

# Knowledge and the Attitude on the Use of Mouthwash among Two Selected Senior High Schools in Kumasi

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## Abstract

**BACKGROUND:** The route of most systemic diseases begins in the oral cavity. Oral health knowledge of mouthwashes and their uses is indispensable for the general population and especially adolescents. The use of mouthwash by adolescents can be a beneficial adjunct to their oral hygiene routine, providing additional protection against dental diseases and promoting fresher breath. Overuse or misuse of mouthwash, particularly those containing alcohol or other potentially irritating ingredients, may lead to adverse effects such as oral mucosal irritation, dry mouth, or alteration of the oral microbiome. **OBJECTIVES:** To determine the knowledge, attitude, and use of mouthwash among senior high school students in Kumasi. **METHODOLOGY:** 120 students responded to a standard questionnaire by a convenient sample technique. The Statistical Package for Social Sciences (SPSS) 22.0 and MS Excel were used for data management and analysis. The results of the study were presented using tables, bar charts, and pie chart. **RESULTS:** The ages of the respondents ranged from 14 to 20 years. Out of the 120 participants, 71 students that represent 59.2% of the total, used mouthwash. Majority of the participants (63%) utilized a mouthwash after brushing their teeth. 49% of the participants reported using mouthwash to address halitosis, 37% used it to combat periodontal disease, and 10% used it for relief from a sore throat. **CONCLUSION:** In general, most of the participants who use mouthwash had excellent knowledge and a positive attitude toward the use of mouthwash.

## Keywords

Oral Cavity, Mouthwash, Plaque Biofilm, Gingivitis, Convenient Sampling

## 1. Background Information

The oral cavity plays a crucial role in the development of systemic diseases, making oral health knowledge indispensable for medical professionals. Growing evidence suggests that oral health is equally important as general health and is linked to major illnesses such as diabetes, obesity, arthritis, and even cancer [1]. Education about oral health is vital in bringing about changes in attitudes and practices, thus forming an essential part of health-related practices [2]. To develop effective health education, it is important to assess knowledge, attitude, and practices [3].

Plaque, defined as a biological matrix, consists of a dense layer of non-mineralized, highly organized microbes, as well as various species and subspecies of gram-positive and gram-negative microbes, organic materials, and inorganic components derived from saliva and gingival crevicular fluid (Collins Dictionary). An ideal biofilm should possess characteristics such as resistance to environmental changes, self-reorganization, and enhanced effectiveness when interacting with other microbes [4]. Plaque biofilm induces an inflammatory response in the host, including macrophages, interleukins, and cytokines, leading to gingivitis. These inflammatory responses cause damage to the gingiva, and if left untreated, gingivitis may progress to periodontitis, characterized by connective tissue attachment loss, alveolar bone loss, and the formation of periodontal pockets.

Plaque accumulation occurs due to difficulties in effectively removing the biofilm, often due to a lack of manual dexterity. The challenges are more pronounced in interproximal and posterior regions of the mouth, which require more technical skills for plaque removal [5]. Even under ideal conditions, some plaque is likely to remain due to the limited ability to overcome these challenges. Mouthwashes have various indications, including the treatment of gingivitis, periodontitis, halitosis, and the maintenance of oral hygiene, especially after periodontal surgery. However, they can have undesirable side effects. The most common adverse effects include tooth stains, alterations in taste perception, and burning sensations in the cheeks and gums. Prolonged usage of mouthwashes can lead to mouth ulcers and mucosal erosions. Additionally, children may accidentally ingest mouthwash, resulting in fluoride overdose or alcohol poisoning [6].

To achieve good oral hygiene and prevent oral diseases, mechanical cleaning with a toothbrush and fluoridated toothpaste is recommended. However, some individuals use mouthwash as an adjunct for oral hygiene. Halitosis, caused by the anaerobic degradation of certain amino acids by oral bacteria, is a common reason for seeking dental care [7]. The prevalence of periodontal disease and caries in Ghana is high, indicating poor knowledge and attitudes towards oral health (Ghana Dental Association, 2018). Limited research exists on the knowledge and attitude regarding mouthwash use in Kumasi, Ghana, highlighting the need to fill this knowledge gap. It is important to assess the knowledge, attitude, and use of mouthwash among adolescents, the awareness of its health benefits to

them and their decision for the use of various types of mouthwash.

