TOOTH WEAR AMONG ADULTS ATTENDING DENTAL CLINICS IN DAR ES SALAAM, TANZANIA

By

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance the dissertation entitled "**Tooth wear among adults attending dental clinics in Dar es Salaam, Tanzania"** in fulfillment of the requirements for the degree of Master of Dentistry (Restorative Dentistry) of Muhimbili University of Health and Allied Sciences.

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ABSTRACT

BACKGROUND

Tooth wear is the non-carious gradual loss of tooth surface, classified as attrition, abrasion, erosion. Risk habits related to tooth wear include clenching, tooth grinding, unilateral chewing, chewing bones, frequent use of citrus fruits/juice, frequent vomiting and repeated heartburn.

OBJECTIVE

To assess tooth wear in adults dental patients in Dar es Salaam, Tanzania by analyzing their habits as related to tooth wear and determining their awareness on tooth wear, its prevalence, types of tooth wear, teeth affected, and extent of tooth wear.

MATERIALS AND METHODS

This descriptive cross-sectional study involved 316 participants selected from patients attending five dental clinics between August to November 2009, in Dar es Salaam. A questionnaire was administered to assess awareness and habits related to tooth wear, and tooth wear measured clinically. The data were analyzed using SPSS version 13 and statistical level of significance was $p < 0.05$.

RESULTS

Overall 39.1% of subjects were aware on tooth wear. Awareness on causes and outcome was 39.5% and 26.4% respectively. Risk habits to tooth wear most frequently reported include unilateral chewing, chewing bones, and use of citrus fruits respectively. More females reported risk habits than males. Thirty percent of respondents using horizontal movement to brush their teeth and few (7.6%) reported using excessive force during brushing. The prevalence of tooth wear was 41.8%. Patients in age group 18-40 years had lower prevalence of tooth wear in both males and females compared to those who were aged 41+ years. Attrition was most prevalent type of tooth wear of which molars were most affected followed by incisors, canine and premolars respectively. Incisal/occlusal was most involved site in all

types of teeth. Enamel had higher scores in all levels of tooth wear than dentine while 6.2% of teeth had dentine exposure.

CONCLUSION

Prevalence of tooth wear was 41.8% of which attrition was observed to rank high. Tooth surface most affected was incisal/occlusal with molars having more wear than other tooth types. Enamel was frequently involved than dentine. Awareness on tooth wear among participants was low. Risk habits frequently reported were chewing bones, unilateral chewing, and use of citrus fruits/juice respectively.

RECOMMENDATIONS

1. There is a need to raise public awareness on causes and risk habits related to tooth wear.
2. There is a need to develop a universally acceptable tooth wear index that will be able to determine prevention and treatment need
3. There is a need of more studies on tooth wear using much bigger sample sizes to be conducted to in Tanzania
4. An item of tooth wear to be included in Oral Health Survey in Tanzania.

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LIST OF ABBREVIATIONS

TW	Tooth Wear
TWI	Tooth Wear Index
TS	Tooth Surface
C	Cervical
I	Incisal
O	Occlusal
B/F	Buccal/Facial
P/L	Palatal/Lingual
MUHAS	Muhimbili University of Health and Allied Sciences
MNH	Muhimbili National Hospital
HC	Health Centre
MDent	Master of Dentistry
DDS	Doctor of Dental Surgery
U.S.A	United States of America
U.K	United Kingdom

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DEDICATION

"Mkamate sana elimu, usimwache aende zake,
mshike maana yeye ni uzima wako"
Mithali 4:13

"Take firm hold of instruction. Do not let her go.
Keep her, for she is your life"
Proverb 4:13

This work is dedicated to
my beloved wife
Dr Mboka J Kilasara

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Dar es Salaam, May 2009 Deogratias Barnabas

CHAPTER ONE

1.0 Introduction

1.1 Background

Tooth wear is non carious gradual loss of tooth surface, that can be a result of physiological or pathological tooth wear [1]. Physiological tooth wear is normal and occurs throughout the lifetime of a dentition in function. Older individuals are expected to have more tooth wear when compared to younger individuals [2]. Pathological tooth wear is the unacceptable level of loss of tooth surface for a particular age group [1].

1.2 Causes of Tooth Wear

Common causes of tooth wear include para-functional habits as in bruxism (other para-functional habits include clenching, unilateral mastication, hand-on-chin posture, chewing gum, nail biting, pipe smoking by holding it between teeth) excessive forces as in tooth brushing or frequent consumption of acidic foods and from diseases that cause high acidic levels in stomach. The extent of tooth wear will vary from individual to individual depending on the causative agent.

1.3 Types of tooth wear

Types of tooth wear include attrition, abrasion, and erosion occurring either in isolation or in combination [3].

1.3.1 Attrition

Attrition occurs when a tooth comes in contact with opposing tooth during functional movements such as chewing or para-functional movements such as bruxism [4]. In this case, wear starts as soon as tooth erupts in oral cavity and reaches its functional position [5]. Certain non-functional and functional oral and extra oral habits are associated with attrition. The non-functional habits either cause teeth to make contact and grind each other like in bruxism, clenching and functional habit that causes tooth wear include unilateral chewing.



