

## Original Article

## The Impact of Tooth Wear on the Oral Health-Related Quality of Life of the Elderly in Ibadan, Nigeria

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## Abstract

**Background:** Tooth wear lesion, otherwise known as tooth surface loss, is an insidious cumulative and multifactorial condition causing irreversible destruction of tooth enamel and dentine. Over time this lesion can threaten the affected individual's Oral Health-Related Quality of Life (OHRQoL). OHRQoL entails interaction among oral health systems: social factors, psychological factors, and the rest of the body. Though, previous studies done decades ago also reported a high prevalence of tooth wear among the elderly in Nigeria, before now there has been no study on the impact of tooth wear types and severity on the OHRQoL of the elderly in this environment, which is necessary for their comprehensive management. The study was done to assess the impacts of tooth wear lesions on the Oral Health-Related Quality of Life of the elderly in Ibadan.

**Methodology:** It was a cross-sectional study, involving 1,200 elderly individuals. Using a multistage random sampling technique, participants were randomly selected from 2 Local Government Areas in Ibadan. Data were obtained using a structured interviewer-administered questionnaire and oral examination using the Simplified Tooth Wear Index, as well as Geriatric Oral Health Assessment Index. Data were analysed using descriptive statistics at  $p \leq 0.05$ .

**Result:** Out of these elderly participants with Tooth wear lesions, 667 (55.6%) had good Oral Health-Related Quality of Life and 552 (43.5%) had poor Oral Health-Related Quality of Life. Attrition and Abrasion were the most common 1,189(99.1%) and least 5(0.4%) types of tooth wear lesions respectively. The lesions were more severe on the posterior teeth than the anterior teeth and more on the lower than the upper teeth.

**Conclusion:** The majority of the elderly with Tooth wear lesions had good OHRQoL, as more of them had mild to moderate grade of tooth wear.

**Keywords:** Elderly; Tooth Wear; Oral Health-Related Quality of life (OHRQoL).

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**How to cite this article:** Ipeaiyeda OJ, Taiwo JO, Lawal FB. The Impact of Tooth Wear on the Oral Health-Related Quality of Life of the Elderly in Ibadan, Nigeria. Niger Med J 2023;64(3):327-336

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## Introduction

Tooth wear (TW) is a gradual and irreversible loss of tooth substance that accumulates with age, resulting from actions other than those which cause tooth decay or dental trauma<sup>1,2</sup>. Quality of life, on the other hand, depends on the degree to which an individual can enjoy the possibilities of life<sup>3</sup>. Oral Health-Related Quality of Life (OHRQoL) is a multidimensional construct that reflects, among other things, people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with their oral health<sup>4</sup>. As a result of increased life expectancy, the global median age is changing dramatically with more people living to older ages<sup>5</sup>. It was predicted that, by the year 2035, the elderly would constitute one in every four persons<sup>6</sup>. The four types of TW lesions are: Attrition, Abrasion, Erosion and Abfraction. Attrition is the physiologic wearing away of the tooth surface because of tooth-to-tooth contact with no foreign object intervening, usually affecting the incisal or occlusal surfaces of teeth<sup>7</sup>. Abrasion is the physical wear of a tooth surface through an abnormal mechanical process from foreign objects repeatedly introduced in the mouth<sup>8</sup>, commonly a V-shaped defect at the cervical area of the tooth<sup>9</sup>. Abfraction is the loss of tooth tissue from eccentric occlusal forces leading to compressive and tensile stresses at the cervical fulcrum area of the tooth<sup>10</sup>. Erosion is the loss of tooth surface by the chemical dissolution of enamel and dentine through the action of non-bacterial acid from dietary or gastric source<sup>11</sup>. When the process of tooth wear is excessive, it causes complications like; crown shortening, dentine hypersensitivity, tooth fracture, pulpitis, pulp necrosis, impaired mastication, temporomandibular disorder and poor aesthetics<sup>12,13</sup>. The elderly with impaired masticatory function tend to avoid foods that are difficult to chew, such as dietary fibers, fruit, and vegetables<sup>14</sup>. Reduction in intake of these food items has been associated with high risk of cardiovascular disease, due to the lipid-reducing capabilities of such foods in addition to the antioxidants in fruits and vegetables, resulting in malnutrition and immunosuppression<sup>15</sup>, and thereby reducing the quality of life of such elderly people. The presentation is more now because many people are now retaining natural teeth into their old age<sup>16</sup>. The study was done because, no previous study connects the impact of tooth wear among the elderly in Nigeria to OHRQoL, which provide the association between the elderly participant's self-perception of the impacts of tooth wear lesion and the dentist's examination findings. Therefore, the information obtained is essential for their holistic management, to achieve complete physical, psychological, and social well-being.