## 2. Study Objective

### 2.1. Main Objective

The main objective of this study is to determine the knowledge, attitude, and use of mouthwash among senior high school students.

### 2.2. Specific Objectives

- To determine how many of the respondents use mouthwash.
- To determine the factors leading to the use of mouthwash.
- To determine if they know the effects and appreciate the oral benefits of mouthwash use.

## 3. Limitations of the Study

- Limited time and resources.
- Some students communicated with their colleagues while answering the questions and could influence their response.

## 4. Literature Review

Mouthwash is a liquid that is swilled around the mouth and gargled with the head tilted back, typically for about 30 seconds before being spit out. It is used as an adjunct to mechanical cleaning (tooth brushing and flossing) to inhibit the influence of plaque biofilm. However, it is important to note that mouthwash is not a substitute for daily brushing and flossing [8].

Commercial mouthwashes contain different active ingredients that contribute to oral hygiene. These include:

- Chlorhexidine: An antiseptic agent effective against various bacteria, yeasts, and viruses. It has a slow-acting antibacterial action and binds to oral mucosa [9].
- Cetylpyridinium chloride (CPC), Domiphen bromide (DB), and Benzethonium chloride: Quaternary ammonium compounds that interact with bacterial cell membranes, leading to the loss of cellular content. They are effective in removing supragingival plaque and calculus [5].
- Essential oils: Phenolic compounds such as thymol, eucalyptol, menthol, and methyl salicylate, which have broad-spectrum antibacterial activity and can reduce plaque accumulation and pathogenicity. They also possess antioxidant and anti-inflammatory properties [10].
- Benzylamine hydrochloride: An analgesic, anti-inflammatory, antibacterial, and anesthetic agent that stabilizes cell membranes and influences prostaglandin and thromboxane formation [10].
- Fluoride: Found in mouthwashes in different concentrations (acidulated phosphate fluoride or sodium fluoride) and helps reduce dental caries by in-

creasing enamel resistance to acid attack [10] [11].

- Hydrogen peroxide: An oxidizing agent used for its oxygenation cleansing action in treating gingivitis. It also has bleaching properties [10].
- Alcohol: Frequently used as a solvent for antimicrobial compounds but does not directly impact effectiveness. Its presence in mouthwashes has been associated with a potential link to oral cancer [5].
- Zinc: Found in various salt formulations, it has broad-spectrum antibacterial activity and inhibits microbial glycolysis [9].
- Other ingredients in mouthwash include water, sweeteners, and xylitol, which can act as bacterial inhibitors [6].

The American Dental Association recognizes two types of mouthwashes: cosmetic and chemotherapeutic. Cosmetic mouthwashes provide temporary benefits such as controlling bad breath and leaving a pleasant taste, while chemotherapeutic mouthwashes contain active ingredients intended to address conditions like bad breath, gingivitis, plaque, and tooth decay (American Dental Association).

#### **4.1. History of Mouthwash**

The historical utilization of mouthwash can be traced back to 2700 BC, when it was first documented in Chinese medicine. Mouth cleansing became a fashionable practice among the aristocratic classes during the Roman era. Preferred formulations included a mixture of salt, alum, vinegar, and additional substances. Bad breath was a widespread concern during the 17th and 18th centuries; however, it was not openly discussed in social contexts. Nevertheless, during the 19th century, Joseph Lister developed Listerine, an antiseptic surgical agent that subsequently gained widespread acceptance as a mouthwash. The primary emphasis transitioned from poor breath prevention to gingivitis and periodontitis treatment in the 1960s, when antimicrobial mouthwashes were introduced. Plaque and gingivitis reduction through conventional oral hygiene practices alone was found to be insufficient [5] [12] [13].