Figure 1. Shows attrition on occlusal surfaces of the mandibular teeth of a 28-year-old female who attended at Muhimbili National Hospital dental clinic

1.3.2 Abrasion

Dental abrasion is the loss of tooth structure by mechanical forces from a foreign element. If this force begins at the cemento-enamel junction, then progression of tooth loss can be rapid since enamel is very thin in this region of the tooth. Once past the enamel, abrasion quickly destroys the softer dentin and cementum structures. Causes of abrasive tooth wear include inappropriate brushing and type of toothbrush used [6-8]. Tooth brushing if not properly done especially when too much force, or plastic brush with hard bristles is used may result in V shaped wear on cervical areas of the culprit teeth [9]. The use of toothpicks and dental floss, and the use of removable partial denture frequently set in and removed from the mouth [7]. The use of hard food substances like chewing uncooked rice or bones can cause abrasion. Other causes of dental abrasion include use of abrasive toothpaste [6], or other materials used to clean teeth such as charcoal and ashes.

1.3.3 Erosion

Dental erosion, is the irreversible loss of tooth structure that results from extrinsic or intrinsic acid sources or both [10]. The main sources of extrinsic acid are acidic foods and carbonated drinks. Use of these food substances lowers the pH level of the mouth and causes demineralization of the teeth and prone to be eroded. Frequency rather than total intake of

acidic juices is a greater factor in dental erosion. In contrast with extrinsic erosion, intrinsic dental erosion occurs when gastric acid from the stomach comes in contact with teeth [10]. This occurs in people with conditions that promote chronic vomiting such as anorexia nervosa, bulimia, and alcoholism and to a lesser extent pregnancy [11]. Patients with gastro-esophageal reflux disease that results in gastric acid re-entering the oral cavity may also present with dental erosion.

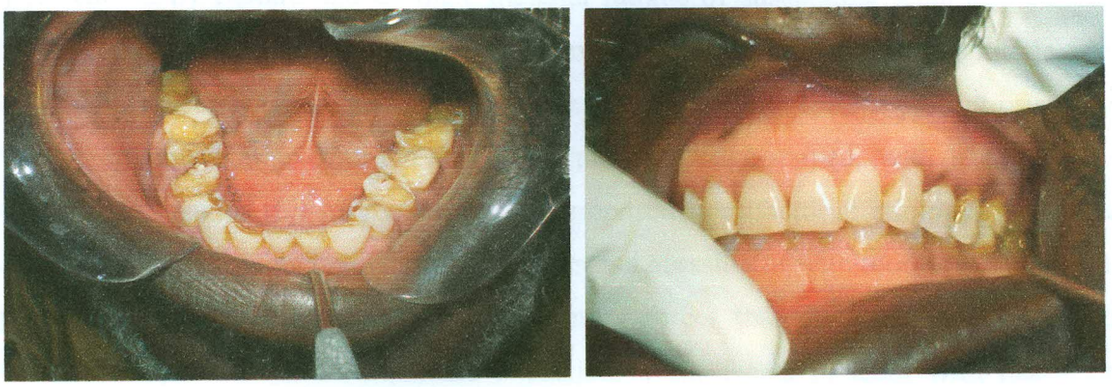


Figure 2. Shows multiple erosion lesions on occlusal surfaces of the mandibular teeth of a 65-year-old male who attended Muhimbili National Hospital dental clinic with complaint of sensitivity. The right picture shows the buccal surfaces of maxillary teeth of same patient.

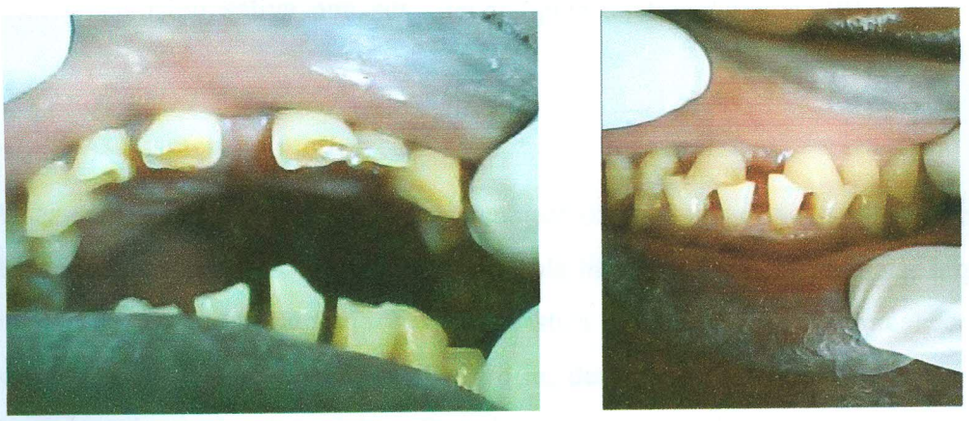


Figure 3. Shows multiple erosion lesions on occlusal surfaces of the upper and lower anterior teeth of a 45-year-old male. The right side pictures shows a patient in occlusion where anterior teeth bite edge to edge.

