The psychosocial consequences of tooth loss are equally significant, as elderly individuals may experience embarrassment, reduced social engagement, and diminished self-esteem, further affecting their mental health and overall well-being.

One of the key determinants of tooth loss among the elderly is their level of knowledge regarding dental and oral health maintenance. Adequate knowledge enables individuals to adopt appropriate oral hygiene behaviors, such as proper tooth-brushing techniques, regular dental check-ups, and the use of adjunctive oral care products. When knowledge is lacking, preventive behaviors tend to be neglected, increasing the risk of dental caries, periodontal disease, and ultimately tooth loss [2]. Evidence suggests that improving oral health knowledge can empower older adults to maintain better oral hygiene, preserve more natural teeth, sustain optimal chewing function, and enhance their overall quality of life. Knowledge serves as the foundation for behavioral change, and without it, efforts to promote oral health may not achieve meaningful or sustainable outcomes. Elderly individuals who possess adequate knowledge about oral hygiene practices are more likely to engage in consistent tooth-brushing, avoid harmful habits, seek timely dental care, and adopt healthier lifestyles that support long-term oral health [7].

To address this challenge, various strategies can be implemented to enhance oral health literacy among the elderly. Health education and promotion activities; such as counseling sessions, demonstrations of proper brushing techniques, guidance on the use of mouthwash, and encouragement of routine dental examinations play a crucial role in preventing tooth damage and tooth loss [7]. Community-based programs that integrate oral health education into routine Posyandu activities can help ensure that elderly individuals receive continuous support and reinforcement of healthy behaviors. Such programs may also involve family members and caregivers, who play an important role in supporting the daily oral hygiene practices of older adults. Furthermore, understanding the relationship between oral health knowledge and tooth loss is essential for designing effective promotive and preventive interventions tailored to the needs of older adults in rural settings. Research that explores this relationship provides empirical evidence that can guide policymakers, health workers, and community organizations in developing targeted oral health promotion strategies.

Given these considerations, it is necessary to conduct research that examines the influence of knowledge regarding dental and oral health maintenance on tooth loss among the elderly. Such research provides empirical evidence that can serve as a foundation for developing targeted oral health promotion programs and preventive strategies aimed at reducing tooth loss and improving the well-being of older adults in the community. Therefore, this study was conducted to analyze the effect of oral health knowledge on tooth loss among elderly individuals at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency.

METHODS

Study location and period

This study was conducted at Posyandu Tunas Bangsa, situated in Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency. The Posyandu serves as a community-based health post routinely attended by older adults, making it an appropriate setting for assessing oral health conditions and behavioral determinants among the elderly population. The research was carried out over a four-month period, from January to April 2026. This timeframe allowed for systematic recruitment, scheduling of clinical examinations, and verification of data quality while minimizing potential fluctuations in Posyandu attendance that could affect sample representativeness.

Prior to data collection, ethical approval was obtained from the relevant institutional ethics committee. Research permission was also secured from local authorities and Posyandu administrators. Participants were informed about the study's purpose, procedures, potential risks, and benefits. Informed consent was obtained verbally or in writing, depending on participant preference. Confidentiality was strictly maintained by anonymizing respondent data and ensuring that all clinical examinations were conducted in accordance with hygiene and safety protocols. Participants were assured that their involvement was voluntary and that they could withdraw at any time without consequences.

Study design and approach

A quantitative research approach was employed using an observational analytic design with a cross-sectional framework [8-10]. This design was selected to enable the researchers to examine the relationship between oral health knowledge and tooth loss at a single point in time. The cross-sectional method is particularly suitable for community-based studies involving elderly populations, as it allows for efficient data collection without requiring long-term follow-up. The analytic component of the design facilitated hypothesis testing to determine whether differences in oral health knowledge were associated with variations in the degree of tooth loss.

Study population, subjects, and recruitment procedures

The study population consisted of 125 older adults aged ≥ 60 years who were registered and actively participating in Posyandu Tunas Bangsa activities. From this population, a sample of 56 elderly individuals was selected using purposive sampling [11,12]. This non-probability sampling technique was chosen to ensure that participants met specific criteria relevant to the study objectives. Inclusion criteria were: 1) elderly individuals aged ≥ 60 years; 2) registered and present at Posyandu Tunas Bangsa during the study period; 3) willing to participate and provide informed consent; 4) able to communicate effectively and respond to questionnaire items. While exclusion criteria were: 1) elderly individuals experiencing severe illness requiring complete bed rest; 2) those undergoing intensive medical care or hospitalization; and 3) individuals with communication impairments that could hinder questionnaire administration or clinical examination.