#### **4.2. Knowledge and Attitude on the Use of Mouthwash**

Saveanu surveyed 718 students for cross-sectional research and discovered that 421 of them (or 60% of the total population) utilized mouthwash [14]. 228 of these students rinsed their mouths with mouthwash after brushing, 139 used when necessary, 42 only in the morning, and 31 only in the evening. Furthermore, it was found that 240 students flossed their teeth after cleansing their teeth. The research underscored the necessity for educational initiatives that aim to enhance students' understanding and dispositions regarding oral hygiene practices. This is due to the fact that knowledge and attitudes regarding these matters varied with educational attainment. 95% of dental students and 87.5% of medical students, according to another descriptive cross-sectional study by Wagaiyu and Simiyu [15], recognized mouthwash as an agent for oral hygiene, an-

tiseptic, and antiplaque. Nevertheless, the adoption of mouthwashes by students was limited to a minority: 16.3% of dental students and 12.5% of medical students reported using mouthwash. In contrast to medical students, dental students demonstrated a greater comprehension of mouthwashes, according to the study. According to the findings of a survey cited by Mitha [16], 34.8% of participants indicated daily usage of mouthwash, whereas 31.0% used it less frequently than once per week. Ninety percent of respondents held the opinion that mouthwash is insufficient in lieu of the toothbrush. The respondents' views on the necessity of mouthwash were divided, with fifty percent holding a positive stance and fifty percent holding a negative one.

Niveda and Jaiganesh conducted an assessment of the knowledge and prescription practices pertaining to mouthwashes among dental undergraduate and postgraduate students. A majority of the respondents (84.9%) advised their patients to use mouthwash to treat gingivitis, periodontitis, and halitosis, among other conditions. Listerine mouthwash was acknowledged by an almost 60% of the participants [17], whereas betadine mouthwash was known to a mere 20.7% of the respondents.

### **4.3. Factors Leading to the Use of Mouthwash**

A study conducted by Kaur and Sharma found that participants considered price when purchasing mouthwash, and factors such as brand, container size, and marketing also influenced their choices [18]. However, only a small number of people (26) purchased mouthwash based on their dentist's prescription. In another study by Mitha, taste, affordability, and the brand being a "family brand" were cited as reasons for choosing a particular mouthwash [16]. Listerine was the most preferred brand (42%), followed by Colgate (28%) and Oral B (11.5%). Wagaiyu and Simiyu reported that only 36.7% of participants received mouthwash recommendations, while over half (63.3%) of students did [15]. The popular brands mentioned were Betadine, Listerine, Chlorhexidine, and Colgate. In terms of dental practitioners, Shrestha found that over 80% of them advised patients to use mouthwash twice a day [19]. Chlorhexidine and Listerine were the most recognized mouthwash brands among dental practitioners. Shabr conducted a cross-sectional study involving 1259 participants and found that females had greater knowledge of mouthwash and used it more frequently than males [20]. Females also reported learning about mouthwash from their dentists, suggesting they visited the dentist more frequently than males.

### **4.4. Benefits of Mouthwash Use**

Mouthwash offers numerous benefits, particularly in addressing bad breath. Studies have shown that mouthwash contributes to mechanical cleaning, reduces biofilm accumulation, and decreases plaque buildup over time. Participants in the study conducted by Wagaiyu and Simiyu acknowledged that mouthwash can help prevent periodontitis, gingivitis, and dental caries [15]. The study by Mitha

revealed that mouthwash was perceived to assist in reducing plaque, preventing periodontal and gum disease, eliminating bad breath, and preventing tooth decay [16]. Controlling plaque is essential in treating gingival inflammation, as highlighted in the study by Afennich [21]. Chemotherapeutic mouthwashes have been developed to take advantage of the antibacterial properties of certain compounds, with chlorhexidine being one of the most effective antiseptics in reducing plaque buildup and gingival irritation, as supported by Løe [22]. A meta-analysis conducted by DePaola demonstrated that essential oils, 0.12% chlorhexidine gluconate, and cetylpyridinium chloride were effective in reducing gingivitis and supragingival plaque [23]. These findings further highlight the benefits of mouthwash in oral care routines.

#### **4.5. Side Effects**

While mouthwashes have gained importance in daily oral care routines due to their various indications, they are associated with certain side effects. The use of over-the-counter mouth rinses without medical supervision is common among patients according to Wilder [24]. In a study by Kaur and Sharma, it was found that 93% of participants in Ontario, Canada, purchased and used mouthwash without a prescription from their dentists, highlighting the widespread use without professional guidance [18].

