



Knowledge, Awareness, and Attitudes towards Tooth Wear among Adult Patients who Visit the University of Ghana Dental School Clinic

Patrick Caldicock Ampofo^{1,*} , Heidimarie N. A. Fleischer², Dennis D. K. Aprese², Helen Wireko¹, Josephine Sackeyfio³, Thomas Ndanu³, Abena A. Djarbeng³ and Neils Quartey-Papafio²

¹*Restorative Dentistry Department, University of Ghana Dental School, College of Health Sciences, Korle-Bu, Accra-Ghana*

²*Biomaterials Science Department, University of Ghana Dental School, College of Health Sciences, Korle-Bu, Accra-Ghana*

³*Community and Preventive Dentistry, University of Ghana Dental School, College of Health Sciences, Korle-Bu, Accra-Ghana*

Abstract:

Introduction: Tooth wear is the loss of tooth surface that is not caused by bacteria or injury. It may be considered either pathological or physiological, depending on the patient's age and severity. Tooth wear can manifest as abrasion, attrition, erosion, or abfraction. Tooth wear is a phenomenon gaining increasing attention because of changes in lifestyle behaviors. Tooth wear permanently damages the enamel and can result in a worn-looking or aging smile. The purpose of this study was to investigate the level of knowledge, awareness, and attitudes towards tooth wear among adult patients attending the University of Ghana Dental School Clinic.

Method: A descriptive cross-sectional study was conducted. A sample size of 100 participants was obtained using a consecutive sampling technique. A self-administered questionnaire was used to collect data.

Results: Generally, participants demonstrated low levels of knowledge about tooth wear. The level of education influenced knowledge of tooth wear; the majority of those with primary education demonstrated low levels of knowledge about tooth wear. There was a high level of awareness across all educational levels, with tertiary education demonstrating the highest (77.6%). Similarly, they all demonstrated positive attitudes towards tooth wear, with the majority of tertiary-educated participants (93.9%).

Discussion: The majority (70%) of the patients thought that tooth wear is a form of cavity or tooth decay and that it is also caused by bacteria, instead of by the frequent consumption of acidic foods. Other studies have noted intrinsic and extrinsic causes of dental erosion. An overwhelming number of patients (over 90%) agreed that the prevention of tooth wear is preferable to curing it and emphasized the importance of visiting the dentist every 6 months. This finding compares with other studies recommending that individuals visit the dentist every six months to prevent other dental issues from arising.

Conclusion: Generally, participants' level of knowledge of tooth wear was quite low. The level of education was significantly associated with knowledge and attitudes towards tooth wear. Dentists must educate patients and the general public about tooth wear.

Keywords: Tooth wear, Attrition, Dental erosion, Abrasion, Abfraction, Knowledge, Tooth surface loss, Oral health awareness, Attitude.

© 2026 The Author(s). Published by Bentham Open.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International Public License (CC-BY 4.0), a copy of which is available at: <https://creativecommons.org/licenses/by/4.0/legalcode>. This license permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

*Address correspondence to this author at the Restorative Dentistry Department, University of Ghana Dental School, College of Health Sciences, Korle-Bu, Accra-Ghana; Tel: +233243629318; E-mails: pampofo@ug.edu.gh, patampofo@hotmail.com and dr.patrick2013@gmail.com

Cite as: Ampofo P, Fleischer H, Aprese D, Wireko H, Sackeyfio J, Ndanu T, Djarbeng A, Quartey-Papafio N. Knowledge, Awareness, and Attitudes towards Tooth Wear among Adult Patients who Visit the University of Ghana Dental School Clinic. *Open Dent J.* 2026; 20: e18742106428836. <http://dx.doi.org/10.2174/0118742106428836251122180820>



Received: August 18, 2025
Revised: October 01, 2025
Accepted: October 16, 2025
Published: January 12, 2026



Send Orders for Reprints to
reprints@benthamscience.net

1. INTRODUCTION

Tooth wear is an essential aspect of oral health that has become an area of concern [1]. It was described by Liu and colleagues [2] as a loss of hard tooth tissue with no occurrence of dental caries or trauma. Queensland Health also stated that tooth wear is an irreversible (irreparable) loss of tooth structure that often impairs effective tooth functioning [3]. This indicates that tooth wear promotes ineffective tooth functioning and introduces oral cavity restrictions, which, in turn, impact the quality of an individual's oral health. Chan and colleagues also asserted that tooth wear could become a problem, causing pain and affecting the functioning and aesthetics of the teeth [4]. Patients with tooth wear commonly have visible changes in the appearance of their teeth, pain, or sensitivity, which can also affect their masticatory function and lead to loss of occlusal vertical dimension [5], and in severe cases, it can have a range of effects on dentofacial morphology [6].

Tooth wear may be considered physiological or pathological [7], with a physiological process evident with aging, while a pathological process is described as "unacceptable levels of progressive wear" [7]. As a physiological process, tooth wear affects the enamel, dentin, and nerves as well as the blood vessels of the tooth [1]. Kaidonis also stated that physiologically, tooth wear is associated with friction between teeth in close contact, with this friction as a major cause [8].

Pathological tooth wear may result in a change in the appearance of the teeth, considered abnormal with respect to the age of the patient. That is, referring to the condition in which the teeth become severely worn such that their appearance is significantly damaged before they are lost, resulting in ineffective functioning of the teeth [9]. Pathological forms of tooth wear are often referred to as Abrasion, Attrition, Erosion, or Abfraction [9], and it is sometimes hard to determine the type of tooth wear present since the different types often occur together [3, 10]. Notably, Abrasion, Attrition, and Erosion are universally accepted, while Abfraction is not accepted by all [3]. According to Addy, Sellis, and colleagues, clinical and experimental studies demonstrate that individual tooth wear types rarely exist alone and often interact with each other [1, 11].

Contemporary discussions and attitudes towards tooth wear and its preventive measures are obviously attributed to contributing factors such as age, sex, education, and

ethnicity. We have an aging population and a projection of an increase in life expectancy among those who remain dentate. On the other end of the dental spectrum, there is a large younger generation with a relatively high level of tooth wear due to lifestyle changes [12]. Epidemiologic studies by Lee reported an increase in the prevalence of tooth wear, while general dental practitioners also observed numerous dental patients with complications from worn teeth [13]. These cases indicate that tooth wear is common in dentistry. However, major attention has not been dedicated to this phenomenon until recent lifestyle changes highlighted its significance. The best treatment for tooth wear is prevention, which requires ensuring that the individual has a good level of knowledge and awareness of factors that promote and reduce tooth wear, as well as demonstrating a proper attitude towards reducing tooth wear. Abdullah stated that knowledge regarding tooth wear is essential for modifying oral health-related behaviours [14].