1.3.4 Abfraction

Abfraction is loss of tooth surface at the cervical areas of teeth caused by tensile and compressive forces during tooth flexure [10]. The term abfraction was proposed by Grippo in 1991 to describe the pathologic loss of both enamel and dentin caused by biomechanical loading forces. He stated that the forces could be static, such as those produced by swallowing and clenching; or cyclic, as in those generated during chewing action. The abfractive lesions were caused by flexure and ultimate material fatigue of susceptible teeth at locations away from the point of loading. The breakdown was dependent on the magnitude, duration, direction, frequency, and location of the forces [7]. Abfraction lesions present primarily at the cervical region of the dentition and are typically wedge-shaped, with sharp internal and external line angles [6]. Moreover, studies proposed multifactorial etiology, with erosion as the primary etiology in conjunction with stress and abrasion or with toothbrush abrasion as the primary etiologic factor [9]. Strong masticatory forces that results into cuspal flexures at cervical margin can cause traumatic occlusion. Wear facets in teeth with heavy occlusal contact was observed in teeth with gingival recession, however Kundapur [59] did not find any association of tooth wear with gingival recession. Other factors associated with abfraction include occlusion, saliva, age, sex, diet and parafunctional habits [30]

1.4 Assessment of tooth wear

Assessment of tooth wear has been a subject of discussion by many researchers and to date there is no consensus on a single reproducible index [12]. The indices used, grade the severity of wear by recording the surface characteristics of teeth with a numerical score. However, all of these indices have a common feature in, describing and quantifying the amount of hard tissue loss that is the size of the affected area is a proportion of the sound surfaces and /or the depth of tissue loss is expressed as a degree of dentine exposure [2]. The percentage of dentine exposure in a given population may be useful but it ignores the impact of tooth wear on enamel. For dentine to become exposed the enamel overlying it must also have been lost. Many indices in current use [12] focus on the outcome of the recording of the degree of

involvement of dentine (exposed dentine) and often ignore the effect on enamel [2]. Profilometry is the most accurate method to measure tooth wear, but this would be inappropriate for assessing the prevalence in a large sample of the population because the time needed for scanning would be impractically long [13]. A more new tooth wear index has been introduced recently and measures wear in both enamel and dentine [14].

1.4.1 Tooth wear indices

Tooth wear can be measured by quantitative and qualitative, however an index that will be universally accepted and that can determine both preventive and treatment need still to be developed. Quantitative methods tend to rely on objective physical measurements, such as depth of groove, area of facet or height of crown while qualitative methods, rely on clinical descriptions, such as mild, moderate or severe [12]. Quantitative and qualitative methods typically utilize grading or scoring systems designed to identify increasing severity or progression of a condition; these are described as indices and are usually numerical. Its application is useful for research into the etiology, prevention and monitoring of a condition, essentially being an epidemiological and clinical tool [12].

Most researchers have been trying to develop an ideal index that will be simple to understand and use, clear in its scoring criteria and be demonstrably reproducible. Eccles and Smith & Knight, are the pioneers of current Tooth Wear indices, other indices that followed are either modification of Eccles' Erosive Wear Index or Smith and Knight Tooth Wear Index [12]. The most recently used index is the exact wear index, in which the wear of enamel and dentine are recorded separately [14]. Most early indices aimed at assessing the need for operative intervention; however, preventive intervention was minimal as most indices assessed enamel wear by a single grade. The criteria used by Fares et al. [14] to assess tooth wear can be used to determine the preventive and curative need.

1.5 Effects of tooth wear

If tooth wear is unattended, it may result into reduced masticatory efficiency, cheek biting, increased tendency to tooth decay, tooth sensitivity and TMJ problems [15]. These effects are

difficult to manage and may require long-term intervention and use of restorative dental appliances like metal or ceramic crowns.

1.6 Management

Dentists are often the first health professionals to diagnose tooth wear, however; its management may require a multidisciplinary approach including physician, general dentist, prosthodontist, orthodontist and gastroenterologist [16]. Management of tooth wear in most cases is based on the level of tooth destruction and type of destruction. It ranges from no treatment (monitoring and evaluation) preventive measures to restoration, with use of expensive dental appliances that require specialized laboratory facilities.

Although tooth wear is increasingly recognized to be a problem [17], it is difficult to predict which individuals will be affected and true prevention is therefore difficult to achieve. Prevention by limiting further tooth wear in individuals already found to be affected by this condition is thus primary. Prevention requires an understanding of the etiology and recognition of early signs and symptoms [18]. Effective prevention of further tooth wear must also include patient education, early detection and intervention by dental health professional is of the utmost importance. Use, of fluoride toothpastes and mouth rinses are encouraged because erosive wear have been shown to be prevented by use of fluoride [19]. Fluoride toothpastes have a role to play in reducing demineralization and promoting re-mineralization of enamel [20]. Use of sealant, bonding agents, and vanishes to prevent or reduce wear has been suggested [21].

2.0 Literature review

2.1 Awareness on tooth wear

Awareness of tooth wear by the public is still not widespread [17]. In a survey in England, Lussi et al. [17], reported that only 34% of children surveyed were aware of tooth erosion and

only 8% remembered it to be mentioned by their dentist. Seligman et al [22] in the U.S. when studying dental attrition and associated factors reported awareness of bruxism to be 23% in both adults and teenagers. This shows that majority of the public are not aware on the causes of tooth wear. Barbour and Rees [11] insisted that the most effective means of reducing and preventing tooth wear is by public education. Wickens [18] went further by saying that effective prevention must involve patient education, early recognition, dietary and toothbrushing advice (technique and timing of brushing), fluoride (patient and/or professional application) dentifrice and mouthwash, control of further tooth wear by careful monitoring of tooth structure (serial casts, photos and the use of indices). Wickens [18] also commented that the media has influence in raising people's awareness. Since almost all of the causes of tooth wear are habitual, awareness of the public will help people to regulate themselves, change unwanted habits, and seek medical help early in case of need.

