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Oral health knowledge, attitudes, practices regarding oral hygiene among students

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Abstract
Oral hygiene is a fundamental aspect of personal health and well-being, playing a crucial role in the prevention of oral diseases such as dental caries, gingivitis, periodontitis, and halitosis. The oral cavity serves as a gateway to the human body, and poor oral hygiene can contribute not only to local infections but also to various systemic conditions including cardiovascular diseases, diabetes mellitus, and respiratory tract infections. Despite the availability of effective oral care products and professional dental services, oral health problems remain highly prevalent due to lack of awareness, improper practices, and negligence toward preventive care.
The present project aims to study the concept and importance of oral hygiene, common oral health disorders and various tooth brushing techniques. Furthermore, this project highlights the importance of oral health education and preventive strategies in reducing the burden of oral diseases. The role of healthcare professionals, particularly pharmacists, in counseling patients and promoting rational use of oral hygiene products is also discussed. The study concludes that maintaining proper oral hygiene practices, along with regular dental check-ups and community awareness programs, can significantly improve oral health status and overall quality of life.

Keywords: Oral hygiene, oral health literacy, plaque, dental cavities, tooth brushing techniques

Introduction
A person's oral health is closely related to their overall health, making it a crucial component of public health. The World Health Organization has identified oral health as one of the most pervasive and significant public health concerns because it affects human activities like eating, speaking, interacting with others, and quality of life [1]. Systemic health and oral health are linked, and our health is influenced by every aspect of who we are. There are particular risks to keeping a healthy physique these days. Individuals are living longer, and peoples are facing difficulties that people have never encountered before due to our "aging" population. People have seen a sharp increase in chronic illnesses over time, including cancer, heart disease, and dental cavities [2]. Mastication, eating, swallowing, pronunciation, face aesthetics, and social interaction are all positively impacted by oral hygiene, which adds up to a higher quality of life. In order to avoid dental caries and periodontal illnesses, teeth cleaning is a well-established oral hygiene practice that involves removing dental plaque, stains, and other deposits from teeth [3]. The Knowledge, Attitudes, and Practices (KAP) model is a commonly used conceptual framework in public health and behavioural research that explores how individuals' understanding of a health issue, their feelings or beliefs about it, and their actual behaviours work together to shape health-related actions. The World Health Organization (WHO) states that although there have been significant improvements in oral health in general recently, dental caries is still a major and enduring global health issue. An open bite is characterized by a lack of contact between antagonistic teeth and is described as a change in the vertical relationship of the maxillary and mandibular dental arches. Rarely does this disorder affect the posterior sectors of the dental arches, but it usually always affects the anterior teeth, especially the incisors. Although the exact cause of this illness is yet unknown, it is thought to be complex and dependent on both intrinsic and extrinsic environmental aetiologic variables [4]. The uniformity in the patterns of periodontal loss of attachment among many populations worldwide, regardless of whether they practice poor oral hygiene or receive regular oral health treatment, is one of the most remarkable and possibly mysterious features of the epidemiology of periodontitis. The microbiota of the dental biofilm (dental plaque) is usually thought to be the cause and sustainer of periodontal disease, which is an inflammatory condition [5].

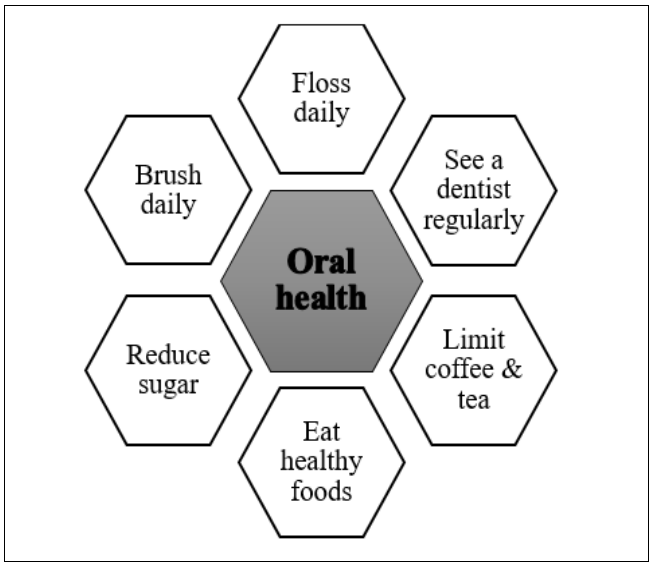


Fig 1: Routine to maintain good oral health

60% to 65% of people in developing nations like India reside in rural areas, where agriculture is the primary industry, illiteracy is common, and people frequently disregard their dental health out of ignorance. Furthermore,