Recruitment was conducted during routine Posyandu sessions. Eligible participants were approached individually, informed about the study objectives and procedures, and invited to participate voluntarily. Those who agreed were enrolled and scheduled for questionnaire administration and clinical examination.

Variables and operational definitions

Independent variable was knowledge of maintaining dental and oral health. This variable referred to the level of understanding possessed by elderly individuals regarding oral hygiene practices, preventive behaviors, risk factors for oral diseases, and recommended dental care routines. Knowledge was measured using a structured questionnaire consisting of multiple items covering concepts such as proper brushing techniques, frequency of dental visits, dietary factors, and oral hygiene tools.

Dependent variable was tooth loss. This variable referred to the number of missing teeth in each participant. Tooth loss was assessed clinically through direct intraoral examination. The number of missing teeth was recorded using an odontogram sheet, allowing classification into categories of mild, moderate, or severe tooth loss.

Data collection procedures

Assessment of oral health knowledge

A structured questionnaire was administered to each participant. The questionnaire included closed-ended items designed to evaluate understanding of oral hygiene practices, preventive behaviors, and basic oral health concepts. Enumerators provided clarification only when necessary to avoid influencing responses.

Clinical examination of tooth loss

Tooth loss data were obtained through direct intraoral examination using diagnostic tools such as a mouth mirror and dental probe (sonde). Each participant underwent a systematic assessment conducted by trained enumerators under the supervision of the principal investigator. The number of missing teeth was recorded on an odontogram sheet to ensure accuracy and consistency. Three trained enumerators assisted in data collection. Prior to fieldwork, they received standardized training on questionnaire administration, clinical examination techniques, and ethical procedures to ensure uniformity and reliability.

Data processing and management

The collected data underwent a series of systematic and carefully structured processing stages to ensure that the final dataset was accurate, complete, and analytically reliable. The first stage was editing, during which all completed questionnaires and clinical examination forms were reviewed meticulously to verify the completeness, clarity, and internal consistency of the responses. At this stage, the research team checked for unanswered items, ambiguous markings, and discrepancies between questionnaire responses and clinical records. Any irregularities identified were clarified immediately with the enumerators or, when possible, with the respondents themselves to prevent misinterpretation during analysis.

Following the editing stage, the data proceeded to coding, a crucial step in transforming qualitative or categorical information into numerical values suitable for statistical analysis. Each response category, whether related to oral health knowledge or tooth loss classification was assigned a specific numeric code based on a predetermined coding scheme. This process ensured uniformity across all data entries and facilitated efficient computation during the statistical analysis phase. Coding also helped minimize subjective interpretation by standardizing how responses were represented in the dataset.

Once coding was completed, the data were transferred into a digital format through the data entry process. All coded responses were inputted into a computerized database using statistical software. This stage required careful attention to detail, as errors in data entry could lead to inaccurate results or misinterpretation of findings. To maintain accuracy, double-entry verification was applied selectively, and the research team cross-checked random entries against the original forms to ensure fidelity between the raw data and the digital dataset.

The final stage of data processing was data cleaning, which involved identifying and correcting any remaining errors, inconsistencies, or missing values within the dataset. During this stage, the researchers examined the dataset for outliers, duplicate entries, mismatched codes, and logical inconsistencies; such as implausible combinations of age, knowledge scores, or tooth loss categories. Any anomalies detected were resolved through reference to the original data collection forms or through consultation with the enumerators. Data cleaning ensured that the dataset met the assumptions required for valid statistical testing and that no systematic errors would bias the results.

Through these sequential stages; editing, coding, data entry, and cleaning the dataset was refined to a high level of accuracy and completeness. This rigorous process ensured that the data were fully prepared for descriptive and inferential statistical analysis, thereby strengthening the credibility and reliability of the study's findings.

Data analysis

Descriptive analysis

Univariate analysis was conducted to describe respondent characteristics, including age distribution, gender, level of oral health knowledge, and degree of tooth loss. Frequency distributions and percentages were used to summarize categorical variables [13-15].

Inferential analysis

Bivariate analysis was performed to examine the relationship between oral health knowledge and tooth loss using the Chi-Square test with a significance level of 5%. The Chi-Square test assessed whether differences in tooth loss categories were statistically associated with varying levels of oral health knowledge.

If Chi-Square assumptions were violated; specifically, if more than 20% of cells had an expected count less than 5 alternative tests such as Continuity Correction or Fisher's Exact Test were applied to ensure valid statistical inference [16,17].