2.2 Related factors

One of the known documented factors related to tooth wear is age. Reported older individuals have more tooth wear compared to younger ones [8, 23-26]. However, some studies did not report any association between age and tooth wear [22, 25].

Various studies have indicated that tooth wear is related to sex and males have significant more wear compared to females [26, 27]. The observed difference is thought to be due to males having stronger masticatory forces as compared to females, [28]. However some studies do not indicate any differences between sexes [29].

Tooth brushing behavior especially horizontal movement and excessive brushing forces have been associated with cervical abrasion. Brushing technique, the groups of teeth brushed, the stiffness of the bristles, the age of the brusher, and also individual brushing habits have been extensively studied in the laboratory and suggested to cause cervical tooth wear [6], however human studies have not been able to support these findings. Some studies indicate that posterior location of teeth, stressful occlusion and class I malocclusion contribute to cervical wear [30]. Pegararo et al [25] found no association between cervical lesion with age, sex, parafunctional habits and unilateral chewing.

Parafunctional habits like bruxism, clenching, unilateral chewing, finger and nail biting are common among adults [31]. Studies indicate that prevalence of bruxism range from 4% to 23% and clenching from 3% to 40% [22]. Taiwo et al., [26] suggested that common habits such as crushing of bones contribute to tooth wear. One study by Milosevic et al [32] indicated crushing of bones is positively associated with tooth wear.

Studies indicate people who used fizzy drinks, fruit juices or acidic beverages frequently have erosive tooth wear [33, 34]. It is advised not to brush immediately following use of such products because, brushing will wear the softened dental surface [18] instead one have to has to wait for 30 minutes, a period during which tooth re-harden again with the help of the buffering effect of saliva [2, 23].

2.3 Prevalence and types of tooth wear

Prevalence of tooth wear in adults ranges from as low as 7.7% in 26-30 yrs old [35] to 92.8% in elderly aged 65 yrs and above [26]. This variation may be attributed to different indices and methods used to assess tooth wear and/or may reflect the true variation between different studies. Some studies have used indices that focus on specific types of wear like erosion [27, 34], attrition [22, 36, 37], abrasion, [38, 39] and a few assess the combination of two or a combination of the three types of tooth wear [26, 40]. Studies, reporting prevalence of tooth wear were collected from convenient populations such as hospital [8, 26, 40, 41], military officers [42], college [4, 14] and some community based [8, 35].

2.4 Tooth types and surfaces affected by tooth wear

Many studies [14, 22, 29] indicate that, all tooth types and all tooth surfaces visible in the mouth are prone to tooth wear, however incisor/occlusal surface have been reported to have more tooth wear. Different studies use different indices, some indices describe tooth wear only on certain surfaces such as incisal & occlusal [43] while other describe tooth wear on cervical surfaces [6, 24]. Few studies focus on specific types of teeth [44].

2.5 Extent of tooth wear

Tooth wear into the enamel or dentine is often measured by tooth wear indices. In exception of few studies [14, 45] almost all other studies award one score in enamel wear and multiple scores in dentine wear. The main reason is that most of the early indices aimed at assessing the need for operative intervention and are therefore more repeatable at the severe levels of dentine involvement. Fares et al [14] gave multiple scores in enamel as well as in dentine, in order to help clinicians or researchers to plan for prevention as well. For the majority of the population, any wear on teeth is often limited to enamel, and dentine involvement only occurs in a relatively small proportion of the population. Wear in enamel, was reported to be common in all subjects in 18-30 yrs adults by Fares et al [14] however, other studies indicated wear in enamel was common in most subjects like in 98.0% of 16 yrs old [3], as in 86% of 12-18yrs old [46], as in 29.2% of 16-73 yrs old adults [4], and as in 26.55% of 12 yrs old [29].

CHAPTER TWO

3.0 Statement of the problem

Worldwide studies indicate that tooth wear is common in adults [4, 24-26, 38, 40], however, prevalence of tooth wear among adults in Tanzania has not been established.

Observations indicate that, patients presenting at the dental clinic with tooth wear seek treatment at a late stage. Management of these patients in most instances entails rehabilitative measures that are expensive and unaffordable by most Tanzanians, and as a result, extraction becomes the cheapest alternative for the relief of pain.

Tanzania being a developing country with merger resources directs most of its resources to life threatening health conditions; as a result oral health delivery system receives a small proportion of resources that may also not be enough for the management of tooth wear.

Raising public awareness on the causes, outcome, and prevention of tooth wear, and as well as determining those with tooth wear is the key to succeed in prevention of further tooth wear. Prevention of tooth wear is preferable to restoration as the latter is often extensive, expensive and carries with it a lifetime commitment to maintenance and further restorative procedures. Assessing tooth wear awareness, screening and early diagnosis is an alternative cheaper method that will reach majority of people with and without tooth wear, before embarking on preventive strategies in-order to prevent occurrence and progression of further tooth wear to those who are already affected.