the general quality of life is low and there is insufficient infrastructure and other facilities [6]. Oral care products are those that are used to clean the mouth, freshen the breath, and maintain oral hygiene. Because dentistry is constantly improving, a wide range of oral care products are now accessible in the market, rendering selection rather difficult. Several techniques might influence the choice of oral care products, which are important in promoting oral health and avoiding dental problems.[7]Dental decay is one of many oral diseases that fall under the category of poor oral health. People of all ages, genders, nationalities, and socioeconomic backgrounds are affected by tooth decay, a major public health issue [8]. The most prevalent chronic infectious childhood illness is early childhood caries (ECC). It is also a significant global public health issue. Early childhood caries has a detrimental effect on quality of life when it is accompanied by discomfort, although not being life-threatening [9]. The common and extremely prevalent streptococci may metabolize carbohydrates and produce acids when fed a healthy, balanced diet low in sugars.Even though these acids can start demineralization, saliva and other physiological processes in the mouth can restore pH, stop lesions from starting, and remineralize the tissues at the crystal level before cavitation. However, a high frequency of sugar consumption results in an ecological imbalance of the oral microbiota [10]. When it comes to tooth caries, nutrition may have both systemic and local effects. It is crucial to consume the right amount of energy and nutrients in order to achieve the best possible tooth production process. This phase begins during the fetal stage and is mostly finished by the time a child is six years old. The mineralization process is disrupted by nutritional deficits, making a tooth more susceptible to caries. Since these organs are known to be sensitive to changes in nutrition, the development and function of the salivary glands as well as the teeth should be considered in this regard [11]. A primary tooth's microbial reservoir could endanger overall health. The health of later permanent teeth may also be at danger due to carious primary teeth. Because of the signal of bacterial transmission, even a tiny amount of caries needs to be carefully considered. In addition to decreasing oral-related quality of life, caries is an intensive infectious illness that requires treatment and results in ER visits, higher costs, and more time. Teenagers' recently sprouted teeth still have caries despite yearly examinations [12]. Children's ability to brush their teeth is infamously uneven because of their growing dexterity and the challenge of successfully manoeuvring a toothbrush around both primary and erupting permanent teeth, which are features of a mixed dentition. Youngsters might not be able to predict the long-term effects of persistently poor dental hygiene [13]. One of the most prevalent conditions affecting people is periodontal disease. The etiology of periodontal disease is recognized to be significantly influenced by immunological, genetic, and plaque bacteria. The combined impact of lifestyle and psychosocial factors in addition to traditional risk factors is also receiving more attention [14]. The vast majority of Indians from lower socioeconomic classes have never gone to the dentist or had a dental examination. The main causes of this include poor literacy rates, inadequate awareness, and financial limitations. Inadequate dental health can lower quality of life and result in discomfort, pain, and incapacity. It can occasionally even exacerbate systemic conditions including diabetes, heart disease, and lung disorders. By raising public knowledge, grassroots health professionals can promote community-based oral health and hygiene and prevent numerous oral/dental disorders [15]. Mothers have a major influence in the adoption of dental brushing behaviors, which are started at a young age in the family setting. However, there is also a substantial correlation between the brushing practices of parents and adolescents during adolescence. It is the duty of parents to support their children's well-being, alleviate their illness, and provide the environment in which they form healthy behavioural patterns [16]. The purpose of oral health education is to increase knowledge, which may result in the adoption of beneficial oral health practices that enhance oral health. The World Health Organization introduced a basic oral health care program for less developed nations that emphasizes the integration of health education with other oral health activities, such as the provision of emergency, restorative, and preventive dental care [17]. Behaviour's and dental care are examples of potentially adjustable elements that may be responsible for dental attendance patterns and barriers like lack of awareness and understanding. A person's level of education, attitude, and conduct were found to be directly correlated with poor dental hygiene [18].