RESULTS

This study was conducted among 56 older adults who were actively participating in Posyandu Tunas Bangsa, located in Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, in 2026. The primary aim of the research was to analyze the influence of knowledge related to maintaining dental and oral health on the degree of tooth loss experienced by the elderly population. The study setting represents a typical community-based health service environment in rural Indonesia, where older adults routinely gather for health monitoring, counseling, and social interaction. This context provided an appropriate and accessible platform for examining oral health conditions and behavioral determinants among aging individuals.

The demographic profile of the respondents revealed that most of the participating elderly had low levels of formal education, reflecting the educational characteristics commonly found in rural communities. Many of them had discontinued employment due to age-related limitations, chronic health conditions, or reduced physical capacity. These socioeconomic and demographic factors are important to consider, as they often influence health literacy, access to health services, and the ability to adopt preventive oral health behaviors. The combination of limited education and cessation of employment may contribute to reduced exposure to health information, including knowledge about proper oral hygiene practices.

Data collection was carried out using two complementary instruments designed to capture both cognitive and clinical aspects of oral health. To assess the level of knowledge regarding dental and oral health maintenance, a structured questionnaire was administered to each respondent. The questionnaire consisted of items that explored understanding of oral hygiene practices, preventive behaviors, risk factors for oral diseases, and recommended routines for maintaining oral health. Respondents completed the questionnaire with guidance from trained enumerators, who ensured that questions were understood clearly without influencing the answers provided.

To evaluate tooth loss, clinical examinations were conducted using a standardized assessment sheet and diagnostic tools. Each elderly participant underwent an intraoral examination in which the number of missing teeth was recorded systematically. The use of an odontogram allowed the researchers to document tooth loss accurately and consistently across all respondents. Diagnostic instruments such as a mouth mirror and dental probe (sonde) were employed to facilitate thorough inspection of the oral cavity. These examinations were performed under the supervision of the principal investigator to ensure adherence to clinical standards and uniformity in assessment procedures.

The implementation of data collection activities was supported by three trained enumerators. Prior to fieldwork, the enumerators received comprehensive training on questionnaire administration, clinical examination techniques, ethical considerations, and communication strategies for interacting with elderly participants. Their involvement ensured that data collection proceeded smoothly, efficiently, and in accordance with established research protocols. The collaborative effort between the research team and the enumerators contributed to the accuracy, reliability, and completeness of the data obtained.

Through this systematic and carefully coordinated process, the study successfully gathered detailed information on both the knowledge levels and oral health conditions of the elderly population at Posyandu Tunas Bangsa. These data formed the foundation for subsequent analysis aimed at understanding how oral health knowledge influences the extent of tooth loss among older adults in rural community settings.

Respondent characteristics

Sex distribution

The data presented in Table 1 show that the majority of respondents were female, accounting for 35 out of 56 elderly participants (62.5%). This predominance of female respondents reflects a pattern commonly observed in community-based health activities in rural Indonesia, where older women tend to demonstrate higher levels of engagement in preventive and promotive health services compared to men. Several factors may contribute to this trend.

First, women often assume caregiving roles throughout their lives, which may foster stronger health-seeking behaviors and greater familiarity with community health programs such as Posyandu. As they age, this established pattern of engagement may persist, making them more likely to attend routine health monitoring sessions. Second, cultural norms in many rural communities encourage women to participate actively in social and communal activities, including Posyandu, which serves not only as a health service but also as a social gathering point for older adults. Third, men in rural settings may be less inclined to participate in health programs due to long-standing perceptions that health monitoring is unnecessary unless symptoms become severe, or due to habits formed during their working years that prioritize labor over preventive care.

Additionally, the higher proportion of female respondents may be associated with demographic realities, as women generally have longer life expectancy than men, resulting in a larger female elderly population. This demographic shift naturally increases the likelihood that more women will be present and available during Posyandu activities. The greater participation of women in this study therefore provides valuable insight into gender-related patterns of health behavior among the elderly and highlights the importance of tailoring oral health promotion strategies to ensure that both men and women receive adequate attention and support.

Overall, the sex distribution observed in this study underscores the need for targeted outreach strategies to encourage greater participation among elderly men, who may be at equal or greater risk of oral health problems but are less represented in community health activities.

Table 1. Distribution of respondents by sex at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, 2026

Sex	Frequency	Percentage
Male	21	37.5
Female	35	62.5

Age distribution

The data presented in Table 2 indicate that, among the 56 elderly respondents, the largest proportion belonged to the age group of 64–67 years, comprising 21 individuals (37.5%). This was followed by the age group 60–63 years, with 19 respondents (33.9%), while the 68–70-year age group represented the smallest proportion, consisting of 16 respondents (28.6%). These findings demonstrate that the majority of participants were in the early-to-middle elderly category, a demographic segment that often remains relatively active and engaged in community-based health programs such as Posyandu.