It is evident that numerous publications on dental management and the prevention of tooth wear exist regarding various etiologies; however, knowledge, awareness, and understanding of the pathogenesis of tooth wear are quite inadequate. In Ghana, to the best of the authors' knowledge, no literature or detailed reports on tooth wear exist, resulting in an information gap. The rise in cases of tooth wear highlights the importance of undertaking this study to examine people's knowledge, awareness, and certain practices that predispose them to early or extensive tooth wear. This study will create an avenue for educating the population and help in developing suitable preventive programs for patient safety.

2. METHODOLOGY

A non-probability sampling method was chosen for this study [15]. This involved using a quantitative research design [16], with a descriptive cross-sectional study approach [17]. The study population targeted the patients who visited the University of Ghana Dental School Clinic. A sample size of 100 was used to represent patients attending the University of Ghana Dental School Clinic. A consecutive sampling procedure was used to obtain participants for the study. Data were collected from participants primarily through closed-ended questionnaires. The questionnaire captured sociodemographic information, knowledge of tooth wear, awareness of tooth wear, and attitudes towards abrasion, attrition, and erosion. The recruitment period for this study was from when ethical approval was granted on

29th March 2023 to 29th June 2023. Data were accessed for research purposes from 30th June 2023 to 30th September 2023.

2.1. Inclusion Criteria

Adult patients who visited the University of Ghana Dental School Clinic for dental services during the study period and had signed the consent form were included in the data collection.

2.2. Exclusion Criteria

Dental staff and students, as well as patients below 18 years of age, who visited the clinic during the study period, were excluded from this study. Participants who did not sign the consent form were also excluded.

2.3. Sample Size Determination

Cochran's sample size formula was used to determine the actual numerical value of the sample from the target population [18]. Cochran developed an equation to find the sample size for a large population proportion using an estimated proportion of an attribute present in the population, and $q = 1 - p$. If the population is small, the sample size can be slightly reduced. The Cochran formula allows researchers to calculate an ideal sample size given a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population. The formula is stated below:

$$N_0 = Z^2 pq/e^2$$

Where N_0 = sample size;

z = the selected critical value of the desired confidence level = 1.96

p = the prevalence of knowledge awareness, and attitudes towards tooth wear within the sample variable = 93.4% = 0.934 [14]

$$q = 1 - p = 1 - 0.934 = 0.066$$

e = the desired level of precision (margin of error) chosen for the study = 0.05

$$N_0 = (1.96^2 \times 0.934 \times 0.066) / 0.05^2$$

$$N_0 = 0.237 / 0.0025 = 94.8 = 95$$

Hence, one hundred (100) participants were chosen to accurately represent the population for the study.

2.4. Ethical Considerations

Ethical clearance was sought from the Ethical and Protocol Review Committee of the Department of Community and Preventive Dentistry of the University of Ghana Dental School. The study was approved with ID number CPPD/019/05/2023.

The participants were assured of privacy and made aware that participation was voluntary and confidential, and those who agreed to participate signed a consent form.

2.5. Data Analysis

Data were extracted and migrated to Microsoft Excel. Descriptive statistics were summarized as means and

frequencies with their associated percentages, while others were represented in a pie chart and a bar graph. Data were summarized into tables and figures using descriptive statistics. Analysis was performed accordingly with respect to the objectives of the study, and findings were interpreted based on the respective objectives. Categorical variables were summarized as proportions and percentages, and analyzed using the Chi-Squared test with a p -value of <0.05 from the Statistical Package for Social Sciences (SPSS) software version 26.

3. RESULTS

Table 1 below indicates the demographic characteristics of the participants. There were an equal number of males and females (50% each). The age distribution of the participants was grouped into five categories: 18 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years, and 61 years and above. The study's findings indicated that three-fifths of the participants were between the ages of 31 and 60 years. The highest age distribution was between 31 and 40 years, with a percentage of 26% ($n = 26$), implying that the majority of the participants were in this age group. The least age distribution of the participants was 61 years and above ($n = 11$). The majority of the participants were Ghanaians and had blue-collar jobs, with just a few foreigners. Nearly half of the participants had tertiary education, followed by secondary/technical education, which accounted for about a third, and then primary education, which constituted 17%.

Table 1. Demographics of participants.

| Age | Frequency (%) |
|--------------------------------|---------------|
| 18-30 | 17 |
| 31-40 | 26 |
| 41-50 | 22 |
| 51-60 | 24 |
| 61+ | 11 |
| Gender | - |
| Male | 50 |
| female | 50 |
| Nationality | - |
| Ghanaians | 93 |
| Foreigners | 7 |
| Occupation | - |
| Student | 24 |
| White-collar jobs | 17 |
| Blue-collar jobs | 59 |
| Educational Level | - |
| Primary | 17 |
| Secondary/Technical/Vocational | 34 |
| Tertiary | 49 |

3.1. Knowledge on Tooth Wear

In Table 2, an overwhelming majority (78%) had not heard of tooth wear. A little above half (53%) indicated

that oral health is as important as general health, while a majority of participants (60%) indicated that tooth wear is not an irreversible disease. It was revealed that out of the 100 participants, 58% indicated tooth wear is not a form of cavity or tooth decay, with almost all the participants (88%) indicating that tooth wear may lead to pain and sensitivity. The majority of the participants (57%) indicated that tooth wear is caused by bacteria, while a greater number of participants (73%) expressed that they did not know whether frequent consumption of acidic foods such as oranges, lemons, carbonated drinks, and alcohol causes tooth wear. Findings on grinding of the teeth revealed that about three-quarters of the participants (72%) indicated grinding did not cause tooth wear. A greater number of the participants (81%) indicated that brushing immediately after consuming acidic foods does not worsen tooth wear, and also 78% thought that holding pins and threads between the teeth can cause tooth wear. Finally, the outcome of the study revealed that 69% of the participants did not know whether brushing with a hard-bristle toothbrush causes tooth wear. Almost all the participants (93%) indicated that prevention of tooth wear is better than cure, and 91% indicated that using fluoride toothpaste could help prevent tooth wear. Finally, a few participants (26%) indicated that saliva protects the teeth against tooth wear.