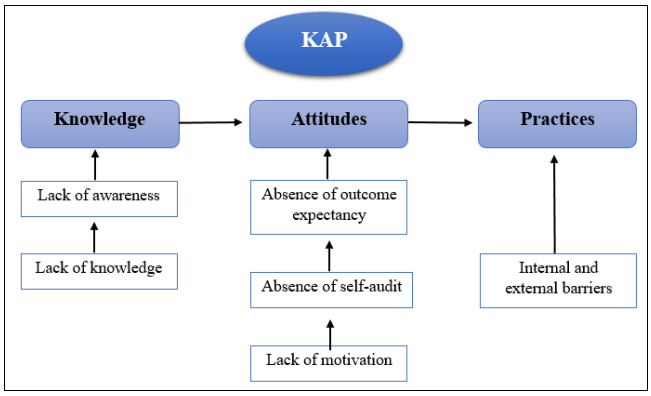


Fig 2: KAP model

A KAP survey is a representative study of a certain population to gather data on knowledge, attitudes, and behaviours related to a given subject. In addition to questions regarding general health behaviours and attitudes, a KAP survey may be created expressly to collect data on TB-related subjects [19]. A healthy mouth cavity and the tissues that surround it are a sign of good oral health. This is important for maintaining oral functions in addition to improving one's appearance and well-being. Professional (dental) students should have sufficient oral health knowledge, attitude, and practice because they focus on health promotion and preventive information [20]. Lack of awareness or disdain for hygienic habits frequently jeopardizes oral health. Better dental health is typically attained by educated people who put their knowledge into practice. Improved self-care is frequently the result of accepting personal responsibility for dental care [21]. An fundamental and crucial part of overall health is dental health. Numerous factors, including stress, nutritional condition, alcohol use, tobacco use, and hygiene, are linked to a variety of oral disorders. An individual's mindset affects their oral health concerns. People exhibit a wide range of attitudes regarding teeth, dental care, and dentists. Attitude is an acquired trait the amount of plaque that accumulates on tooth surfaces is a common indicator of oral health, and poor oral hygiene has been linked to cardiovascular disorders, periodontal diseases, and even preterm low birth weight babies [22]. On the other hand, healthy oral habits

lower the amount of plaque that accumulates on tooth surfaces [23]. A variety of factors influence oral hygiene practices and seeking dental care. When patients are informed and given positive reinforcement, they are more likely to adhere to oral health care regimens. One of the causes of non-adherence to oral hygiene routines is a lack of knowledge. Additionally, oral health behavior is significantly influenced by oral health attitudes and beliefs [24].

The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate decisions" is the definition of health literacy. “The Silent Health Epidemic" refers to low health literacy, which is characterized by a limited ability to acquire, understand, and act upon health information. “Oral Health Literacy (OHL)" is the term used to describe the same concept in an oral context. The necessity of dental care is frequently overlooked, and it is occasionally not seen as part of a healthy lifestyle. If appropriate preventive care is followed on a regular basis, healthy teeth can last a lifetime [25]. According to some researchers, consuming too much sugar raises the risk of dental cavities, obesity, cardiovascular disease (CVD), type-2 diabetes, metabolic syndrome, and non alcoholic fatty liver disease (NAFLD). Furthermore, the main risk factor for the onset of SDB (sleep-disordered breathing) is obesity. Reduced insulin sensitivity, hyperglycaemia, increased body weight and adiposity, and common cardiometabolic risk factors are all linked to inadequate sleep length and quality in children and adolescents [26]. Due to their reliance on parents or caregivers for dental appointments, oral hygiene, and nutritional needs, children are the most vulnerable segment of the population that has challenges in obtaining oral care services. Therefore, examining dental care utilization and related characteristics in elementary and primary school students might enhance their access to oral care services and lessen the prevalence of oral illnesses [27].

Maintaining proper oral hygiene can be achieved in a variety of ways.