The predominance of respondents aged 64–67 years may reflect several underlying demographic and behavioral patterns. Individuals within this age range typically experience the transition from early to middle old age, during which functional independence is still largely preserved. As a result, they are more capable of attending routine health activities, participating in social gatherings, and responding to health-related interventions. This age group may also possess greater awareness of the importance of maintaining health, including oral health, as they begin to encounter age-related physiological changes that motivate them to seek preventive care.

Meanwhile, the slightly lower proportion of respondents aged 60–63 years suggests that although this group is still relatively young within the elderly classification, some individuals may not yet perceive Posyandu services as essential or may still be engaged in residual work activities that limit their attendance. Conversely, the smallest proportion observed in the 68–70-year age group may be attributed to increasing physical limitations, chronic health conditions, or mobility challenges that reduce their ability to participate regularly in Posyandu activities. Older individuals

Table 2. Distribution of respondents by age at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, 2026

Age group (years)	Frequency	Percentage
60–63	19	33.9
64–67	21	37.5
68–70	16	28.6

in this range may also rely more heavily on family members for daily care, which can influence their participation in community-based health programs.

Overall, the age distribution highlights that the majority of respondents were elderly individuals who remain active and capable of engaging in health promotion activities. This demographic profile is advantageous for research on oral health knowledge and tooth loss, as individuals in this age range are generally able to provide reliable responses, participate in clinical examinations, and benefit from educational interventions. The distribution also underscores the importance of tailoring oral health programs to accommodate varying levels of functional ability across different elderly age groups, ensuring that both younger and older segments of the elderly population receive appropriate support and access to oral health services.

Distribution of educational background

The data presented in Table 3 illustrate the distribution of educational attainment among the 56 elderly respondents. The largest proportion of respondents had completed Elementary School (SD), accounting for 22 individuals (39.2%). This was followed by respondents with no formal education, totaling 16 individuals (28.6%). Meanwhile, 9 respondents (16.1%) had completed Junior High School (SMP), 7 respondents (12.5%) had completed Senior High School (SMA), and only 2 respondents (3.6%) held a Bachelor's degree.

This distribution clearly indicates that the majority of respondents possessed a relatively low level of formal education, with most having completed only elementary schooling or having never attended school at all. Such educational patterns are commonly observed among older adults living in rural areas of Indonesia, where access to formal education in earlier decades was limited, and socioeconomic constraints often required children to engage in agricultural or domestic labor rather than pursue extended schooling.

The predominance of low educational attainment among respondents has important implications for oral health literacy and health-seeking behavior. Individuals with limited formal education may have reduced exposure to health information, lower comprehension of health messages, and limited ability to interpret written materials related to disease prevention, including oral hygiene practices. This condition may contribute to inadequate oral health maintenance behaviors, such as improper brushing techniques, infrequent dental visits, or reliance on traditional practices that may not align with evidence-based oral health recommendations.

Furthermore, elderly individuals with minimal education may face challenges in understanding the importance of preventive dental care, recognizing early signs of oral disease, or navigating the healthcare system to access professional dental services. These limitations can increase vulnerability to oral health problems, including dental caries, periodontal disease, and ultimately tooth loss. In contrast, respondents with higher educational attainment, although few in number may possess better health literacy, enabling them to adopt healthier behaviors and seek timely dental care.

The overall pattern of educational attainment observed in this study underscores the need for tailored oral health education strategies that accommodate varying literacy levels. Health promotion programs at Posyandu should incorporate simple, clear, and culturally appropriate messages, supported by visual aids and hands-on demonstrations, to ensure that elderly individuals with limited formal education can understand and apply recommended oral hygiene practices. Strengthening oral health literacy among this demographic group is essential for improving oral health outcomes and reducing the burden of tooth loss in rural communities.

Distribution of oral health knowledge

The data presented in Table 4 reveal that, out of 56 elderly respondents, the majority demonstrated a poor level of oral health knowledge, totaling 34 individuals (61%). This was followed by 13 respondents (23%) who exhibited a fair level of knowledge, while only 9 respondents (16%) fell into the good knowledge category. These findings clearly indicate that most elderly individuals in the study population possess insufficient understanding of dental and oral health maintenance.

The predominance of poor knowledge among respondents reflects a broader pattern commonly observed in rural communities, where limited access to formal education, restricted exposure to health information, and cultural norms surrounding oral hygiene may hinder the acquisition of adequate oral health literacy. Elderly individuals with poor knowledge may not fully understand the importance of regular tooth-brushing, proper brushing techniques, the role of fluoride, the need for routine dental check-ups, or the risks associated with consuming cariogenic foods. As a result, they may be more vulnerable to oral diseases such as dental caries and periodontal disease, which ultimately contribute to tooth loss.