Most of the participants (72%), as indicated in Table 3, strongly agreed, while a few (11%) strongly disagreed, that it is worth spending more time studying knowledge about tooth wear. Additionally, the majority of the participants strongly agreed (29%) and strongly disagreed (27%) that they were concerned with toothpaste containing fluoride. Most of the participants strongly agreed (46%) and agreed (36%), respectively, that regular dental checkups or visits can prevent or reduce tooth wear. Similarly, a few of the participants strongly agreed (20%) and agreed (62%) that visiting the dentist only when experiencing dental or tooth wear-related issues is not ideal. A little more than half of the participants agreed (55%) that it was best to seek treatment as soon as one had tooth wear, while 39% strongly agreed.

Almost half of the participants (48%) disagreed with cutting down the consumption of acidic and carbonated drinks/foods. Finally, the study ascertained that 40% (indicating a majority) of the participants disagreed with

using a soft-bristled toothbrush and the appropriate brushing technique.

Table 2. Participants' knowledge of tooth wear.

| Knowledge on Tooth Wear | Yes | No |
|--|-------|-------|
| Heard of tooth wear | (22%) | (78%) |
| General Knowledge of Tooth Wear | | |
| Oral Health is important | 53 | 47 |
| An irreversible disease | 40 | 60 |
| Form of cavity or tooth decay | 42 | 58 |
| Pain or sensitivity | 88 | 12 |
| Causes of Tooth Wear | | |
| Bacteria | 57 | 43 |
| Frequent consumption of acidic foods | 27 | 73 |
| Grinding | 28 | 72 |
| Brushing immediately after acidic foods | 19 | 81 |
| Holding pins and threads between teeth | 78 | 12 |
| Brushing with a hard-bristle toothbrush | 31 | 69 |
| Knowledge in Prevention of Tooth Wear | | |
| Prevention is better than a cure | 93 | 7 |
| Regular dental check-up | 62 | 38 |
| Using fluoride toothpaste | 91 | 9 |
| Saliva protects teeth | 26 | 74 |

3.2. Attitude towards Abrasion

The majority of the participants (44%) brushed their teeth once daily, while many others (30%) brushed twice occasionally, as tabulated in Table 4 below. Additionally, just a few of them (4%) brushed their teeth more than twice daily. Furthermore, none of the participants used chewing sponges or sticks as the sole materials for cleaning their teeth; rather, a few of them used a combination of toothbrush, paste, and chewing sponge (4%) and a combination of toothbrush, paste, and chewing stick (8%) as materials for cleaning their teeth. Most of the participants (88%) used a toothbrush and toothpaste to clean their teeth. Also, a few participants (8%) used a hard-bristle toothbrush for brushing, while many of them (40%) used a medium-bristle toothbrush. More than half of the participants (52%), however, used a soft-bristle toothbrush for brushing and cleaning their teeth.

Table 3. Awareness of tooth wear.

| Variable | Strongly Agree | Agree | Indifferent | Disagree | Strongly Disagree |
|--|----------------|-------|-------------|----------|-------------------|
| Spending time studying knowledge about tooth wear. | 72 | 8 | 0 | 9 | 11 |
| Concerned with toothpaste containing fluoride | 29 | 19 | 14 | 11 | 27 |
| Regular dental checkup | 46 | 36 | 0 | 10 | 8 |
| Visiting only when having dental-related issues | 20 | 62 | 0 | 10 | 8 |
| Cut down on acidic foods and carbonated | 15 | 17 | 0 | 48 | 20 |
| Use a soft bristled tooth brush with the appropriate technique of brushing | 30 | 22 | 0 | 40 | 8 |
| Seek treatment the moment i have tooth wear. | 39 | 55 | 0 | 0 | 6 |

Table 4. Represents the position of participants about dental abrasion.

| Variable | Frequency | Percentage (100%) |
|--|------------|-------------------|
| How often do participants brush their teeth daily | - | - |
| a. Once | 44 | 44 |
| b. Twice daily | 22 | 22 |
| c. Twice occasionally | 30 | 30 |
| d. More than twice daily | 4 | 4 |
| Materials used to clean the teeth | - | - |
| a. Tooth brush and paste | 88 | 88 |
| b. Chewing sponge. | 0 | 0 |
| c. Chewing sticks | 0 | 0 |
| d. Combination of 'a' and 'b' | 4 | 4 |
| e. Combination of 'a' and 'c' | 8 | 8 |
| f. Other | 0 | 0 |
| Type of toothbrush used | - | - |
| a. Hard bristle | 8 | 8 |
| b. Medium bristle | 40 | 40 |
| c. Soft bristle | 52 | 52 |
| d. Other | 0 | 0 |
| Duration of brushing teeth | - | - |
| 1 min | 15 | 15 |
| 2 - 3 min. | 26 | 26 |
| 3 - 5 min | 52 | 52 |
| more than 5 min. | 7 | 7 |
| 5. Bite Nails | - | - |
| a. Yes | 34 | 34 |
| b. No | 27 | 27 |
| c. Sometimes | 39 | 39 |
| Total for Each Variable | 100 | 100 |

The majority of the participants (52%) brushed their teeth for 3 to 5 minutes, followed by a quarter (26%) who brushed for 2 to 3 minutes. Few participants (7%), however, brushed for more than 5 minutes. Finally, many of the participants (34%) bit their nails, while 27% did not bite their nails at all. A majority of the participants (39%) also indicated that they sometimes unknowingly bite their nails.

3.3. Attitude towards Attrition

Half of the participants (51%) sometimes grinded or clenched their teeth, while many of the participants (28%) indicated that they constantly grind or clench their teeth. Comparatively, a few of the participants (21%) indicated that they did not grind or clench their teeth, as illustrated in Fig. (1) below.

3.4. Attitude towards Erosion

In Table 5, the majority of the participants (43%) took carbonated or alcoholic drinks occasionally, a few of the participants (13%) rarely took carbonated or alcoholic drinks, while a small number (7%) took these drinks daily.