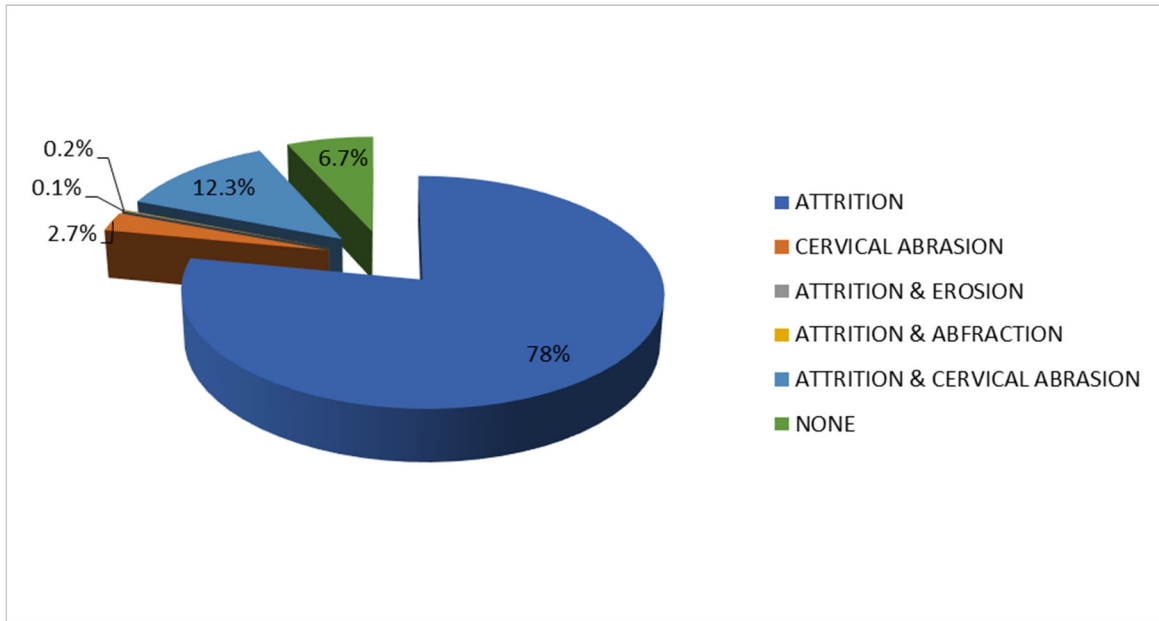
Materials and methods: Ethical clearance for the study was obtained from UI/UCH Ethical Review board (UI/EC/17/0275). In addition, informed consent was obtained from the participants before being recruited into the study. The study was a community-based cross-sectional study involving 1,200 elderly individuals, using a multistage random sampling technique. The first stage involved a random selection of two Local Government Areas (LGA) in Ibadan (Ibadan North and Akinyele) through a ballot system by an independent research assistant. The second stage involved a random selection of six wards, out of the 12 wards in each LGA in Ibadan, having in all 12 wards from the total number of 127 wards in Ibadan. The third and last stage involved the selection of the elderly in all the houses, within the chosen 12 wards. The target population was the elderly aged 65 years and above in Ibadan who fulfilled the inclusion criteria. Also, dentate elderly individuals or partially dentate individuals who had all four first permanent molar teeth and six upper and lower anterior teeth were targeted. Then, those who gave informed consent to participate in the study and met other inclusion criteria were recruited. The sample size was determined using Kish-Leslie's (1965) formula<sup>17</sup>, yielding a minimum sample size of 1,156; meanwhile, 1,200 elderly people were recruited. The research team consisted of; two dentists, two research assistants, two record clerks, and a statistician. Before the study, one day training was organized for the members of the research team on: instrument of data collection (questionnaire), assessment of tooth wear lesions, delivery of oral health education, and data entry management. Also, members were trained to ensure privacy and maintain a neutral tone when administering the questionnaire to the elderly participants. Data were obtained using a structured interviewer-administered questionnaire and by oral examination. They were interviewed and examined to investigate the pattern of tooth wear lesions and their impacts on the quality of life of the elderly. A pre-test study was done to validate the study instrument. The questionnaire was pre-tested among 30 elderly people selected by convenient sampling from Ibadan North-West Local Government Area, another LGA that was different from the LGA chosen for the main study. Validation of the questionnaire was done using