The presence of respondents with fair knowledge (23%) suggests that some elderly individuals possess partial understanding of oral health concepts but may still lack consistency in applying preventive behaviors. This group may be aware of basic oral hygiene practices but may not perform them regularly or correctly. They may also have limited awareness of the importance of professional dental care, relying instead on self-care practices or traditional remedies that may not be effective in preventing oral disease.

The small proportion of respondents with good knowledge (16%) indicates that only a minority of elderly individuals have adequate understanding of oral health maintenance. These individuals are more likely to engage in proper brushing techniques, maintain regular oral hygiene routines, and seek dental care when needed. However, their small number highlights the need for more comprehensive and accessible oral health education programs within the community.

Overall, the distribution of oral health knowledge underscores a critical gap in oral health literacy among the elderly population at Posyandu Tunas Bangsa. The predominance of poor knowledge suggests that many older adults may not be equipped with the information necessary to maintain optimal oral health, prevent tooth loss, or recognize early signs of oral disease. This situation calls for strengthened health promotion efforts, including structured education sessions, interactive demonstrations, and culturally appropriate counseling tailored to the needs and literacy levels of elderly individuals. Enhancing oral health knowledge is essential for empowering the elderly to adopt healthier behaviors, reduce the risk of tooth loss, and improve their overall quality of life.

Table 3. Educational background of elderly respondents at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, 2026

Educational level	Frequency	Percentage
No formal education	16	28.6
Elementary school	22	39.2
Junior high school	9	16.1
Senior high school	7	12.5
Bachelor's degree	2	3.6

Table 4. Distribution of oral health knowledge among Elderly Respondents at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, 2026

Knowledge	Frequency	Percentage
Good	9	16
Fair	13	23
Poor	34	61

Distribution of tooth loss

The data presented in Table 5 show that the majority of elderly respondents experienced moderate tooth loss, totaling 29 individuals (52%), with between 6 and 30 missing teeth. This category represents a substantial degree of tooth loss, indicating that most respondents have lost a significant portion of their natural dentition. Moderate tooth loss often reflects long-term exposure to untreated dental caries, periodontal disease, inadequate oral hygiene practices, and limited access to professional dental care. Individuals in this category may experience noticeable functional limitations, including reduced chewing efficiency, difficulty consuming certain foods, and compromised speech clarity. These functional impairments can further influence nutritional status, social interaction, and overall quality of life.

A total of 18 respondents (32%) fell into the mild tooth loss category, having lost between 1 and 5 teeth. Although this group has experienced less extensive tooth loss, the presence of missing teeth still indicates underlying oral health challenges. Mild tooth loss may result from localized dental caries, early periodontal disease, or trauma. While functional limitations may be less pronounced in this group, even the loss of a few teeth can affect mastication, occlusion, and aesthetics. Early tooth loss also serves as an important warning sign of potential future deterioration if preventive measures are not strengthened.

The smallest proportion of respondents; 9 individuals (16%) experienced severe tooth loss, defined as the loss of 31–32 teeth. This category represents near-complete edentulism, a condition that profoundly affects oral function. Elderly individuals with severe tooth loss typically face substantial challenges in chewing, speaking, and maintaining facial structure. They may rely heavily on dentures or may be unable to use prosthetic devices effectively due to anatomical or financial constraints. Severe tooth loss is often associated with long-standing oral disease, cumulative neglect of oral hygiene, and limited access to dental services throughout life. It may also reflect socioeconomic barriers, cultural beliefs, or health conditions that hinder regular dental care.

Overall, the distribution of tooth loss indicates that moderate tooth loss is the most prevalent condition among elderly respondents at Posyandu Tunas Bangsa. This pattern suggests that while most respondents have not yet reached complete edentulism, they have already lost a considerable number of teeth, placing them at increased risk of further deterioration. The predominance of moderate tooth loss highlights the need for targeted oral health interventions, including preventive education, routine dental check-ups, and accessible restorative services. Strengthening oral health literacy and promoting early treatment could help prevent progression to severe tooth loss and improve the functional and psychosocial well-being of the elderly population.

Chi-square analysis

The results presented in Table 6 show the distribution of tooth loss categories across different levels of oral health knowledge among the 56 elderly respondents. The Chi-Square test yielded a p-value of 0.008 ($p < 0.05$), indicating a statistically significant association between oral health knowledge and tooth loss. This finding suggests that elderly individuals with poorer knowledge of dental and oral health are more likely to experience more severe tooth loss compared to those with better knowledge.