A few participants (4%) consumed citrus fruits daily, while most of the participants took citrus fruits either weekly or occasionally. More than half of the participants (56%) consumed acidic bedtime drinks and foods after tooth brushing whenever they felt hungry.

In terms of how frequently participants vomited, a few of them (10%) indicated that they do not vomit often, while the majority of the participants (67%) indicated that they vomited only when sick. Finally, as it is established that heartburn and indigestion cause tooth wear, many of the participants (45%) normally experienced it, while 40% experienced it sometimes. About a quarter (25%) experienced it after eating certain foods, 23% experienced it occasionally, and 15% experienced it whenever they were sick.

Table 5. Represents the stance of participants in relation to dental erosion.

| Variable | Frequency | Percentage (100%) |
|---|-----------|-------------------|
| 1. How frequently participants drank carbonated or alcoholic drinks | - | - |
| a. Daily | 7 | 7 |
| b. Weekly | 35 | 35 |
| c. Occasionally | 43 | 43 |
| d. Rarely | 13 | 13 |
| e. Never | 2 | 2 |
| 2. How many times did participants consume citrus fruits | - | - |
| a. Daily | 4 | 4 |
| b. Weekly | 47 | 47 |
| c. Occasionally | 46 | 46 |
| d. Rarely | 6 | 6 |
| e. Never | 0 | 0 |
| 3. How frequently participants took acidic bedtime drinks and foods after tooth brushing | - | - |
| a. Daily | 0 | 0 |
| b. Weekly | 41 | 41 |
| c. Whenever I feel hungry | 56 | 56 |
| d. Never | 3 | 3 |
| 4. How frequently participants vomited | - | - |
| a. Not Often | 10 | 10 |
| b. Sometimes after taking in meals. | 23 | 23 |
| c. Only when Sick | 67 | 67 |
| d. Never | 0 | 0 |
| 5. Participants who experienced heartburn or indigestion | - | - |
| a. Yes, I normally do | 45 | 45 |
| b. No, I don't | 15 | 15 |
| c. Sometimes I do | 40 | 40 |
| 6. How often do participants who experienced heartburn or indigestion | - | - |
| a. Always after eating | 22 | 22 |
| b. Sometimes after eating certain foods | 25 | 25 |
| c. Occasionally | 23 | 38 |
| d. Whenever I am sick | 15 | 15 |
| e. Rarely | 0 | 0 |

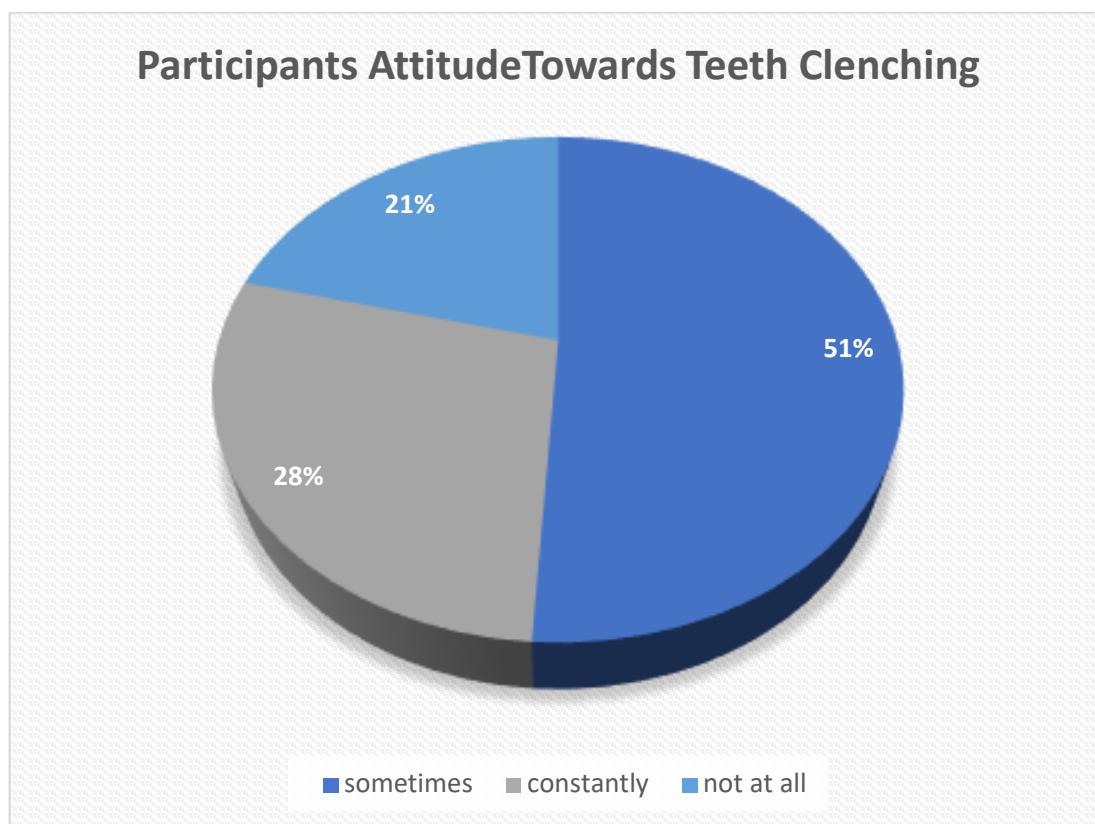


Fig. (1). Represents the perspective view of participants concerning dental attrition.

Table 6 compared the level of knowledge, awareness, and attitudes towards tooth wear across various age groups, genders, and education levels. For respondents between the ages of 18-30, 31-40, and 41-50, the majority (76.5%, 84.6%, and 50%) had low knowledge of tooth wear, while those between 51-60 had a larger proportion of participants (37.5%) with moderate knowledge. Those aged 61 and above were evenly split, with 36.4% having both high and low levels of knowledge of tooth wear. Regarding the level of awareness of tooth wear, respondents between ages 18-30, 31-40, 41-50, 51-60, and 61+ (64.7%, 69.2%, 72.8%, 70.3%, and 72.7%) had a

high level of awareness of tooth wear, respectively. An overwhelming majority of respondents aged 18-30, 31-40, 41-50, 51-60, and 61+ (70.6%, 92.3%, 90.9%, 95.8%, and 81.8%) had a high level of attitude towards tooth wear, respectively.