Cronbach's alpha statistical test. A value of 0.81 obtained showed that the instrument had good reliability. The inter-examiner kappa score was 0.84, while the intra-examiner kappa statistics score of the two examiners were 0.89 and 0.87, respectively. The interpretation was made according to the classification by Landis and Koch<sup>18</sup>. The questionnaire assessed the participant's socio-demography, medical history, and oral habits (dietary, social, and oral hygiene practices). Two trained and calibrated dentists conducted oral examinations on teeth dried with cotton wool rolls using gloved hands, dental mirrors, and Williams' periodontal probes. It was done outside the participant's house under natural light, with the participants seated on a chair. The investigators stood in front of the participants, while the record clerks stood beside the investigator. For the purpose of this study, the severity of TW was categorized into no TW, mild, moderate, and severe, using the Simplified Tooth Wear Index, which is graded into 0, 1, 2, and 3 (0= No wear into the dentine, 1= Dentine exposed for less than 1/3 of surface, 2= Dentine exposed greater than 1/3 of surface, 3= Exposure of pulp or secondary dentine)<sup>19</sup>. The impact of tooth wear on the quality of life was assessed using the Geriatric Oral Health Assessment Index (GOHAI) that had been validated in our environment<sup>20</sup>, which consists of 12 positive and negative items, with 5 Likert scale options. Responses were scored on a scale ranging from 1 to 5, reflecting 1 for the least score and 5 for the maximum score for each item (1= always, 2= often, 3= sometimes, 4= rarely, 5= never). Scores from the positively worded items (item numbers 3, 5, and 7) were reversed during data processing so that the directions of all responses were the same. GOHAI scale score was calculated by the sum of all values of responses to the 12 items for each participant, the summary score (ADD- GOHAI) ranging from 12 to 60<sup>21,22,23,24</sup>. In this study, the mean GOHAI scale score was calculated, a score above the mean indicated good Oral OHRQoL<sup>22</sup>, while a score below the mean depicted poor OHRQoL. Data were entered into Microsoft Excel, from where it was transferred into IBM Statistical Package for Social Sciences (SPSS, Version 23) for cleaning, coding, and analysis. The level of significance was set at  $p \leq 0.05$ . Univariate analysis was used to describe the participant's socio-demography (age, gender, occupation, level of education), oral habits and OHRQoL were summarized using mean and standard deviation. Bivariate analysis, Chi-square was used to assess the association between tooth wear lesions and OHRQoL, the severity of tooth wear and OHRQoL.