However, further examination of the Chi-Square assumptions revealed that 5 cells (55.6%) had expected counts less than 5, exceeding the acceptable threshold of 20% for valid Chi-Square analysis. This indicates that the assumptions underlying the Chi-Square test were not fully met, potentially affecting the robustness of the initial statistical inference. When expected cell counts are too low, the Chi-Square distribution may not accurately represent the data, and alternative statistical tests are recommended to ensure validity.

To address this issue, additional analyses were conducted using Continuity Correction and Fisher's Exact Test, both of which are more appropriate when dealing with small sample sizes or sparse data. Continuity Correction produced a p-value of 0.024, while Fisher's Exact Test yielded a p-value of 0.008. Both values remained below the significance threshold of 0.05, confirming that the association between oral health knowledge and tooth loss is statistically significant regardless of the analytical method used.

These results collectively reinforce the conclusion that oral health knowledge plays an important role in influencing the extent of tooth loss among elderly individuals. Respondents with poor knowledge exhibited a higher proportion of severe and moderate tooth loss, whereas those with good knowledge tended to experience less severe tooth loss. This pattern highlights the critical role of oral health literacy in shaping preventive behaviors, early treatment-seeking, and long-term oral health outcomes.

The findings also underscore the need for targeted oral health education interventions within the community. Enhancing oral health knowledge through structured counseling, demonstrations of proper oral hygiene techniques, and regular health promotion activities at Posyandu could help reduce the progression of tooth loss among the elderly. By improving awareness and understanding of oral health maintenance, elderly individuals may be better equipped to adopt healthier behaviors, seek timely dental care, and preserve their natural dentition for longer periods.

In summary, the results of the Chi-Square test and its alternative analyses demonstrate that oral health knowledge significantly influences tooth loss among elderly respondents, confirming that knowledge is a key determinant of oral health status in this population.

Table 5. Distribution of tooth loss among elderly at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, 2026

Tooth loss category	Frequency	Percentage	Description
Mild	18	32%	Loss of 1–5 teeth
Moderate	29	52%	Loss of 6–30 teeth
Severe	9	16%	Loss of 31–32 teeth

Table 6. Results of the Chi-square test on the influence of oral health knowledge on tooth loss among elderly at Posyandu Tunas Bangsa, Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency, 2026

Knowledge category	Severe tooth loss	Moderate tooth loss	p-value
Poor	9	25	0.008
Good	0	22	

DISCUSSION

Elderly knowledge of dental and oral health at Posyandu Tunas Bangsa

Based on the findings of this study, the level of dental and oral health knowledge among elderly respondents at Posyandu Tunas Bangsa in Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency in 2026 was predominantly categorized as poor. This indicates that most older adults in the community have not yet developed an adequate understanding of the fundamental principles of maintaining oral health. Their limited knowledge encompasses several essential aspects, including proper tooth-brushing techniques, the recommended frequency and timing

of brushing, the appropriate tools and materials for oral hygiene, the role of diet in oral health, the importance of routine dental check-ups, and the broader consequences of tooth loss on general health and daily functioning.

Knowledge, as a cognitive domain, represents the outcome of an individual's sensory and perceptual processes in responding to an object or phenomenon. It is shaped by multiple factors such as age, educational background, personal experiences, environmental influences, and the availability of information sources [18]. In the context of elderly individuals, these determinants often interact in complex ways. For example, limited formal education may restrict the ability to interpret health information, while aging-related cognitive changes may reduce the capacity to retain or apply new knowledge. Environmental factors, including rural living conditions and limited access to dental services, further constrain opportunities for learning and practicing proper oral hygiene.

The theoretical framework of the ABC Model (Antecedent–Behavior–Consequences) provides a useful lens for understanding the relationship between knowledge and oral health outcomes [19-22]. According to this model, knowledge functions as an antecedent that shapes an individual's behavior, including daily oral hygiene practices, dietary choices, and treatment-seeking patterns. These behaviors subsequently produce consequences, reflected in the condition of the oral cavity, including the presence or absence of dental caries, periodontal disease, and ultimately tooth loss. In this study, the predominance of poor knowledge among respondents aligns with the observed pattern of moderate to severe tooth loss, suggesting that inadequate antecedents have contributed to suboptimal behaviors and unfavorable oral health consequences.

The low level of oral health knowledge among the elderly thus emerges as a significant contributing factor to the high prevalence of tooth loss in the community. This underscores the urgent need for continuous and structured oral health education programs tailored to the needs and literacy levels of older adults. Educational interventions should emphasize practical demonstrations, culturally appropriate messages, and repeated reinforcement to ensure comprehension and retention. Strengthening oral health literacy among the elderly is essential for empowering them to adopt healthier behaviors, prevent further tooth loss, and improve their overall well-being [23-26].