4.0 Justification

The results of this study will reveal the level of awareness on tooth wear, risk factors and habits among adult participants in Dar es Salaam. This information will help in planning for public education on preventive measures on tooth wear.

Clinical assessment will determine the prevalence of tooth wear in the study population, the types of tooth wear, the types of teeth affected and affected tooth surfaces. These results will be used as baseline data for comparison with other studies elsewhere, and assist in planning for further research areas on tooth wear. Assessing tooth wear awareness, screening and early diagnosis will help to quantify the prevalence of tooth wear in Dar es Salaam, before embarking on preventive strategies

There is a need for this study to be conducted, as information obtained will give the Ministry of Health and Social Welfare an insight of tooth wear in Dar es Salaam and help in planning of further study countrywide by including a subject matter in oral health survey of Tanzania. In addition, Municipals in Dar es Salaam can use these data as baseline information in planning preventive programs concerning raising awareness, screening, and early diagnosis on tooth wear.

CHAPTER THREE

5.0 Aim of the study

To assess tooth wear in adult dental patients in Dar es Salaam, Tanzania by analyzing their habits as related to tooth wear and determining their awareness on tooth wear, its prevalence, types of tooth wear, teeth affected, and extent of tooth wear

5.1 Broad Objective

To determine the awareness on tooth wear, related habits, its prevalence, teeth and surfaces affected, types of wear, and associated factors among adult dental patients in Dar es Salaam by age and sex.

5.1.1 Specific objectives

1. To determine the proportion of participants who are aware on tooth wear by age and sex
2. To assess the habits related to tooth wear among participants by age and sex
3. To determine the types of tooth wear among participants by age and sex
4. To determine the tooth types affected by tooth wear
5. To determine the distribution of tooth surfaces affected by tooth wear
6. To determine the extent of tooth wear by using the modified exact tooth wear index

CHAPTER FOUR

6.0 Materials and methods

6.1 Study Design and Study Period

This descriptive cross sectional study was conducted between August and November 2009.

6.2 Study area

The study was conducted in six public dental clinics including Muhimbili National Hospital (MNH), Mwananyamala, Temeke , Mnazi Mmoja and Magomeni, which are located in Dar es Salaam. Dare s salaam is one of the cities of Tanzania with a population of 3,118,132 people [47] and the city has three municipals including Ilala, Kinondoni, and Temeke, each having one district hospital, other hospitals, and several health centers.

6.3 Study population

The study population involved adult dental patients aged 18 years and above attending the dental clinics in Dar es Salaam city during the time of study.

6.4 Sampling method

This was two stages sampling procedure. The first stage was visiting respective municipal councils and selecting dental clinics to be included in this study, with the help of respective municipal officers who were responsible. The sampling frame of dental clinics included six public hospitals which are MNH, Amana, Mwananyamala, Lugalo, Temeke and Vijibweni, and three health centres Mnazi mmoja, Magomeni and Sinza. MNH, Amana and Mnazi mmoja are from Ilala municipal council, Mwananyamala, Lugalo, Sinza and Magomeni are from Kinondoni municipal, Temeke and Vijibweni are from Temeke municipal council. All these hospitals and health centres offer dental services. One hospital and one health centre were conveniently selected from list of hospitals and health centres from each municipal council (except Temeke municipal has no public health centre that offer dental services). The selected dental clinics included MNH, Mwananyamala, Temeke, Mnazi mmoja and Magomeni. The number of participants obtained from each clinic was treated as one cluster.

MNH, Mwananyamala, Temeke, Mnazi mmoja and Magomeni. The number of participants obtained from each clinic was treated as one cluster.

The second stage involved selection of study participants, which included adult dental patients aged 18 years and above attending for treatment to specified dental clinics on a daily basis within the study period. They were introduced to the study and requested to participate by consenting (Appendix I and II). After consenting, a self-administered questionnaire was provided to each participant to fill in before being examined for assessment of tooth wear.

6.5 Sample size

Sample size calculation was done based on prevalence (p) =14.4 [40], 95% confidence interval =1.96, margin of error =5%, adding 10% of non respondent we end up with sample size of 213, because of clustering we have to add up to 426 to adjust the effect of clustering, however the number was not reached due to time constrains. Therefore, the total sample size collected was 316 adult participants.

6.5.1 Inclusion Criteria

All adult patients aged 18 yrs and above attending the selected dental clinics during the study period were eligible.

6.5.2 Exclusion Criteria

Patients were excluded if they reported to have any of the known conditions that could introduce bias such as presence of crowns and/or bridges and/or other artifical appliances that were in occlusion with natural teeth.

6.6 Ethical Issues

Muhimbili University of Health and Allied Sciences granted ethical clearance and permission to conduct the research in respective clinics were obtained from respective municipal councils and from Muhimbili National Hospital. All participants were requested to consent by writing before taking part in this study. The consent form contained information that helped the participant to understand his/her role, and rights to voluntarily participation to the study.