The outcome of gender and tooth wear revealed that, out of the 50 participants, each for males and females, more than half (62% and 52%) had poor knowledge of tooth wear. Also, the highest number of participants for males and females had a high level of awareness of tooth wear (66% and 74%). Almost all males and females (84% and 92%) showed positive attitudes towards tooth wear.

Table 6. Factors affecting Tooth Wear. The outcome of tooth wear and age didn't reveal any significant differences.

| Association between Age and Knowledge of Tooth Wear | | | | |
|---|--------------------|----------------|-----------|------------------------------|
| Variable | Level of Knowledge | | | |
| Age(years) | High N (%) | Moderate N (%) | Low N (%) | X ² |
| 18-30 | 3(17.6) | 1(5.9) | 13(76.5) | 21.597 0.006 *P ≤ 0.05 |
| 31-40 | 2(7.7) | 2(7.7) | 22(84.6) | |
| 41-50 | 6(27.3) | 5(22.7) | 11(50) | |
| 51-60 | 8(33.3) | 9(37.5) | 7(29.2) | |
| 61+ | 4(36.4) | 3(27.2) | 4(36.4) | |

(Table 6) contd....

| Association between Age and Knowledge of Tooth Wear | | | | | χ^2 | p-value | | | |
|---|---------------------------|-----------------------|-----------|----------|--------------------|---------|--|--|--|
| Variable | Level of Knowledge | | | | | | | | |
| Age(years) | High N (%) | Moderate N (%) | Low N (%) | | | | | | |
| Association between age and awareness of tooth wear | | | | | | | | | |
| - | Level of awareness | | | - | - | - | | | |
| 18-30 | 11(64.7) | 3(17.6) | 3(17.6) | 2.657 | 0.954 *P ≤ 0.05 | | | | |
| 31-40 | 18(69.2) | 3(11.5) | 5(19.2) | | | | | | |
| 41-50 | 16(72.7) | 4(18.2) | 2(9) | | | | | | |
| 51-60 | 17(70.8) | 5(20.8) | 2(8.3) | | | | | | |
| 61+ | 8(72.7) | 2(18.2) | 1(9) | | | | | | |
| Association between age and attitude towards tooth wear | | | | | | | | | |
| - | Level of Attitude | | | 7.306 | 0.121 *P ≤ 0.05 | | | | |
| | Positive N (%) | Negative N (%) | | | | | | | |
| 18-30 | 12(70.6) | 5(29.4) | | | | | | | |
| 31-40 | 24(92.3) | 2(7.7) | | | | | | | |
| 41-50 | 20(90.9) | 2(9.1) | | | | | | | |
| 51-60 | 23(95.8) | 1(4.2) | | | | | | | |
| 61+ | 9(81.8) | 2(18.2) | | | | | | | |
| Association between gender and knowledge of tooth wear | | | | | | | | | |
| Variable | Level of knowledge | | | χ^2 | p-value | | | | |
| Gender | High N (%) | Moderate N (%) | Low N (%) | | | | | | |
| Male | 10(20) | 9(18) | 31(62) | 1.030 | 0.598 *P ≤ 0.05 | | | | |
| Female | 13(26) | 11(22) | 26(52) | | | | | | |
| Association between gender and awareness of tooth wear | | | | | | | | | |
| - | Level of awareness | | | - | - | - | | | |
| Male | 33(66) | 8(16) | 9(18) | 2.210 | 0.331 *P ≤ 0.05 | | | | |
| Female | 37(74) | 9(18) | 4(8) | | | | | | |
| Association between gender and attitude towards tooth wear | | | | | | | | | |
| - | Level of Attitude | | | 1.515 | 0.218 *P ≤ 0.05 | | | | |
| | Positive N (%) | Negative N (%) | | | | | | | |
| Male | 42(84) | 8(16) | | | | | | | |
| Female | 46(92) | 4(8) | | | | | | | |
| Association between level of education and knowledge of tooth wear | | | | | | | | | |
| Variable | Level of knowledge | | | - | - | | | | |
| Education Level | High N (%) | Moderate N (%) | Low N (%) | - | - | | | | |
| Primary | 0 | 2(11.8) | 15(88.2) | 12.741 | 0.012 *P ≤ 0.05 | | | | |
| Secondary | 6(17.6) | 7(20.6) | 21(61.8) | | | | | | |
| Tertiary | 17(34.7) | 11(22.4) | 21(42.8) | | | | | | |
| Association between level of education and awareness of tooth wear | | | | | | | | | |
| - | Level of awareness | | | - | - | - | | | |
| Primary | 10(58.8) | 4(23.5) | 3(17.6) | 3.215 | 0.523 *P ≤ 0.05 | | | | |
| Secondary | 22(64.7) | 6(17.6) | 6(17.7) | | | | | | |
| Tertiary | 38(77.6) | 7(14.3) | 4(8.2) | | | | | | |
| Association between level of education and attitude towards tooth wear | | | | | | | | | |
| - | Level of Attitude | | | 10.663 | 0.05 *P ≤ 0.05 | | | | |
| | Positive N (%) | Negative N (%) | | | | | | | |
| Primary | 11(64.7) | 6(35.3) | | | | | | | |
| Secondary | 31(91.2) | 3(8.8) | | | | | | | |
| Tertiary | 46(93.9) | 3(6.1) | | | | | | | |

The majority of participants had poor knowledge of tooth wear across all educational levels (42.8%, 61.7%, and 88% for tertiary, secondary, and primary education, respectively). Additionally, none of the participants with primary education had a high level of knowledge of tooth wear. Furthermore, numerous participants from the various educational levels had a relatively high level of awareness (58.8%, 64.7%, and 77.6% for primary, secondary, and tertiary education, respectively). For primary, secondary, and tertiary education, almost all the participants (64.7%, 91.2%, and 93.9%) had positive attitudes towards tooth wear.

4. DISCUSSION

Apart from a few, most of the patients who visited the University of Ghana Dental School admitted that they had not heard of tooth wear and lacked knowledge about it. This is consistent with Richards and Al-Ashtal [19, 20], who were of the view that the average individual may not be knowledgeable about tooth wear and its causes. Additionally, they shared sentiments that, including laypersons, there was evidence of a lack of knowledge of dental tooth wear (especially erosion) even among some dentists and dental students. Adequate knowledge about tooth wear is paramount to promote oral health literacy, overall dental health, and the general well-being of the individual [21].