Children, in particular, may be at risk of swallowing mouthwash, leading to potential fluoride overdose and the development of fluorosis, characterized by enamel mottling and fractures in deciduous and permanent teeth [9] [25]. Additionally, the alcohol content in mouthwashes has been associated with certain risks, including acting as a carrier for carcinogens and increasing the risk of oral cancer [26]. Side effects experienced by users of mouthwashes include a burning sensation in the cheeks, teeth, and gums, particularly with alcohol-based mouthwashes [8]. Chlorhexidine, a commonly used mouthwash, can cause brown discoloration of teeth, tongue, and restorations, as well as changes in taste perception [5] [9]. These side effects can impact patient compliance and satisfaction.

### **5. Methodology**

#### **5.1. Study Area**

The study was conducted in two selected schools in Kumasi, Ghana: Kumasi Wesley Girls' School and Opoku Ware School. Kumasi Wesley Girls' School, formerly known as Mmofraturu Girls' Boarding School, was established in 1979 and has around 1700 students. Opoku Ware School, named after Asante King Opoku Ware I, was established in 1952 and has approximately 4000 students.

#### **5.2. Study Type and Design**

The research design adopted was a cross-sectional quantitative survey. This research was conducted within the period of June to August 2022.

### 5.3. Sampling Size and Technique

A convenient sampling size of 160 students was selected. The sample size was calculated using <https://www.surveymonkey.com/mp/sample-size-calculator/> where the estimated population size was 5700, the percentage confidence level was 95% and the margin of error was 5%. However, due to limited financial resources and limited time to collect and analyze data only 120 out of the 160 students took part in the study. The sample size was distributed equally among the school with 60 students from each school. Simple random sampling was used to select participants within each school.

### 5.4. Inclusion Criteria

- Participants who are students of Opoku Ware School or Kumasi Wesley Girls' School.
- Participants who gave their consent.

### 5.5. Exclusion Criteria

- Participants who are not students of Opoku Ware School or Kumasi Wesley Girls' School.
- Participants who do not give their consent.

### 5.6. Data Collection Tool

A self-designed structured questionnaire with 15 questions was developed with closed and open-ended questions to collect data. Validity and reliability of the questionnaire was tested through pilot testing and expert review. Translation was available any participants that encounter any problem due to literacy.

### 5.7. Data Processing and Analysis

The Statistical Package for Social Sciences (SPSS) software version 22.0 and MS Excel was used for data management, processing, analysis, and management of data. Data analysis was done through frequency generation, tables, pie-charts and bar-graphs.

### 5.8. Ethical Consideration

Ethical clearance was obtained from the Committee on Human Research, Publications, and Ethics of the Kwame Nkrumah University of Science and Technology. Informed consent was obtained from participants, and confidentiality and anonymity were ensured.

## 6. Results

### Socio-Demographics

The gender distribution of participants was in a fifty-fifty ratio as the questionnaires were distributed to single-sex schools in an equal ratio. 48.3% of the students were aged 16. This was followed by age 15 at 25.8%, 17-year-old's made

up 15.8%, whilst 14-year-olds made up 5%. 4.2% were 18-year-olds and only one person (0.8%) was aged 20 years. 86 of the participants were Christians constituting 71.7% and 34 were Muslims constituting 28.3%.

#### Frequency of toothbrushing among participants

When participants were asked about how many times they brushed in a day, 51 participants responded once and 69 brushed twice a day. This is seen in **Table 1**.