Numerous methods have been shown to improve oral hygiene. Brushing your teeth is one of the most important habits. The American Dental Association (ADA) advises using the toothbrush at a 45° angle against the gums and moving it back and forth in quick strokes. Additionally, brushing your tongue can assist get rid of bacteria and improve your breath. Oral hygiene can be improved by using a mouthwash or rinse in addition to regular brushing and flossing. Antimicrobial mouthwash aids in lowering plaque and bacterial activity, which can cause gum disease and gingivitis [28].

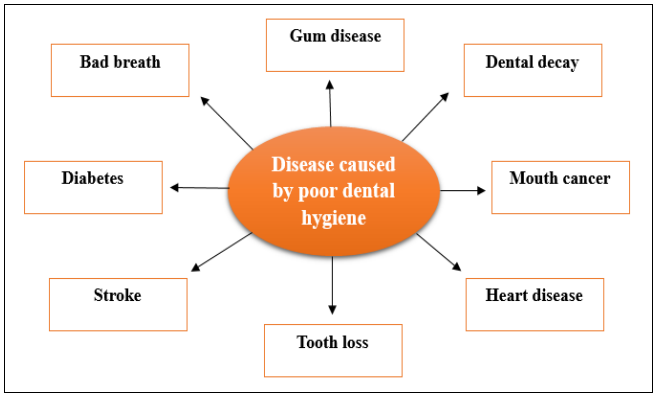


Fig 3: Disease caused by poor dental hygiene

Materials and Methods

- **Study Design:** A survey that assesses students' dental knowledge and oral hygiene habits, including regular dental care routines, awareness of oral health, and patterns of dentist visits.

- **Study Population:** Participants from different schools, colleges, and universities between the ages of 14 and 25 make up the sample size of 150.

- **Sampling Method:** random selection procedure; students were fully informed of the survey's goals, and participation was entirely voluntary.

- **Materials Used:** A questionnaire intended to examine oral hygiene practices and comprehension. Online tools such as Google Forms.

- **Data Collection Method:** Participants filled out a self-administered survey that addressed:
  - How frequently they clean their teeth—once or twice a day.
  - Using floss, mouthwash, or toothpaste.
  - Knowledge of periodontal problems, cavities, and the need of dental care.
  - The frequency of their dental visits.
  - Foods that affect teeth, like candy or drinks.
  - Sample completion time provided; answers captured immediately.

- **Data Analysis:** Raw data organized into charts, then examined with basic percentage calculations and frequency counts; findings visualized through charts and tables.

Characteristics of questionnaire

In order to facilitate participant responses and data analysis for researchers, the questionnaire has a defined structure that includes a planned series of questions arranged logically and consecutively. Each question has a closed-ended format with specific response options. Responses are measured on a 5-point Likert scale, ranging from strongly disagree to strongly agree. Questionnaires are frequently used as data collection instruments in research projects, either as the sole source of information or in conjunction with other methods in mixed-method studies. However, how a questionnaire is created, used, and verified determines its quality and accuracy [29].

The purpose of this study is to assess a sample of adolescents' oral hygiene knowledge using a questionnaire that looks at their everyday oral hygiene practices and the equipment they use [30].

Likert scale: The standard Likert scale, which was created in 1932 by Rensis Likert to gauge sentiments, is a 5- or 7-point ordinal scale that respondents use to indicate how much they agree or disagree with a statement [31]. "Strongly disagree," "disagree," "indecisive," "agree," and "strongly agree" are five possible ratings for a response category [32].

- The 5-point Likert scale provides ordinal information on attitudes and ranges from strongly disagree (1) to strongly agree (5) for easy scoring
- By normalizing subjective opinions into quantifiable intervals, the 5-point Likert scale makes group comparisons and trends easier.

- By enabling graded self-reporting of habits and opinions, a 5-point Likert scale lessens response ambiguity.

Administration

To gather information on the oral hygiene practices and knowledge of the chosen students, a Google Form questionnaire was distributed to them online. All participants received a clear explanation of the survey's goal prior to its launch. They were told to carefully study each question and choose the best response based on their everyday routines and knowledge. The form was easy to use, straightforward, and made to be completed quickly. Responses were kept anonymous to promote candid feedback, and participation was entirely voluntary.