Most patients knew that oral health is as important as general health and that tooth wear may lead to pain and sensitivity. This confirms Gopi Chander and Venkat's studies, which indicated that patients suffering from tooth wear usually experience changes in the appearance of their teeth, pain or sensitivity, which can also affect their masticatory function and lead to the loss of occlusal vertical dimension [5]. However, about 42% of the patients thought that tooth wear was a form of cavity or tooth decay and did not know that it was an irreversible disease. This means that the patients who visited the University of Ghana Dental School Clinic had misconceptions and inadequate knowledge about tooth wear. This finding is contrary to the definition of tooth wear by Toufique *et al.* [22] and Mehta *et al.* [23], who emphasized that tooth wear is an irreversible, non-carious dental problem that leads to the loss of dental hard tissue. Furthermore, Lussi and Carvalho [24] also expressed that tooth wear is one of the most serious dental conditions, increasing the risk of irreversible loss of normal tooth tissue, resulting in reduced oral health and causing certain restrictions in the mouth.

Additionally, the majority of the patients who visited the Dental School Clinic thought that tooth wear was caused by bacteria instead of frequent consumption of acidic foods such as oranges, lemons, carbonated drinks, and alcohol. Only a few of the patients knew that grinding of teeth causes tooth wear; most thought otherwise. Aseri, *et al.* [25] opined that, among other factors, tooth wear is caused by a variety of intrinsic factors such as grinding, excessive vomiting, and gastric reflux, and extrinsic factors such as acidic drinks, fumes, and foods. In Oginni's

study [10], it was revealed that participants who consumed between 6 and 10 oranges per day during the season had erosion, particularly on the anterior surfaces, while Sun *et al.* [26] expressed that acidic beverages, xerostomia, and inappropriate brushing habits were also identified as risk factors for tooth wear. This is in contrast with a study carried out by Cheng *et al.* [27], who concluded that excessive intake of soft drinks could cause dental consequences, including dental erosion. The majority also admitted that they vomited only when they were sick and experienced indigestion and heartburn either after eating certain foods, occasionally, or whenever they were sick.

Furthermore, most of the patients knew that holding pins and threads between teeth is also a major cause of tooth wear. This result is consistent with Schlossman and Montanna [28], whose study revealed that certain habits such as smoking, holding a nail or needle between the teeth, nail biting, tearing of tooth threads, using tooth sticks, and even the use of an ill-fitting clasp or removable denture prosthesis can cause tooth wear, particularly dental abrasion. On the contrary, most of the patients did not know that brushing with a hard-bristle toothbrush, as well as brushing immediately after consuming acidic foods, may worsen tooth wear. The patients assumed it was a good habit to brush after eating food since it is well known that individuals should brush before bed. Oginni and Olusile [10] investigated certain habits that predispose one to tooth wear and found that brushing technique and toothbrush design were more relevant in causing tooth wear, especially dental abrasion. Litonjua *et al.* [29] also established that the kind of tooth wear known as cervical abrasion is caused by toothbrushes, toothpastes, and brushing techniques. According to Bartlett and Smith [30], tooth brushing involves hard bristles, the amount of force, frequency of brushing, and the abrasiveness of the toothpaste; hence, an individual could control tooth wear if knowledgeable. It is therefore recommended that patients and individuals be educated about their lifestyle, especially regarding the moderate consumption of acidic foods and proper brushing habits, to promote knowledge and reduce the prevalence of tooth wear. Few of the patients brushed their teeth twice daily; however, the majority of the patients either brushed once a day or occasionally twice a day. The attitude of brushing once a day or occasionally twice a day has opposite effects. Too much brushing, while preventing the development of caries, serves as a risk factor for abrasion. Even though very few of the patients used a combination of toothbrush, paste, and either chewing sticks or sponges, most of the patients used only a toothbrush and fluoride-containing toothpaste. Furthermore, it was encouraging to note that many of the patients used medium or soft-bristled toothbrushes for brushing. Soft-bristle toothbrushes reduce dental abrasion and are recommended to maintain good oral hygiene. Most of the patients brushed within 3 to 5 minutes, while a few brushed for more than 5 minutes. Only 15% of them brushed for the recommended time. This demonstrates

that many patients thought brushing their teeth for more than 3 minutes kept the teeth clean; however, this actually promotes dental abrasion. This is consistent with a study by Attin *et al.* [31], who suggested that more brushing may protect the teeth against dental caries but, at the same time, may cause tooth surface loss. The majority of these participants also either regularly or sometimes bit their nails in an attempt to reduce nail length. Biting the nails with the teeth tends to cause friction between the nails and the teeth, which can cause abrasion. This is consistent with a study carried out by Vyas [32] and Juneja *et al.* [33], who revealed that nail biting is a habit practiced by many but carries numerous health risks, including attrition of the incisors. It is therefore recommended that people be educated about the adverse effects of biting nails with their teeth and also on the proper techniques for brushing to avoid dental abrasion and promote overall oral health. Additionally, most of the patients sometimes ground or clenched their teeth, whether knowingly or unknowingly. This attitude is a negative behavior that tends to promote attrition.

Almost all of the patients (over 90%) admitted that prevention of tooth wear was better than curing it. They also knew that every individual needed to visit the dentist and attend regular checkups every 6 months. This is in line with Sancheti's [34] study on the need to visit the dentist. According to Dr. Sancheti, every individual should visit the dentist every six months to prevent not only tooth wear but also other dental issues that may arise. Patients who visited the Dental School Clinic preferred toothpaste that contained fluoride. This indicates that patients knew that using fluoride toothpaste was beneficial to the oral cavity. However, patients did not know that saliva also helps protect the teeth. This is contrary to Holbrook [35], whose study emphasized that saliva plays an important role in the prevention of tooth wear and advised that patients should chew sugar-free gum to encourage saliva flow, especially in patients with xerostomia without any underlying condition [35]. Schneider [36] also asserted that chewing sugar-free gum after eating or drinking stimulates saliva production, which neutralizes acid in the mouth and minimizes the possibility of teeth being decayed or worn away.

There was a significant association between the age of respondents and the level of knowledge of tooth wear. The elderly respondents demonstrated both high and low levels of knowledge of tooth wear. This was contrary to Abdullah *et al.*'s study [14], which mentioned that there is no significant association between age and knowledge of tooth wear.