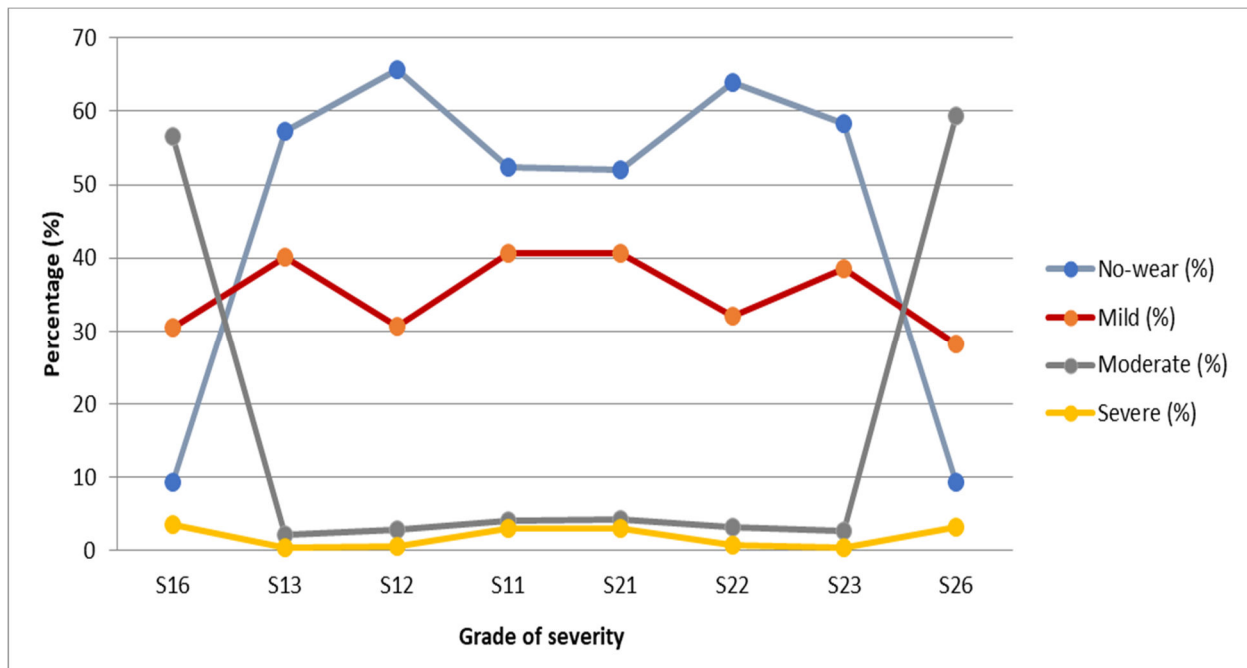
**Result:** This study showed that the prevalence of tooth wear lesions was 93.3% out of 19,200 teeth examined from 1,200 elderly participants in Ibadan. Attrition alone was found on 14,985(78%) teeth, Cervical abrasion alone was seen on 523 (2.7%). A combination of Attrition and Erosion was found on 31(0.2%), Attrition and Abfraction were seen on 11(0.1%) teeth. Attrition and Cervical abrasion were found on 237(12.3%), while 1,293(6.7%) teeth had no tooth wear.

Out of the elderly participants with tooth wear lesions, 667 (55.6%) had good OHRQoL, and 552 (43.5%) had poor OHRQoL.

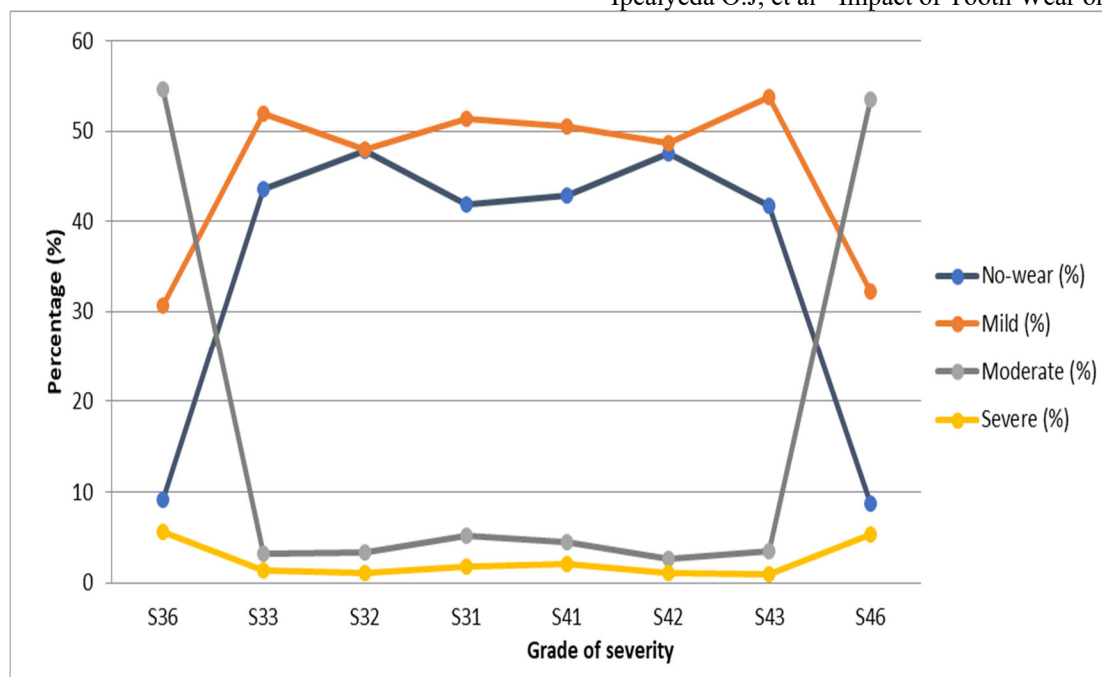
Seven percent (7%) of the participants had severe tooth wear on the anterior teeth, while 10.5% had severe tooth wear on the posterior teeth. Similarly, 10.3% of the participants had moderate tooth wear on the anterior teeth, while 59.7% had moderate tooth wear on the posterior teeth. Mild tooth wear (63.3%) was recorded more on the anterior teeth, as against 25.8% recorded for the posterior teeth. Some teeth had no tooth wear.