#### Relationship between Gender and Daily Brushing of Teeth

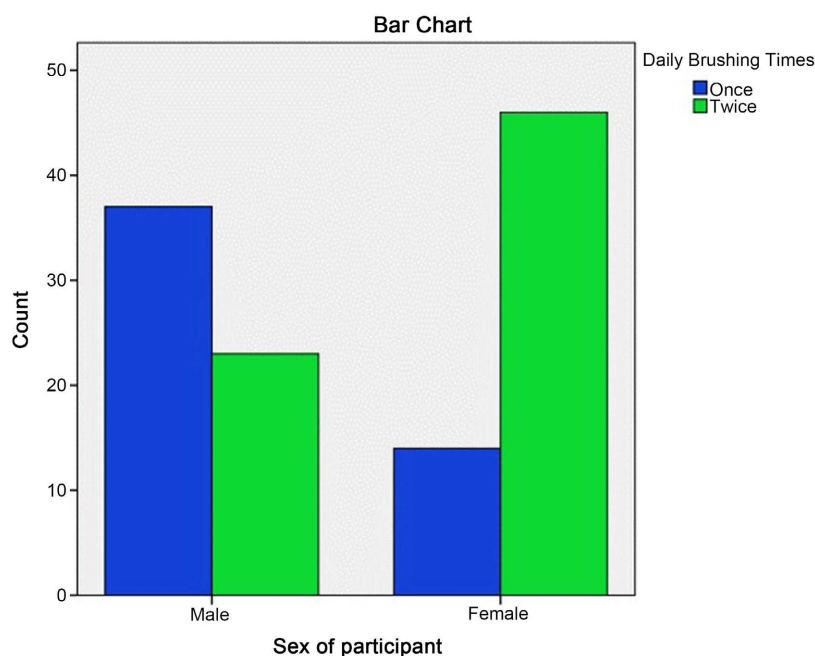
The bar chart in **Figure 1** is comparing the relationship that exists between the frequency of daily brushing and the gender of participants. From the bar chart below, 15 females and 37 males brushed once daily. 46 females and 22 males brushed twice a day.

#### Cleaning Aids Used

Participants selected the cleaning aid they used. They were at liberty to choose more than one cleaning aid if it applied to them. As seen in **Table 2**, every participant used a toothbrush and toothpaste. Mouthwash was the second most used cleaning aid with 71 people using it. 8 used charcoal, 7 dental floss, 3 chewing sponge and 2 chewing sticks.

**Table 1.** Frequency of toothbrushing among participants.

Number of times brush in a day	Frequency	Percentage (%)
Once	51	43
Twice	69	57
Total	120	100



**Figure 1.** Bar chart of cross-tabulation of gender versus number of times participants brush in a day.



**Table 2.** Cleaning aids used by participants.

Cleaning Aid	Yes (Frequency)	Percent (%)
Toothbrush and Toothpaste	120	100
Mouthwash	71	59.2
Dental Floss	7	5.8
Chewing Sticks	2	1.7
Chewing Sponge	3	2.5
Charcoal	8	7.5

### Various mouthwash Known by Participants

Participants were at liberty to select more than one brand of mouthwash they knew about. Colgate was the most popular mouthwash known by participants with a frequency of 88. This was followed by Listerine (37), then Kamaclox (22) and lastly Chlorhexidine (11) was the least known among the options given. This is shown in **Table 3**.

### Where participants heard about mouthwash

In **Figure 2**, it is seen that the mass media had been pivotal in making mouthwashes well known to participants and accounted for 39% or awareness. This was closely followed by parents at 32%, the dentist at 26% and the least being from Friends at 3%.

### Use of Various Mouthwash

**Table 4** shows various selections of mouthwash used by participants. Colgate (51.8%) is the most used mouthwash followed by Listerine (25.9%), Kamaklox (14.2%), Chlorhexidine (5%) and finally others (3%) not listed.

### Where Participants get the mouthwash

From **Figure 3**, 55% of the participants purchased their mouthwash at the pharmacy followed by the 35% from the Supermarket and 10% from the Dental Clinic

### How many times mouthwash is used

34 participants used mouthwash twice a day as seen in **Table 5**. 32 used mouthwashes once a day whilst 4 used it thrice a day. One participant used it differently. The frequency of use didn't apply to 49 of the participants.

### When they use mouthwash

In **Figure 4** it is seen that 63% of the participants use mouthwash after brushing followed by 21% who used the mouthwash before brushing. 13% used mouthwash during brushing and 3% didn't use mouthwash.