The findings of this study are consistent with previous research, which similarly reported that elderly individuals often exhibit low levels of oral health knowledge due to limited access to reliable information. Such knowledge deficits are believed to contribute to the high incidence of tooth loss observed in many rural communities [27]. Nevertheless, it is important to acknowledge that tooth loss is a multifactorial condition. While knowledge plays a critical role, other determinants, including age-related physiological changes, systemic health conditions, periodontal disease, and access to dental care also significantly influence oral health outcomes. These additional factors highlight the need for a comprehensive approach to oral health promotion that integrates education, preventive services, and improved access to dental care.

Tooth loss among elderly at Posyandu Tunas Bangsa

Based on the results of the clinical examinations conducted among elderly participants at Posyandu Tunas Bangsa in Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency in 2026, it was found that the majority of respondents experienced tooth loss within the moderate category. This indicates that most older adults had lost a considerable number of teeth; between 6 and 30 yet had not reached the stage of complete edentulism. The predominance of moderate tooth loss suggests that oral health problems among the elderly in this community are substantial and have progressed beyond early stages, reflecting long-term exposure to untreated dental caries, periodontal disease, and inadequate oral hygiene practices.

Tooth loss is commonly classified into three categories; mild, moderate, and severe based on the number of missing teeth [28]. This classification is clinically important because each category corresponds to different levels of functional impairment. Mild tooth loss may cause minimal disruption, whereas moderate tooth loss often affects chewing efficiency, speech clarity, and facial aesthetics. Severe tooth loss, particularly near-complete edentulism, can profoundly impact nutritional intake, social interaction, and overall quality of life. Tooth loss is therefore not merely a dental condition but a multifaceted health issue with implications for oral function, systemic health, and psychosocial well-being [29-32].

The high prevalence of moderate tooth loss among respondents can be attributed to several interrelated factors. One of the most prominent is the low level of oral health knowledge observed among the elderly, which limits their ability to adopt proper oral hygiene practices, recognize early signs of dental disease, and seek timely professional care. However, knowledge alone does not fully explain the extent of tooth loss. The natural aging process contributes to physiological changes such as reduced salivary flow, gingival recession, and diminished manual dexterity, all of which increase susceptibility to oral disease. Additionally, systemic health conditions common among older adults; such as diabetes, hypertension, and nutritional deficiencies may exacerbate periodontal problems and accelerate tooth loss.

Environmental and structural factors also play a significant role. Limited access to dental services, financial constraints, and geographical barriers often prevent elderly individuals in rural areas from receiving regular dental check-ups or restorative treatment. Cultural beliefs and long-standing habits may further discourage the use of professional dental care, leading many older adults to rely on self-care or traditional remedies that are insufficient for preventing disease progression. These combined influences create a cumulative burden that increases the likelihood of moderate to severe tooth loss.

The findings of this study are supported by previous research [33-35], which demonstrated that tooth loss is closely associated with reduced chewing ability, compromised nutritional status, diminished quality of life, and increased risk of systemic diseases. As chewing efficiency declines, elderly individuals may avoid hard or fibrous foods, leading to inadequate nutrient intake and potential malnutrition. Tooth loss also affects social confidence, communication, and psychological well-being, contributing to isolation and decreased participation in community activities. Furthermore, impaired oral function has been linked to systemic conditions such as cardiovascular disease and diabetes, highlighting the broader health implications of tooth loss.

In conclusion, the high proportion of moderate tooth loss among elderly respondents at Posyandu Tunas Bangsa underscores the urgent need for comprehensive oral health interventions. Efforts should focus on improving oral health literacy, enhancing access to dental services, and promoting preventive behaviors to reduce the progression of tooth loss. Addressing these factors holistically is essential for improving oral health outcomes and supporting the overall well-being of the elderly population in rural communities.

Influence of dental and oral health knowledge on tooth loss among elderly at Posyandu Tunas Bangsa

The results of the data analysis indicate that dental and oral health knowledge has a clear and measurable influence on tooth loss among elderly individuals at Posyandu Tunas Bangsa in Talunrejo Hamlet, Talunrejo Village, Bluluk District, Lamongan Regency in 2026. Elderly respondents who possessed poor levels of oral health knowledge were more likely to experience moderate tooth loss, reflecting a substantial decline in their natural dentition. This pattern suggests that knowledge functions as an important determinant of oral health behavior, shaping the

extent to which individuals engage in preventive practices and seek timely dental care. In this context, the level of knowledge becomes a critical factor influencing the overall condition of the oral cavity and the likelihood of tooth loss.