**Figure 1:** Prevalence of type of tooth wear lesions



**Figure 2:** Severity of tooth wear lesions in upper teeth



**Figure 3:** Severity of tooth wear lesions in lower teeth

**Table 1:** Impact of Tooth wear lesions on Oral Health Related Quality of Life

Tooth wear Lesions	Oral Health Related Quality of Life (OHRQoL)			
	Poor OHRQoL n (%)	Good OHRQoL n (%)	Total n (%)	p-value
Absent	6 (0.5)	5 (0.4)	11(0.9)	
Present	522 (43.5)	667(55.6)	1189(99.1)	f=0.550

**Table 2:** Relationship between Oral Habits and Tooth wear lesion (Attrition)

Oral habit which are risks to Attrition	Tooth wear (Attrition)		P-value
	Present n (%)	Absent n (%)	
<b>Bruxism</b>			
Yes	29(2.4)	0(0.0)	
No	1160(96.7)	11(0.9)	f=0.763
<b>Extreme stress at work</b>			
Yes	841(70.1)	7(0.6)	
No	348(29.0)	4(0.3)	f=0.740
<b>Chewing hard substances</b>			
Yes	1146(95.5)	11(0.9)	
No	43(3.6)	0(0.0)	f=1.000
<b>Bite on hard object</b>			
Yes	644(53.7)	4(0.3)	
No	545(45.4)	7(0.6)	f=0.363

f= Fishers Exact

**Table 3:** Relationship between Oral Habits and Tooth wear lesion (Erosion)

Oral habit which are risks to Erosion	Tooth wear (Erosion)		P-value
	Present n (%)	Absent n (%)	
<b>Chewing vitamin C or Aspirin</b>			
Yes	5(0.4)	369(30.8)	f=0.034*
No	2(0.2)	824(68.7)	
<b>Involuntary regurgitation</b>			
Yes	1(0.1)	185(15.4)	f=0.703
No	6(0.5)	1008(84.0)	
<b>Taking soft drink and juices</b>			
Yes	6(0.5)	1037(86.4)	f=1.000
No	1(0.1)	156(13.0)	
<b>Alcohol</b>			
Yes	7(0.6)	928(77.3)	f=0.359
No	0(0.0)	265(21.1)	
<b>Taking soft drink directly from bottle</b>			
Yes	2(0.2)	410(34.2)	f=1.000
No	5(0.4)	783(65.3)	
<b>Swish acidic drink</b>			
Yes	4(0.3)	729(60.8)	f=1.000
No	3(0.3)	464(38.7)	
<b>Siphon fuel with mouth</b>			
Yes	1(0.1)	131(10.9)	f=0.559
No	6(0.5)	1062(88.5)	
<b>Mouth rinsing with water after taking drinks</b>			
Yes	5(0.4)	876(73.0)	f=1.000
No	2(0.5)	317(26.4)	
<b>Use straw to take soft drink</b>			
Yes	6(0.5)	905(75.4)	f=1.000
No	1(0.1)	288(24.0)	