### Reasons for using mouthwash

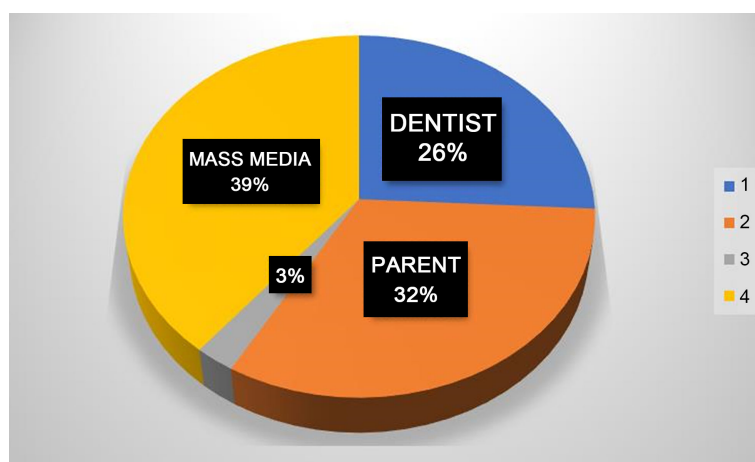
The majority of the participants accounting for 49% used mouthwash because of Bad Breath. 35% use mouthwash because of the periodontal disease, 10% use mouthwash because of sore throat and 4% due to other conditions. This is represented in **Figure 5**.

In **Table 6**, 25 (20.8) participants kept the mouthwash in their mouths for about 30 seconds whilst 17 (14.2%) held the mouthwash in their mouth for 20

seconds. 8 (6.7%) participants used mouthwash for 40 second and 21(17.5%) for more than one minute. 49 (40.8%) participants could not tell how long this process took or did not use mouthwash.

**Table 3.** Various brands of mouthwash known by participants.

Mouthwash	Frequency	Percent (%)
Colgate	88	54.3
Listerine	37	22.8
Kamaclox	22	13.6
Chlorhexidine	11	7
Others	4	2



**Figure 2.** Pie chart for where participants heard about mouthwash.

**Table 4.** Participant use of various types of mouthwash.

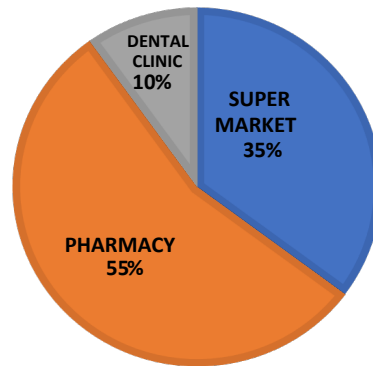
Mouthwash	Frequency	Percentage
Colgate	44	51.8
Listerine	22	25.9
Kamaklox	12	14.2
Chlorhexidine	3	5
Others	4	3

**Table 5.** Frequency of use of mouthwash.

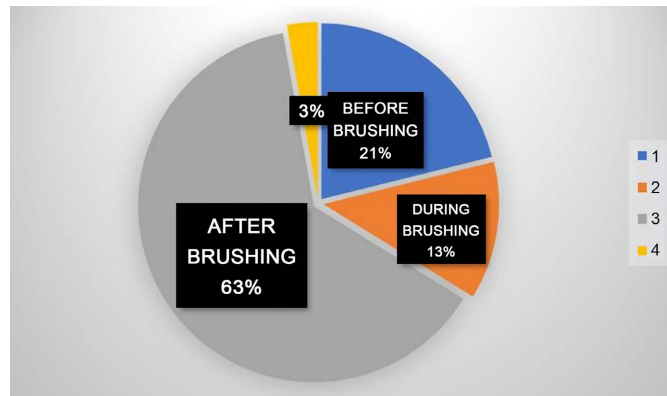
How many times in a day do you use	Frequency	Percent (%)
Once	32	26.7
Twice	34	28.3
Thrice	4	3.3
Others	1	0.8
n/a	49	40.8
Total	120	100

**Table 6.** How long do you keep mouthwash in the mouth?

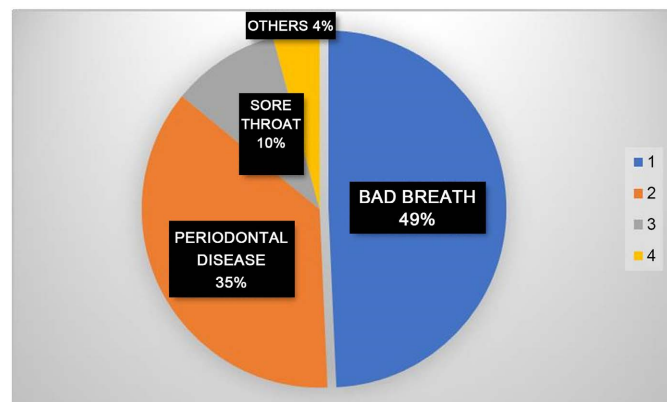
How long do you keep mouthwash in the mouth	Frequency	Percent (%)
20 seconds	17	14.2
30 seconds	25	20.8
40 seconds	8	6.7
More than a minute	21	17.5
n/a	49	40.8
Total	120	100.0