Data collection: A structured questionnaire was used to collect data for this investigation. It asked several questions about dental check-ups, toothpaste use, brushing frequency, and dental health awareness. Students were given the questionnaire, and their responses were recorded for further examination. Following compilation, the data was sorted and analyzed to evaluate students' oral hygiene behaviours and awareness.

Results: The study selected a total population of 150 participants, of whom 116 provided complete and correct responses, while the remaining participants gave incomplete responses or did not respond properly; therefore, the response rate was calculated based on these 116 completed responses.

Frequency of toothbrush changes: The majority of young people (26.72% males and 61% females) change their toothbrushes every two to three months, according to the results of the question, "I know that I should change my toothbrush every three months. " After two to three months, 3.44% of men and 4.1% of women do not change their toothbrushes; they only do so when the bristles are worn out or damaged. According tod Martijn P.C. Van Leeuwen Sometimes the manufacturer advises on toothbrush packaging that the toothbrush should be thrown away after three months. The most recent theory is that a toothbrush's wear reduces plaque clearance more than its age. According to a research by Rosema et al., the point at which a new brush consistently outperformed a used one was "when the outer tufts are splayed beyond the base of the toothbrush." However, just 45 participants' brush analysis served as the basis for this recommendation.

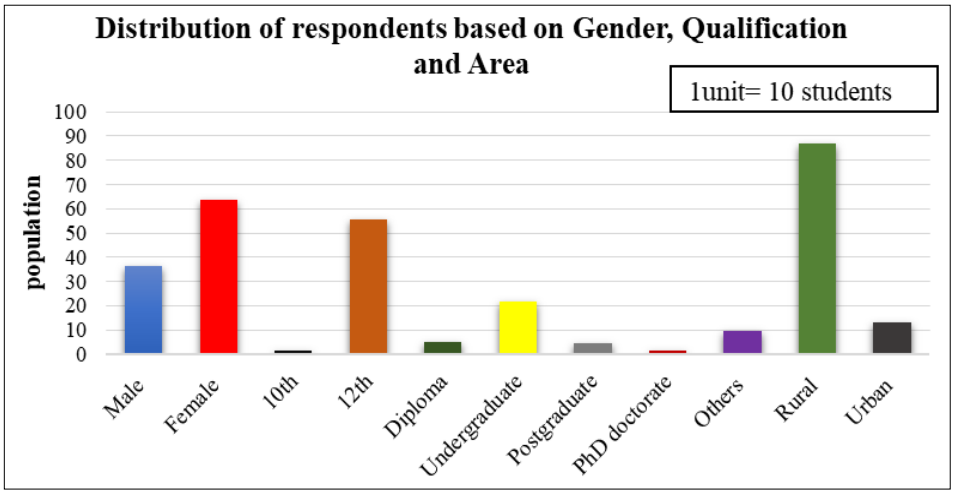


Fig 4: Distribution of Respondents based on Gender, Qualification, and Area

Demographic Profile of Respondents: The survey presents the demographic profile of respondents (from figure4) based on genders, educational qualification, and area of residence. The data show the distribution of participants based on Gender includes 36.2% males, 63.8% females. On the basis of Qualification include 1.7% 10^{th} pass, 55.7% 12^{th} pass, 5.2%diploma, 21.7% undergraduate, 4.3% postgraduate, 1.7%PhD doctorate, 9.6%others.on the based on Area includes 87% rural, 13% urban.

Oral health perception

1. **Relationship between knowledge towards oral health and population**

- The agreement levels (strongly agree, agree, neutral, disagree, and strongly disagree) are clearly shown for easy comparison in Figure 5 charts that show participants' understanding of important oral health facts across three questions.
- The bars for question 1 indicate dominant awareness, with 24.1% strongly agreeing and 62.1% agreeing (totalling 86.2%), a neutral peak of 6.9% (indicating some confusion), and lower bars of 5.2% disagree and 1.7% strongly disagree.
- Question 2 has the tallest combined agreement bars at approximately 89% (41.38% strongly agree, 48.28% agree), a small neutral bar (6.03%), and minimal disagreement (2.59% and 1.72%), indicating strong consensus with slightly taller bars for men than for women.