f= Fishers Exact

**Table 4:** Relationship between Oral Habits and Tooth wear lesion (Cervical Abrasion)

Oral habits which are risk factors for Cervical Abrasion	Cervical Abrasion		P-value
	Present n (%)	Absent n (%)	
<b>Caffeine addiction</b>			
Yes	4(0.3)	7(0.6)	f=1.000
No	470(39.2)	719(59.9)	
<b>Smoking</b>			
Yes	29(2.4)	37(3.1)	f=0.441
No	445(37.1)	689(57.4)	
<b>Stains on your teeth</b>			
Yes	49(4.1)	58(4.8)	f=0.178
	425(35.4)	668(55.7)	
<b>What do you use in cleaning your teeth</b>			
Brush	293(24.4)	443(36.9)	

Chewing stick	36(3.0)	56(4.7)	0.962
Both	145(12.1)	227(18.9)	
<b>Type of toothbrush</b>			
Soft	175(14.6)	283(23.6)	
Medium	211(17.6)	313(26.1)	0.772
Hard	88(7.3)	130(10.8)	
<b>Frequency of brushing</b>			
Once	290(24.2)	467(38.9)	
Twice	177(14.8)	245(20.4)	0.399
More than twice	7(0.6)	14(1.2)	
<b>Tooth cleaning technique</b>			
Horizontal	162(13.5)	181(15.1)	
Vertical	195(16.3)	381(31.8)	0.001*
Both	117(9.8)	164(13.7)	
<b>How do you brush</b>			
Gently	319(26.6)	471(39.3)	
Vigorously	155(12.9)	255(21.3)	f=0.211

f= Fishers Exact

## Discussion

This study showed a very high burden of tooth wear lesions among the elderly participants. This finding corroborates the long-established reports that, tooth wear lesions are very common among the elderly<sup>25</sup>.

Attrition was the most common lesion in this study<sup>22</sup>. High prevalence of attrition was attributed to the following practices: the habit of crushing bone, eating hard food substances, rigorous mastication of more fibrous diet and use of chewing sticks for oral hygiene care routinely. These contributing factors were strongly evident in this study as 95.5% of the participants with attrition chewed hard food substances, while 53.7% had the habit of biting hard objects. It was obvious that the high prevalence of attrition in this study was not due to bruxism, as only 2.4% of the participants experienced it. This was supported by an opinion expressed by Johansson et al., 2008, that tooth wear status was not predictive of on-going bruxism<sup>24</sup>. However, it was noted by Liu et al., 2014, that habits of bruxism developed unusual wear patterns of occlusal surfaces<sup>2</sup>. This was supported by Carlsson, 2002, who had reported that people who engaged in parafunctional habits could experience up to four times more tooth wear than those without this habit<sup>25</sup>. Khan et al., 1998, agreed that tooth wear progressed faster in bruxers than in non-bruxers<sup>26</sup>. Among the participants with attrition in this survey, extreme stress at work was reported by 70.1% of them. Lurie et al., 2007, noted that stress can induce parafunctional habits, like clenching and grinding of teeth<sup>27</sup>. Cervical abrasion was the second commonest type of tooth wear in this study, as 2.7% of the participant's teeth had it alone. A low prevalence of cervical abrasion (2.3%) of participants was similarly reported by Taiwo et al.<sup>22</sup>. This may be because the two studies were carried out in the same city, with participants of similar attributes. A survey of factors associated with cervical abrasion was conducted by Oginni and Olusile in 2002<sup>23</sup>. The low prevalence of abrasion in this study may be because many of the participants were highly educated (had tertiary education) and were skilled workers, as such engaged in less oral habits that cause abrasion. Other risk factors causing cervical abrasion that were investigated in this study included tooth cleaning technique, teeth cleaning force, frequency of tooth cleaning and the texture of the toothbrush's bristle. It was observed that there was a significant association between the tooth cleaning technique and cervical abrasion. This is attributable to incorrect tooth brushing method engaged by the participants. This is in tandem with the submission of L. A. Litonjua et al., 2003<sup>28</sup>. Also, W.B Gillete and R.L Van House observed that wrong tooth brushing method has detrimental effect with the potential of causing abrasion<sup>29</sup>. William Addy and Hunter in 2003 also submitted that incorrect or vigorous tooth brushing with toothpaste can cause cervical abrasion<sup>30</sup>. In this study, the prevalence of teeth with dental erosion was 0.2%, which occurred in combination with attrition. Taiwo et al., 2005, reported that erosion had a prevalence of 1.1% among the elderly in Ibadan South East<sup>22</sup>. The study by Ibiyemi et al., 2010, of adult males, aged 20 years and above in Igbo- Ora