It was established that females had higher knowledge and awareness of tooth wear and positive attitudes towards tooth wear; however, there was no significant association between gender and knowledge, awareness, and attitudes towards tooth wear. This is in contrast with the study carried out by Abdullah *et al.* [14], who found significant differences in the association between knowledge and practice with the gender of his subjects. This could be due to the limited sample size used

compared to the study by Abdullah *et al.*, which included 349 participants.

In this study, all the participants had some level of education. The majority of the participants had either completed secondary or tertiary education, with very few having only primary education. There was a significant association with knowledge and attitude of tooth wear, but no significant relationship with awareness, which is similar to Ibiyemi *et al.* [37]. This could be because those with higher educational backgrounds were more likely to practice good oral health.

5. LIMITATION

The study was limited to adult patients who visited the university's clinic; hence, it may not be a true representation of the general population. This limits the generalization of the findings, which may be biased. Recruiting participants, particularly adults, can be difficult. A larger sample size could have been used.

CONCLUSION

Generally, participants' level of knowledge of tooth wear was quite low. The attitudes towards tooth wear were generally positive, with a significant association between age and the level of knowledge of tooth wear. There was no significant association between gender and knowledge, awareness, or attitudes towards tooth wear. The level of education was seen to have a significant association with knowledge and attitudes towards tooth wear. The study also found that the majority of the participants used the term 'dental caries' instead of 'tooth wear'.

RECOMMENDATION

Overall, these findings highlight the urgent need for mass education on tooth wear in local dialects and, if appropriate, official translations and graphics to be made available to individuals in order to promote their knowledge formally and informally. Dentists should take time to explain to patients what tooth wear is, how it differs from dental caries, and how it can be prevented or its onset delayed. There should be regular tooth wear screenings for adult patients visiting the dental clinic, with follow-up appointments to monitor tooth wear progression and ensure timely interventions, promoting better oral health outcomes.

AUTHORS' CONTRIBUTIONS

The authors confirm their contribution to the paper as follows: P.C.A.: Conceptualization, Formal Analysis, Investigation, Resources, Writing-Review & Editing, Supervision, Project Administration; H.N.A.F.: Methodology, Writing-Original Draft Preparation, Writing-Review & Editing, Visualization, Software; D.D.K.A.: Investigation, Data Curation, Writing-Review & Editing, Supervision; H.W.: Investigation, Data Curation, Writing-Review & Editing, Supervision; J.S.: Conceptualization, Methodology, Writing-Review & Editing, Supervision; T.A.N.: Conceptualization, Methodology, Supervision, Writing-Review & Editing;

A.A.D.: Methodology, Investigation, Software, Writing-Original Draft Preparation; N.Q.-P.: Supervision, Project Administration. All authors reviewed the results and approved the final version of the manuscript.

ABBREVIATION

SPSS = Statistical Package for Social Sciences

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance was sought and approved from the Ethical and Protocol Review Committee of the Department of Community and Preventive Dentistry of the University of Ghana Dental School, Ghana. The study was approved with ID number CPPD/019/05/2023.

HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Those who agreed to participate signed a consent form.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the nurses and the entire staff of the University of Ghana Dental School Clinic (Korle-Bu Teaching Hospital) for their support.

REFERENCES

- [1] Abd Karim NB, Ismail NM, Naing L, Ismail AR. Tooth wear prevalence and sample size determination: A pilot study. *Malays J Med Sci* 2008; 15(4): 35-40. PMID: 22589636
- [2] Liu B, Zhang M, Chen Y, Yao Y. Tooth wear in aging people: An investigation of the prevalence and the influential factors of incisal/occlusal tooth wear in northwest China. *BMC Oral Health* 2014; 14(1): 65. <http://dx.doi.org/10.1186/1472-6831-14-65> PMID: 24902953
- [3] Tooth wear. 2022. Available from: <https://www.qld.gov.au/health-condition/mouth-and-dental-health/oral-health-conditions/tooth-wear>
- [4] Chan AKY, Tsang YC, Lai EHH, Chu CH. Tooth wear in older adults: A review of clinical studies. *Geriatrics* 2024; 9(1): 12. <http://dx.doi.org/10.3390/geriatrics9010012> PMID: 38247987
- [5] Gopi Chander N, Venkat R. An appraisal on increasing the occlusal vertical dimension in full occlusal rehabilitation and its outcome. *J Indian Prosthodont Soc* 2011; 11(2): 77-81. <http://dx.doi.org/10.1007/s13191-011-0066-9> PMID: 22654346
- [6] Crothers AJR. Tooth wear and facial morphology. *J Dent* 1992; 20(6): 333-41. [http://dx.doi.org/10.1016/0300-5712\(92\)90019-9](http://dx.doi.org/10.1016/0300-5712(92)90019-9) PMID: 1452872
- [7] Loomans B, Opdam N, Attin T, et al. Severe tooth wear: European consensus statement on management guidelines. *J Adhes Dent* 2017; 19(2): 111-9. PMID: 28439579
- [8] Kaidonis JA. Tooth wear: The view of the anthropologist. *Clin Oral Invest* 2008; 12(Suppl 1): 21-6. <http://dx.doi.org/10.1007/s00784-007-0154-8>
- [9] Bartlett D, Dugmore C. Pathological or physiological erosion - Is there a relationship to age? *Clin Oral Invest* 2008; 12(Suppl 1): 27-31. <http://dx.doi.org/10.1007/s00784-007-0177-1>
- [10] Oginni O, Olusile AO. The prevalence, aetiology and clinical appearance of tooth wear: The Nigerian experience. *Int Dent J* 2002; 52(4): 268-72. <http://dx.doi.org/10.1111/j.1875-595X.2002.tb00629.x> PMID: 12212814
- [11] Addy M, Shellis RP. Interaction between attrition, abrasion and erosion in tooth wear. *Monogr Oral Sci* 2006; 20: 17-31. <http://dx.doi.org/10.1159/000093348> PMID: 16687882
- [12] Bartlett DW, Fares J, Shirodaria S, Chiu K, Ahmad N, Sherriff M. The association of tooth wear, diet and dietary habits in adults aged 18-30 years old. *J Dent* 2011; 39(12): 811-6. <http://dx.doi.org/10.1016/j.jdent.2011.08.014> PMID: 21911033
- [13] Lee A, He LH, Lyons K, Swain MV. Tooth wear and wear investigations in dentistry. *J Oral Rehabil* 2012; 39(3): 217-25. <http://dx.doi.org/10.1111/j.1365-2842.2011.02257.x> PMID: 21923888
- [14] Abdullah NF, Noor SN, Roslan H. Attitude and awareness toward tooth wear among adults in Pulau Pinang. *Int J Public Health and Clin Sci* 2017; 4: 52-63. <http://dx.doi.org/doi.org/10.1063/1.4968863>
- [15] Mujere N. Sampling in research. Mixed Methods Research for Improved Scientific Study. IGI Global 2016; pp. 107-21. <http://dx.doi.org/10.4018/978-1-5225-0007-0.ch006>
- [16] Bhandari P. A note on survey research methods levels of measurement: Foundational basis for quantitative analysis of survey data. *Dhulaigiri* 2022; 16: 122-6. <http://dx.doi.org/10.3126/dsaj.v16i01.50982>
- [17] Simkus J. Cross-sectional study: Definition, designs & examples. 2023. Available from: <https://www.simplypsychology.org/what-is-a-cross-sectional-study.html>
- [18] Cochran WG. Sampling Techniques. (3rd ed.), New York: John Wiley & Sons 1977.
- [19] Richards W, Filipponi T, Roberts-Burt V. Mind the gap! A comparison of oral health knowledge between dental, healthcare professionals and the public. *Br Dent J* 2014; 216(4): E7. <http://dx.doi.org/10.1038/sj.bdj.2014.100> PMID: 24557409
- [20] Al-Ashtal A, Johansson A, Omar R, Johansson AK. Awareness and knowledge of dental erosion among Yemeni dental professionals and students. *BMC Oral Health* 2015; 15(1): 119. <http://dx.doi.org/10.1186/s12903-015-0103-x> PMID: 26449377
- [21] Holtzman JS, Atchison KA, Macek MD, Markovic D. Oral health literacy and measures of periodontal disease. *J Periodontol* 2017; 88(1): 78-88. <http://dx.doi.org/10.1902/jop.2016.160203> PMID: 27523517
- [22] Toufique H, Nisar N, Saadat S. Tooth wear and its related factors: Findings from a hospital-based study. *Pak Oral Dent J* 2017; 37: 459-64.
- [23] Mehta SB, Loomans BAC, Banerji S, Bronkhorst EM, Bartlett D. An investigation into the impact of tooth wear on the oral health related quality of life amongst adult dental patients in the United Kingdom, Malta and Australia. *J Dent* 2020; 99: 103409.