**Figure 3.** Pie chart for Where Participants get the mouthwash.



**Figure 4.** Pie chart for when they use mouthwash.



**Figure 5.** Pie Chart for Reasons for using mouthwash.

According to the table, after rinsing with mouthwash, the taste of the mouthwash remained in the mouth for 24.2% of participants for less than 15 minutes. The taste lasted for 16 - 30 minutes in 25% of participants, 31 - 45 mins in 4.2%, 46 - 60 minutes in 1.7% and more than one hour in 4.2% of participants (**Table 7**).

#### **Extrinsic Stains and burning sensation**

Extrinsic stains were not a common finding associated with the use of mouthwash among participants who use mouthwash. 80% said no stains were seen on teeth whilst 20% confirmed the observance of stains. 65% of the participants associated a burning sensation with the use of mouthwash and 35% of the participants reported otherwise.

## **7. Discussion**

### **7.1. Socio-Demographic**

The gender distribution of participants was in a fifty-fifty ratio as the questionnaires were distributed to single-sex schools in an equal ratio. Most of them were between the ages of 15 (25.8%) and 16 (48.33%) years with the least being 18 (4.2%) and 20 (0.8%) years. This is not surprising as most of the participants were in SHS1 and SHS 2. The majority of the participants were Christians and Science students. The results were inconsistent with a study by Saveanu [14] revealing that the mean age was 14.6. Out of the 718 participants, 34.8% were males and 65.2% were females. 354 representing 49.4% were in Middle school and 50.6% were in high school.

### **7.2. Oral Hygiene Practices of Participants**

In this category, the research question was aimed to find out how the participants maintained their oral hygiene. All the participants use a toothbrush and toothpaste as a means of maintaining good oral hygiene. This can be attributed to the prospectus given to students in the boarding school which include a toothbrush and toothpaste which was enforced by school authorities. The results from the study revealed that the majority of the participants (57%) brushed twice daily whilst the other 43% brushes their teeth only once a day. These results are consistent with Proper Tuosie Beni's study (2009) in Ho reported that

**Table 7.** Taste remain in the mouth after rinsing.

TASTE REMAINS IN THE MOUTH AFTER RINSING	Frequency	Percent (%)
Less than 15 mins	29	24.2
16 - 30 mins	30	25.0
31 - 45 mins	5	4.2
46 - 60 mins	2	1.7
More than one hour	5	4.2
n/a	49	40.8
Total	120	100

59.9% brushed twice daily. The majority of the participants ( $n = 46$ , 76%) that brush twice daily were females. The results were similar to research conducted by Nordström revealed that 87% were girls and brushed twice daily compared to 67% representing boys who brushed only twice [27]. Beni (2009) also showed that 55.3% of females brushed twice compared to 44.7% of the males. This could be attributed to the fact that female students have a better approach to dental health issues than male students. These high figures show that there is a high level of awareness and practice of the conventional way of maintaining good oral hygiene.

### 7.3. Knowledge and Attitude of Students on the Use of Mouthwash

According to the current study carried out, all the participants from the study have heard about mouthwash with the mass media playing a pivotal role. A greater percentage of the population (39%) has heard about the use of mouthwash from the mass media which is closely followed by parents (32%) and dentists (26%). Only 3% of the entire population heard about mouthwash from friends. When the participants were asked, which cleaning aids they use in addition to the conventional toothbrush and toothpaste, a majority of the participants representing 59.2% of the entire population use mouthwash. This was followed by Charcoal (7.5%), Dental Floss (5.8%), Sponge (2.5%), and Sticks (1.7%) in **Table 2**. The result findings from the study are in agreement with (Saveanu *et al.*, 2022) which revealed that 60% of students practice the use of mouthwash in addition to the conventional way of maintaining their oral hygiene [14]. However, this finding is inconsistent with the study done in Chandigarh, India by Blaggana *et al.*, (2016) which revealed that only 20% of Secondary School Students use mouthwash [28].