Question 3 shows strong agreement bars (27.59% strongly agree, 57.76% agree, totalling 85.35%), balanced neutral bars (7.76%), and disagreement bars (3.45% each), while the bars for females are slightly shorter than those for males. Overall, despite minor knowledge gaps, the figures visually highlight strong public awareness—fluoride strengthens teeth, plaque is bacterial buildup, and sugary foods cause cavities.

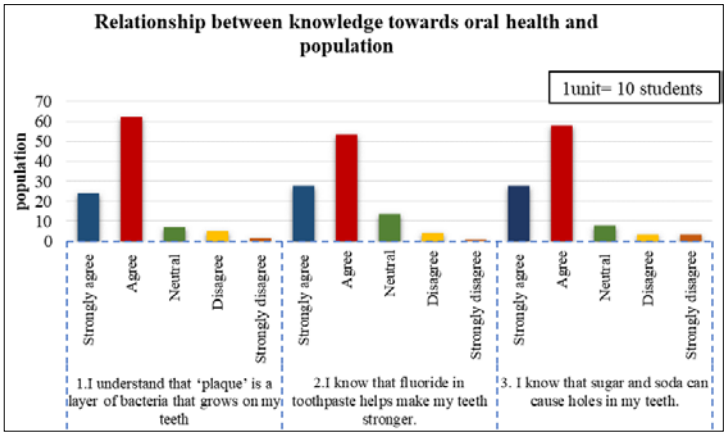


Fig 5: Relationship between knowledge towards oral health and population

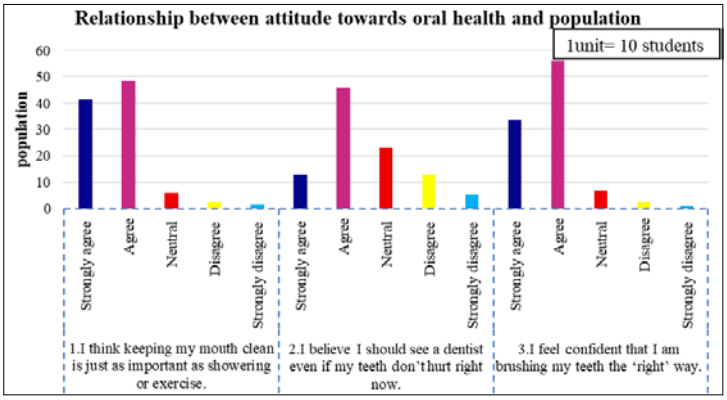
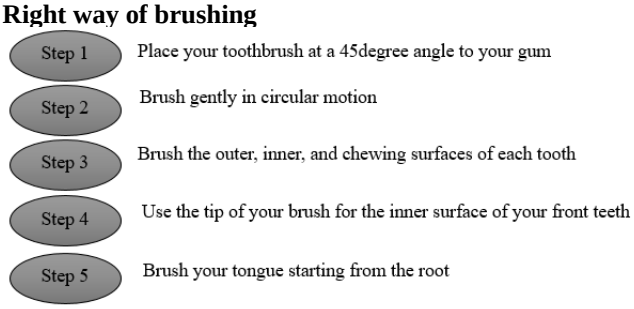


Fig 6: Relationship between attitude towards oral health and population

2. Relationship between attitude towards oral health and population

- Participants' responses to three questions measuring attitudes regarding dental hygiene practices reveal varying degrees of agreement and self-assurance. The majority of respondents strongly agreed with Question 1 indicating that oral hygiene is on par with daily activities like taking a shower and working out.
- Question 2 received a range of responses: 12.93% strongly agreed, 45.69% agreed (58.62% total), but 23.27% remained neutral (hinting at hesitation), matched by 12.93% disagreeing and 4.17% strongly disagreeing. This indicates that while many people value proactive visits, many others wait for pain, exposing flaws in preventive mindsets.
- There was widespread agreement on Question 3 suggesting a high level of confidence in people's brushing techniques. In conclusion, the findings support a strong emphasis on hygiene while highlighting the need for improved routine dental care.