<http://dx.doi.org/10.1016/j.jdent.2020.103409> PMID: 32533998

[24] Lussi A, Carvalho TS. Erosive tooth wear: A multifactorial condition of growing concern and increasing knowledge. In: Lussi A, Ganss C, Eds. Erosive Tooth Wear: From Diagnosis to Therapy. Basel: Karger 2014; pp. 1-15.
<http://dx.doi.org/10.1159/000360380>

[25] Khan SDAA, Khan SD, Aljarullah AM, *et al.* Knowledge and attitude on tooth wear among Najran population, KSA. Bioinformation 2022; 18(10): 1029-35.
<http://dx.doi.org/10.6026/973206300181029> PMID: 37654841

[26] Sun K, Wang W, Wang X, Shi X, Si Y, Zheng S. Tooth wear: A cross-sectional investigation of the prevalence and risk factors in Beijing, China. BDJ Open 2017; 3(1): 16012.
<http://dx.doi.org/10.1038/bdjopen.2016.12> PMID: 29607073

[27] Cheng R, Yang H, Shao M, Hu T, Zhou X. Dental erosion and severe tooth decay related to soft drinks: A case report and literature review. J Zhejiang Univ Sci B 2009; 10(5): 395-9.
<http://dx.doi.org/10.1631/jzus.B0820245> PMID: 19434767

[28] Schlossman M, Montana M. Preventing damage to oral hard and soft tissues. Prevention Across the Lifespan: A Review of Evidence-Based Interventions for Common Oral Conditions. Colgate 2017; pp. 97-120.
<https://www.colgate.com/content/dam/cp-sites/oral-care/oral-care-center/global/article/pdf/2017-prevention-across-the-lifespan.pdf>

[29] Litonjua LA, Andreana S, Cohen RE. Toothbrush abrasions and noncarious cervical lesions: Evolving concepts. Compend Contin Educ Dent 2005; 26(11): 767-768, 770-774, 776 *passim*.

PMID: 16300231

[30] Bartlett D, O'Toole S. Tooth wear: Best evidence consensus statement. J Prosthodont 2021; 30(S1): 20-5.
<http://dx.doi.org/10.1111/jopr.13312> PMID: 33350551

[31] Attin T, Hornecker E. Tooth brushing and oral health: How frequently and when should tooth brushing be performed? Oral Health Prev Dent 2005; 3(3): 135-40.
PMID: 16355646

[32] Vyas T. Effect of chronic nail biting and non-nail-biting habit on the oral carriage of enterobacteriaceae. J Adv Med Dent Sci Res 2017; 5: 53.

[33] Juneja A, Juneja A, Sultan A. Nail Biting: A body focused repetitive behaviour case report. J Behav Health 2016; 5(1): 33-7.
<http://dx.doi.org/10.5455/jbh.20150826024242>

[34] Sanchez A. A visit to the Dentist every 6 months is something I must Insist! Int J Dent Med Sci Res 2021; 3: 242-3.

[35] Peter Holbrook W, Árnadóttir IB, Kay EJ. Prevention. Part 3: Prevention of tooth wear. Br Dent J 2003; 195(2): 75-81.
<http://dx.doi.org/10.1038/sj.bdj.4810331> PMID: 12881743

[36] Schneider S. The onset of dental erosions caused by acidic foods and drinks and its prevention. Doctor of Philosophy, Vilnius Universitetas 2023.
<https://epublications.vu.lt/object/elaba:192825781/>

[37] Ibiyemi O, Taiwo JO. Some socio-demographic attributes as covariates in tooth wear among males in a rural community in Nigeria. Ethiop J Health Sci 2012; 22(3): 189-95.
PMID: 23209353