showed that Erosion had a prevalence of 10.4%<sup>31</sup>. Oginni and Olusile, 2002, in a study of adult and elderly patients in Ile-ife, reported a prevalence of 1.3%<sup>23</sup>. This study examined the various oral habits that could cause erosion; consumption of alcohol and acidic drink, ingestion of drinks directly from bottle, chewing of vitamin C or Aspirin, swishing acidic drink on teeth, siphoning fuel with mouth and intake of acidic fruit without rinsing mouth. This study had a statistically significant association between chewing Vitamin C or Aspirin and erosion. It is a known fact that chewing vitamin C or Aspirin causes demineralization of teeth due to their low pH, this is supported by Bartlett et al., 2011<sup>11</sup>.

**Concerning location and severity:** This study showed that TW was more severe in the mandibular (lower) teeth than the maxillary teeth. Also, TW was more in the posterior teeth than the anterior teeth. This pattern of the presentation was like the study conducted by Taiwo et al., 2005<sup>22</sup>. This may be because the participants for both studies were from the same environment (Ibadan city), practicing similar oral habits and possibly sharing similar genetic composition. However, this was different from the report of Liu et al., 2014<sup>2</sup>, who investigated aging people in China and reported the severity of tooth wear that, the incisors and canines showed greater wear than molars, and molars showed greater wear than premolars in both the maxillary and mandibular dentitions. In this study, in the upper anterior teeth, severe TW was the least occurred grade of the four grades of severity, followed by moderate TW, then mild TW, no wear into the dentine was the most common lesion. In the lower anterior teeth, severe TW was the least occurred grade of the four grades of severity, followed by moderate TW, then no wear into the dentine, while mild TW was the most common lesion. In both the upper and lower posterior teeth, severe TW was the least common grade, followed by no wear into the dentine, then mild TW, while moderate TW was the most common grade.

The relationship between quality of life and health is bi-directional. The quality of life of a person may affect the person's health and daily activities<sup>32</sup>, as the health of the individual can in turn affect the person's quality of life and activities<sup>33</sup>. Lawal et al., 2015<sup>14</sup>, stated in their studies that OHRQoL measures give an alternative approach to evaluate oral health status in a way that priorities its effect on lifestyles. The impact of a disease condition on quality of life should be considered when assessing health status. This study discovered that the majority (55.6%) of the elderly participants with TW had good Oral OHRQoL, while the remaining 43.5% had poor OHRQoL. In other words, Tooth wear lesions diminish OHRQoL. This agrees with the submission of Papagianni et al., 2013<sup>15</sup>, that patients with tooth wear have impaired OHRQoL compared with healthy control. People with TW lesions have impaired OHRQoL in the form of physical pain, disruption of psychology, functional limitations, and social disability. Rodriguez et al., 2013<sup>16</sup>, in their study, reported that Pathological TW had significant adverse effect on the quality of life of patients. Vargas-Ferreira et al., 2010<sup>17</sup>, noted that tooth Erosion of low severity did not have any significant negative impact on the children's perception of oral health.

## Conclusion

The prevalence of tooth wear lesions is still very high among the elderly in this environment, where Attrition was the commonest TW in this study, followed by Abrasion, then Erosion and Abfraction was the least occurred. The severity of TW was more on the posterior teeth than the anterior teeth. A similar and decreasing order of severity of TW existed in the upper and lower posterior teeth, ranging from moderate grade, to mild, to no wear, into the dentine, then severe grade. A significant association existed between chewing Vitamin C or Aspirin and Erosion among the elderly participants, also, between tooth cleaning technique and Cervical Abrasion. The majority of the elderly participants with TW had good Oral Health-Related Quality of Life in this study, though TW undermines the OHRQoL of Life of some participants.

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