Right way of brushing



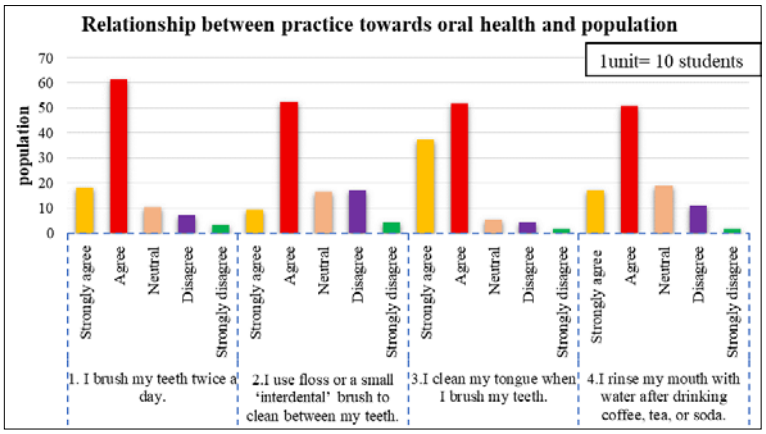


Fig 7: Relationship between practice towards oral health and population

3. Relationship between practice towards oral health and population

Male students showed slightly higher concurrence than female students, highlighting both widespread adherence to guidelines and limited non-adherence. The majority of students reported brushing twice daily (Figure 7), indicating strong oral hygiene awareness despite a minority who do not follow this routine. Although more than half admitted to using floss
or interdental instruments, many are still unsure or use them infrequently, indicating a lack of awareness and motivation for interdental care in comparison to regular toothbrushing with only 4.3% of participants disagreeing, the majority of participants supported or strongly supported tongue cleansing during brushing, indicating that it is a common practice. Parallel to this, the majority of students rinse after consuming staining or sugary drinks, although a sizable portion exhibit hesitancy or irregularity, suggesting that while recognition is widespread, full adoption and consistency are lacking because of knowledge gaps.

4. Dental habits

According to Figure 8, most students agree that toothbrushes should be changed every three months, demonstrating a thorough awareness of maintenance procedures. While some students acknowledged using a timer for at least two minutes each brushing session, many chose indifferent answers, indicating irregularities and a lack of awareness regarding the best time. Responses to the question of whether white teeth indicate good oral health were mixed, with some respondents agreeing and many opposing or being neutral. This highlights a widespread misperception that health and tooth color are not related.

While a small percentage disagreed or remained neutral, the majority of students agreed that bleeding gums during brushing indicate unhealthy gums, suggesting persistent knowledge gaps in gingival care. In conclusion, students have strengths in some areas of oral hygiene knowledge but have significant gaps and misconceptions in other areas.