In terms of frequency of use, most participants who use mouthwash practice it twice daily. When it comes to purchasing mouthwash, the majority obtain it from the pharmacy. The duration of keeping mouthwash in the mouth and the lingering taste after rinsing varied among participants. Among those who do not use mouthwash, reasons cited include not knowing its purpose and considering it expensive. A study conducted by (Shrestha *et al.*, 2021) revealed that majority (69.3%) of the participants kept the mouthwash in their mouth for about 30 seconds. Majority of the participants (24.2%) and (25%) revealed that the taste of the mouthwash remained in the mouth after rinsing for less than 15minutes and from 16 to 30 minutes respectively after use. These results are similar to those by Shrestha *et al.* [19]. The results from the study also showed that 40.8% and 43% revealed that the taste of the mouthwash remained in the mouth after rinsing for less than 15minutes and from 16 to 30 minutes respectively after use in **Table 7**.

When the participants (40.8%) who do not practice the use of mouthwash were asked, why they did not practice the use of mouthwash, 18 of the participants said that they do not what it is used for and the other 21 said mouthwash is expensive. These results provide insights into the awareness, usage patterns,

and perceptions of mouthwash among the study participants.

#### **7.4. Factors Leading to the Use of Mouthwash**

According to Mitha, participants primarily used mouthwash regularly to combat bad breath (33.8%) rather than to prevent oral diseases (30.5%) [16]. Only a small percentage (3.8%) replaced toothbrushing and toothpaste with mouthwash. In the present study, the majority of participants used mouthwash to fight bad breath (49%), followed by addressing periodontal disease (37%) and relieving sore throat (10%). Only 4% used mouthwash for teeth whitening. In terms of gender differences, Shabr found that females in Saudi Arabia were more knowledgeable about and frequent users of mouthwash compared to males [20]. Similarly, in the present study, a higher percentage of females (60.2%) practiced the use of mouthwash compared to males (39.8%). Regarding brand preferences, the majority of participants used Colgate mouthwash (52%), followed by Listerine (26%) and Kamaclox (14.2%). These findings may differ from other studies, such as the survey conducted by Shrestha [19] and the research by Kaur and Sharma [18] suggesting variations in brand availability across different geographic settings.

#### **7.5. Effects of Use of Mouthwash**

The majority of participants in the present study (65%) reported experiencing a burning sensation associated with the use of mouthwash. Although slightly lower, the findings align with the study by Shrestha who reported that 80% of participants diluted their mouthwash due to the burning sensation [19]. Regarding extrinsic stains, 80% of participants who used mouthwash in the present study answered “no” when asked if it caused such stains. This contrasts with the study by Shrestha [19] on dental practitioners in Chitwan, where 48.3% reported the occurrence of extrinsic stains. These differences could be attributed to variations in knowledge acquisition and the popularity of Chlorhexidine Gluconate as a brand in their study. Additionally, 99% of participants in the present study expressed satisfaction with the benefits and effects of mouthwash and would recommend its use to others, which aligns with the findings of Wagaiyu and Simiyu where 92% of medical and 87% of dental students would recommend mouthwash to their peers [15].

### **8. Conclusion**

Based on the findings of the study, it can be concluded that senior high school students have a good level of knowledge and a positive attitude towards the use of mouthwash. Factors such as health benefits, gender, and specific brands influence the use of mouthwash, with bad breath being the primary reason for its use. Females show a higher awareness of dental health issues and Colgate is the most popular brand. Overall, students are satisfied with the positive effects of mouthwash and would recommend its use to others.

## 9. Recommendation

Based on the study findings, the following recommendations can be made:

- Senior High Schools should incorporate dental practitioners into their extra-curricular activities to educate students about the benefits of using mouthwash.
- Dentists should advise and encourage students to use mouthwash as part of their oral hygiene routine.
- Dental professionals and marketing brands should raise awareness about the positive effects and potential side effects of mouthwash to the general public.

By implementing these recommendations, it is expected that students will have better knowledge and understanding of mouthwash and its role in maintaining oral health.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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