6.7 Instruments

6.7.1 Questionnaire

Self-assessment questionnaires (Appendix III) translated to Swahili (Appendix IV) were filled in by participants. The questionnaire assessed socio-demographic details (age, sex and clinic), Awareness on tooth wear was assessed using 21 questions, with dichotomous responses involving questions on general awareness on tooth wear, its causes, outcome, and prevention. Those who answer correctly half of the questions and above were categorized as being aware. Habits related to tooth wear (clenching, tooth grinding, chewing bones, unilateral chewing, vomiting, use of acidic beverages, and repeated heartburn) were assessed using dichotomous responses, and any whose answer was "yes" in any of the habit was categorize to have risk habit. Tooth brushing habits were assessed separately in relation to type of tooth brush, sequency, force applied and adjuvant used.

6.7.2 Clinical examination form

The same examiner visited each of the respective dental clinics and carried out the clinical examination after the patient was seated on a dental chair that had an overhead light source. After explaining to the patient, every tooth with the exception of third molars was dried with a piece of gauze and examined using a dental mirror and sickle probe. An assistant (recorder) recorded the obtained information in the clinical survey forms (appendix V). Starting with tooth 17 to 47, each tooth was assessed independently for change in surface characteristics in accordance with the modified criteria by Gandara and colleagues [10]. (see Table 1). All those teeth that could not be assessed due to being obscured by calculus deposit, gross caries or restoration covering 50% or more was assigned score 8 and all those teeth that were missing were assigned score 9.

Table1: Tooth surface clinical appearance criteria used by Gandara et al [10].

Score	Criteria
0	No change of surface characteristics
1 (attrition)	Presence of occlusal and incisal facets **and/or** Generalized/matching wear on occluding or incisal contact with flatter back teeth and shorter front teeth **and/or** Enamel and dentin wear at the same rate
2 (abrasion)	Smooth buccal surfaces with well defined margins that are wedged or V-shaped defects, with greater depth than width located in the cervical region normally free of plaque,
3 (erosion)	Cupping of occlusal surfaces, (incisal grooving) with dentin exposure **and/or** Presence of even, smooth surfaces, concavities, mainly cervically on labial surfaces, but also on lingual surfaces: much greater width than depth **and/or** Raised amalgam restorations and clean surfaces **and/or** Pits on cusps and incisal edge

The extent of tooth wear (enamel and dentine involvement) of each tooth assessed and reported was in accordance to the modified index proposed by Fares et al [14] (see table 2). Presence of calculus, decay or restorations that obscure assessment of tooth wear and involved more than 50% of a tooth and missing teeth were awarded scores 8 and 9 respectively.

Table 2. Tooth wear modified index used by Fares et al [14]

Exact Tooth Wear Index for Enamel	
Score	**Criteria**
0	No tooth wear: no loss of enamel characteristics or change in contour
1	Loss of enamel affecting less than 10% of the scored surface
2	Enamel loss affecting between 10% and 1/3 of the scored surface
3	Enamel loss affecting at least 1/3 but less than 2/3 of the scored surface
4	Enamel loss affecting 2/3 or more of the scored surface

Exact Tooth Wear Index for Dentine	
Score	**Criteria**
0	No dentinal tooth wear: no loss of dentine
1	Loss of dentine affecting less than 10% of the scored surface
2	Dentine loss affecting between 10% and 1/3 of the scored surface
3	Dentine loss affecting at least 1/3 but less than 2/3 of the scored surface
4	Dentine loss affecting 2/3 or more of the scored surface, no pulpal exposure
5	Exposure of pulp or secondary dentine formation

6.8 Reliability

Intra examiner consistency on clinical findings was based on the clinical scores from 29 randomly selected participants (approximately 10% of all participants). Measures of agreement of the various scores for each tooth were compared and reported using Kappa statistics. Results of intra-examiner reproducibility for different variables ranged from kappa 0.705 to 0.934. However due to logistical reasons re-interviews could not be carried out hence could not be assessed for test-retest reliability estimation.

6.9 Data Management and Analysis

Data analysis was done using SPSS version 13 [48]. Frequency distribution and summative indices of questions on awareness were compiled and distribution was dichotomized by taking those who answered correctly half of questions and above as being aware. Data transformation by recoding, counting and cross-tabulation was performed and obtained information was processed using Chi-square used to compare proportions with p-value of 0.05 considered statistically significant. Most bivariate associations were not significant, and therefore multivariate analysis was not performed.

CHAPTER FIVE

7.0 Results

7.1 Socio-Demographic

A total of 316 participants with mean age of 30.84±10.588 were involved with their demographic characteristics whereby 60.1% were females as shown in Table 3.

Table 3. Distribution of respondents by dental clinic attendance, age and sex

Hospital /health centre	18-40 yrs		41+ yrs		
	Male	Females	Male	Females	Total
MNH	21	36	6	10	73
Mwananyamala	17	36	4	4	61
Temeke	19	19	1	4	43
Mnazi Mmoja HC	30	33	6	5	74
Magomeni HC	15	37	7	6	65
Total	102	161	24	29	316

7.2 Awareness of tooth wear

Figure one shows distribution of awareness on definition, causes, outcome and prevention of tooth wear. The overall awareness of tooth wear was 39.9%. Most participants were aware on means of prevention of tooth wear (56.6%) while only 26.4% were aware of the outcome of tooth wear. Among participants aged 18-40 yrs 43.3% were aware on questions about tooth wear, causes, outcome and prevention while only 39.6% of participants aged 41 years and above were aware on the subject matter. The distribution of awareness by sex is shown in Figure 4 below. However, there was no statistical significance between awareness and sex or age.