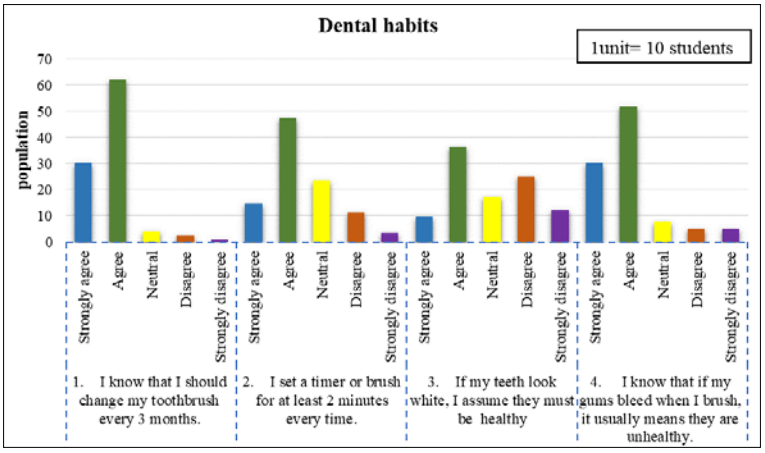


Fig 8: Dental habits

Discussion

According to health belief theory, dental health practices should be linked to dental health beliefs. Surprisingly, no research on the durability of dental health beliefs or their impact on oral health behaviour has been reported. An essential component of the human body, teeth reveal a person's lifestyle and medical history. Oral health frequently reveals systemic health problems and serves as a window into general well-being. It is described as the lack of conditions affecting the gums, teeth, and tissues that support them. Maintaining good oral hygiene is essential for improving attractiveness, boosting self-esteem, and advancing dental and overall health [33]. 60% to 65% of people in developing nations like India reside in rural areas where agriculture is the primary industry, illiteracy is common, and people frequently neglect their dental health due to ignorance. The general quality of life is also low, and infrastructure and other facilities are lacking [34]. It is now widely acknowledged that risk factors for childhood dental caries include poor diet, poor oral hygiene practices, young parents, inadequate parenting skills, and prior dental caries [35].

The prevalence of chronic illnesses, such as dental caries, cancer, and cardiovascular diseases, has increased in recent decades. These illnesses put social, economic, and political pressure on people. Oral diseases, which are frequently lifelong and preventable, cause suffering and financial hardship for both patients and healthcare systems [36]. Although periodontitis progresses slowly, the tissue damage it causes is mostly irreparable. Many patients are unaware of the problem until it has advanced to the point that tooth movement occurs. In the early stages, the ailment is usually asymptomatic; it is not painful [37].

Any combination of educational activities intended to encourage voluntary behaviours that promote health is referred to as health education. Individuals, families, organizations, or communities may engage in these acts or behaviours. Therefore, educational interventions for kids, parents, legislators, or medical professionals may fall under the purview of health education [38]. Maintaining proper oral hygiene can be achieved in a variety of ways. Numerous methods have been shown to improve oral hygiene. Brushing your teeth is one of the most important habits. The American Dental Association (ADA) advises using the toothbrush at a 45° angle against the gums and moving it back and forth in quick strokes [39]. Brushing of the tongue can also be done to help remove the bacteria and also to freshen the breath. In addition to brushing and flossing every day, using a mouthwash or rinse will improve oral hygiene. Antimicrobial mouthwash aids in lowering plaque and bacterial activity, which can cause gum disease and gingivitis [40]. By stopping tooth decay, fluoride mouthwashes can also be beneficial. Reducing the quantity of sweetened beverages drank is another measure that can

improve oral hygiene. The purpose of this study was to assess students' oral hygiene practices, attitudes, and knowledge [41].

Conclusion

To summarize the main conclusions of this study, the results unequivocally show that although teenagers have a basic understanding of oral hygiene principles and their vital role in preserving good dental health, there are still significant gaps in both their comprehensive knowledge base and their daily practical application of these concepts.

Many students can correctly characterize the process of plaque formation as a sticky, dangerous bacterial layer that builds up on teeth and the protective role of fluoride in strengthening tooth enamel to prevent decay, but they do not follow the proper practices for good oral health hygiene. This deficiency is caused by a number of factors, such as irregular brushing habits, where students frequently only brush once a day (usually in the mornings, skipping the evenings), a lack of use of essential tools like interdental brushes or dental floss, and a reactive approach to dental care that rarely includes routine preventive check-ups.

These mistakes increase susceptibility to common oral health problems, such as dental caries (cavities), gingivitis, and other gum diseases, as well as increased tooth sensitivity that may impact everyday comfort and diet. Furthermore, the clear discrepancy between what students know intellectually and what they actually do on a daily basis highlights the urgent need for ongoing motivational techniques, individualized advice from professionals and educators, and focused interventions to close this gap.

Therefore, it is essential that educational institutions especially schools and colleges prioritize and implement comprehensive, multidimensional oral health education programs. These could include interactive workshops on effective brushing techniques and plaque control, expert-led seminars highlighting the benefits of fluoride and the full range of hygiene aids, hands-on dental health camps for screenings and demonstrations, and frequent awareness drives stressing the importance of proactive dental visits. Adolescents can be empowered not only with knowledge but also with the abilities, routines, and self-assurance necessary to adopt and maintain optimal oral care practices throughout their lives by incorporating such programs into the curriculum and campus life. This will ultimately result in significantly improved long-term oral health outcomes and a lower incidence of avoidable dental issues.

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