Adequate knowledge fosters positive behaviors related to maintaining dental and oral health, whereas insufficient knowledge often leads to suboptimal hygiene practices and neglect of preventive measures [36-38]. The ABC Theory (Antecedent–Behavior–Consequences) provides a conceptual foundation for understanding this relationship. According to the theory, knowledge serves as an antecedent that shapes behavior, including daily oral hygiene routines, dietary choices, and treatment-seeking patterns. When oral health behaviors are performed correctly and consistently, the resulting consequences include preserved dental function, reduced risk of oral disease, and prevention of tooth loss. Conversely, poor oral health behaviors; often rooted in inadequate knowledge lead to negative consequences such as dental caries, periodontal disease, and ultimately tooth loss [19].

The low level of dental and oral health knowledge observed among elderly respondents at Posyandu Tunas Bangsa is therefore a significant contributing factor to the high prevalence of tooth loss. Elderly individuals with limited knowledge tend to have insufficient understanding of the importance of maintaining oral hygiene, performing regular tooth-brushing with proper techniques, attending periodic dental check-ups, and adopting preventive measures against dental and periodontal diseases. As a result, oral health problems such as caries and periodontal disease often remain undetected and untreated in their early stages, allowing these conditions to progress and eventually lead to tooth loss.

These findings align with previous research [23,39], which demonstrated that improving oral health knowledge among elderly individuals enhances their awareness and understanding of preventive measures, thereby reducing the risk of tooth mobility and tooth loss. The study cited in [40] further emphasizes that structured oral health education can significantly increase knowledge related to dental and oral disease prevention. Enhanced knowledge subsequently influences behavior, encouraging elderly individuals to adopt healthier oral hygiene practices and seek professional care when necessary, ultimately reducing the likelihood of tooth loss.

Taken together, the results of this study underscore the importance of oral health knowledge as a key determinant of tooth loss among elderly individuals. Strengthening oral health literacy through continuous education, counseling, and community-based interventions is essential for empowering elderly populations to maintain their oral health more effectively. By improving knowledge, it becomes possible to influence behavior positively, prevent disease progression, and reduce the burden of tooth loss among older adults in rural communities.

Limitation

This study has several limitations that should be considered when interpreting the findings. First, the research was conducted at a single Posyandu location, which limits the generalizability of the results to other elderly populations with different demographic, cultural, or socioeconomic characteristics. Second, the sample size was relatively small, reducing statistical power and increasing the likelihood of unstable estimates, particularly in categorical analyses such as the Chi-Square test.

Third, the assessment of oral health knowledge relied on self-reported questionnaire responses, which may be affected by recall bias, misunderstanding of questions, or social desirability bias, potentially leading respondents to overestimate or underestimate their actual knowledge. Fourth, the cross-sectional design prevents the establishment of causal relationships; the study can identify associations between knowledge and tooth loss but cannot determine temporal direction or causality.

Fifth, several cells in the Chi-Square analysis had expected counts below the recommended threshold, indicating that statistical assumptions were not fully met and requiring alternative tests. This may affect the robustness of the statistical conclusions. Sixth, clinical assessment of tooth loss did not include evaluation of underlying causes such as caries severity, periodontal status, or prosthetic use, which may provide a more comprehensive understanding of tooth loss patterns.

Finally, external factors such as access to dental services, dietary habits, systemic diseases, and medication use were not analyzed in depth, even though they may significantly influence oral health outcomes. Future studies should incorporate larger and more diverse samples, longitudinal designs, and more comprehensive clinical assessments to strengthen the validity and applicability of the findings.

CONCLUSION

Based on the findings of this study, it can be concluded that most elderly respondents at Posyandu Tunas Bangsa in Talunrejo Hamlet, Bluluk District, Lamongan Regency in 2026 had a poor level of dental and oral health knowledge. The majority also experienced tooth loss in the moderate category. The analysis further showed a significant influence of oral health knowledge on tooth loss, indicating that limited knowledge contributes to greater tooth loss among the elderly. These results are expected to serve as a basis for Posyandu and health workers in developing continuous dental and oral health education programs for elderly individuals as part of promotive and preventive efforts to reduce tooth loss.

Ethical consideration, competing interest and source of funding

- The ethical approval: This study had obtained ethical approval from the Health Research Ethics Commission of Poltekkes Kemenkes Surabaya, number: EA/2198/KEPK-Poltekkes_sby/II/2023.
- There is no conflict of interest related to this publication.
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