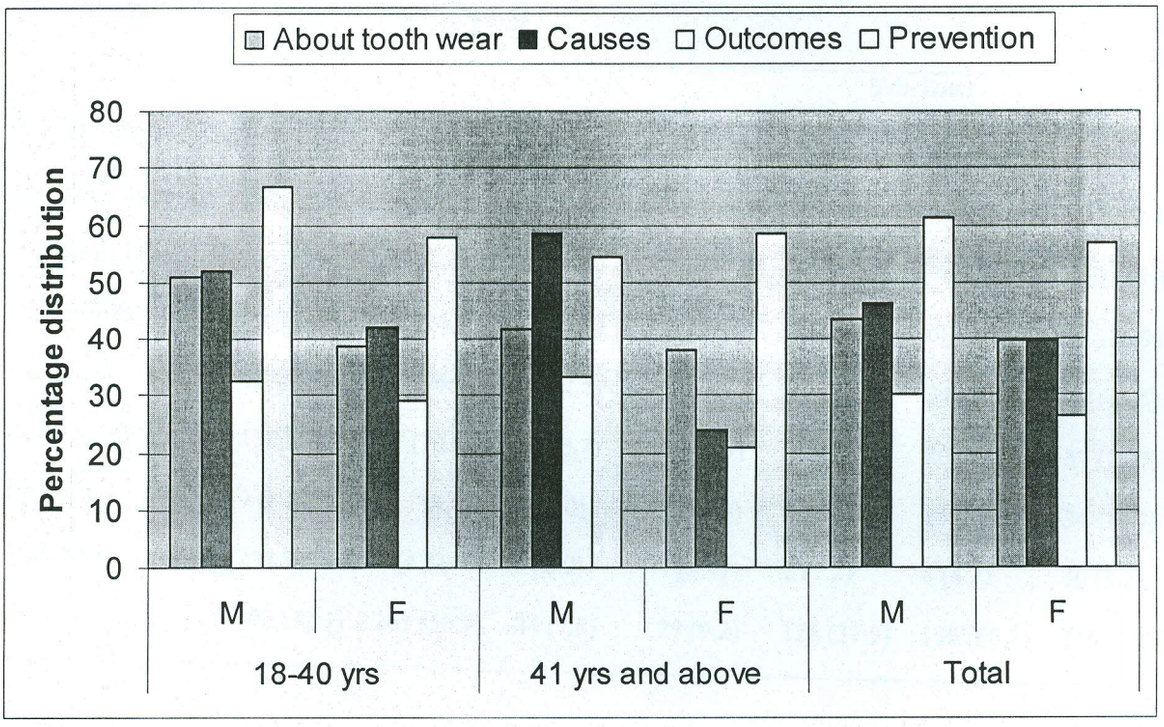


Figure 4: Distributions of respondents who are aware on tooth wear in terms of definition and general knowledge, causes, outcome and prevention by age, sex (N=316).

7.3 Risk habits related to tooth wear

Table 4 shows that the risk habits most reported by participants was unilateral chewing (56.0%) and the least reported was vomiting once or more weekly (3.2%), other habits reported were, chewing bones (35.4%), use of citrus fruits or its juice more than twice per day (25.9%), heartburn which is repeating several times in a week (15.5%), clenching (10.8%,), tooth grinding (11.7%), respectively. Participants aged 18-40 yrs had more risk factors reported than those aged 41 yrs and above. There is no statistical significant difference observed between the risk factors and age or sex.

Table 4. Distribution of risk habits related to tooth wear reported by participants by age and sex. (N=316)(percentages in parenthesis)

	18-40yrs		41+ yrs		Sub-Total		Grand-total
Risk factors	Male	Female	Male	Female	Male	Female	
Unilateral chewing	57 (55.8)	87 (54.0)	14 (58.3)	19 (65.5)	71 (56.3)	106 (55.8)	177 (56.0)
Chewing bones	32 (31.3)	66 (41.0)	4 (16.7)	10 (34.5)	36 (28.6)	76 (40.0)	112 (35.4)
Citrus fruits	26 (25.5)	42 (26.1)	6 (25.0)	8 (27.6)	32 (25.4)	50 (26.3)	82 (25.9)
Heartburn	12 (11.8)	27 (16.8)	3 (12.5)	7 (24.1)	15 (11.9)	34 (17.9)	49 (15.5)
Tooth grinding	13 (12.7)	17 (10.6)	4 (16.7)	3 (10.3)	17 (13.5)	20 (10.5)	37 (11.7)
Clenching	9 (8.8)	21 (13.0)	0 (0.0)	4 (13.8)	9 (7.1)	25 (13.2)	34 (10.7)
Vomiting	2 (1.2)	7 (4.3)	0 (0.0)	1 (3.4)	2 (1.2)	8 (4.2)	10 (3.2)
	102 (32.3)	161 (50.9)	24 (7.8)	29 (9.2)	126 (39.9)	190 (60.1)	316 (100.0)

Concerning tooth cleaning related behaviors, nearly all participants (92.1%) used industrial made plastic toothbrush. Horizontal movement was reported to be used by 30.7% of respondents, and only few (7.6%) reported using excessive force during brushing. All participants used toothpaste to clean their teeth. Other adjuvants used by participants were charcoal (8.5%), ashes (5.1%) and salt (6.0%). Replacement of tooth brush within three months was reported by 58.5% of respondents (Table 5).

Table 5.distribution of respondents by tooth cleaning related behaviors

Tooth brushing habits	Yes	No
Type of tooth brush		
Plastic	291 (92.1)	25 (7.9)
Wooden	13 (4.1)	303 (95.9)
Plastic + wooden	17 (5.4)	299 (94.6)
Sequence of brushing		
Horizontal	97 (30.7)	219 (69.3)
Up & down	87 (26.9)	229 (73.1)
Circular	96 (30.4)	220 (69.6)
Combination	136 (43.0)	180 (57.0)
Perceived force during brushing		
Excessive	24 (7.6)	292 (92.4)
Moderate	206 (65.2)	110 (34.8)
Minimal	72 (22.8)	244 (77.2)
History of using the following		
Charcoal	27 (8.5)	289 (91.5)
Ashes	16 (5.1)	300 (94.9)
Salt	19 (6.0)	297 (94.0)
Replacing toothbrush		
Within three months	185 (58.5)	131 (41.5)
More than three months	86 (27.2)	230 (72.8)

7.4 Prevalence of tooth wear

Of the 316 participants examined, 132 (41.8%) had tooth wear [among them 3 (3.0%) had one tooth with tooth wear, 39 (29.5%) had 2-5 teeth with tooth wear, 52 (39.2%) had 6-10 teeth with tooth wear and 37 (28.0%) had 11 or more teeth with tooth wear. Among those with tooth wear 30.5% were aged 18-40yrs, and 96.3% were aged 41yrs and above. Thirty-two percent of males had tooth wear compared to 30% of female in 18-40 yrs age group, while 100% of females and 92% of males had tooth wear in 41+ yrs age group. The difference observed is not statistically significant.

Table 6: Distribution of participants with or without tooth wear by age and sex (N=316)

		With tooth wear	Without tooth wear	Total
18-40yrs	Male	33 (32.0)	70 (68.0)	103 (100.0)
	Female	47 (30.0)	112 (70.0)	159 (100.0)
	Sub-Total	80 (30.5)	182 (69.5)	262 (100.0)
41+yrs	Male	23 (92.0)	2 (8.0)	25 (100.0)
	Female	29 (100.0)	0 (0.0)	29 (100.0)
	Sub-Total	52 (96.3)	2 (3.7)	54 (100.0)
	Grand-;Total	132 (41.8)	184 (58.2)	316 (100.0)

Table 7: Distribution of participants with tooth wear by age and sex and by types of tooth wear (n=132)

		Attrition	Abrasion	Erosion	Combination	Total
18-40 yrs	Male	29 (87.9)	1 (3.0)	3 (9.1)	0 (0.0)	33 (100.0)
	Female	39 (87.2)	3 (6.3)	3 (6.3)	2 (0.0)	47 (100.0)
41+yrs	Male	18 (80.0)	1 (5.0)	2 (10.0)	2 (5.0)	23 (100.0)
	Female	23 (82.8)	0 (0.0)	3 (10.3)	3 (6.9)	29 (100.0)
Total		113 (85.6)	5 (3.8)	11 (8.3)	3 (2.3)	132 (100.0)

7.5 Tooth type affected by tooth wear

Tooth wear was found in all tooth types, with incisors being more affected (n=490; 47.3%) than other tooth types, this was followed by canine (37.3%), molars (28.1%) and premolars (13.9%) respectively.

Table 8. Distribution of tooth types with or without tooth wear (percentage of teeth in parenthesis)

	Teeth with tooth wear	Teeth without tooth wear	Total
Incisors	490 (47.3)	547 (52.7)	1037 (100.0)
Canine	190 (37.3)	328 (63.3)	518 (100.0)
Premolars	134 (13.9)	830 (86.1)	964 (100.0)
Molars	240 (28.1)	613 (71.9)	853 (100.0)
Total	1054 (31.3)	2318 (68.7)	3372 (100.0)

Table 9 below shows that, attrition was most prevalent type of tooth wear in all tooth types with percent distribution of 89.2% followed by erosion (5.7%) and abrasion (2.0%). There is no statistical significance of the observed findings.

Table 9. Percentage distributions of tooth types by type of tooth wear

Tooth types	Types of tooth wear				Total
	Attrition	Abrasion	Erosion	Combination	
Incisors	440 (89.8)	1 (0.2)	38 (7.8)	11 (2.2)	490 (100.0)
Canines	162 (85.3)	10 (5.3)	7 (3.7)	11 (5.9)	190 (100.0)
Premolars	112 (83.6)	9 (6.8)	9 (6.8)	4 (2.9)	134 (100.0)
Molars	226 (94.2)	1 (0.4)	6 (2.6)	7 (2.9)	240 (100.0)
Total	940 (89.2)	21 (2.0)	60 (5.7)	33 (3.2)	1054 (100.0)

7.6 Types of tooth surfaces affected by tooth wear

Of all the surfaces, the incisal/occlusal surface was most affected by tooth wear, of which mostly found on incisors, molars, canines and premolars respectively. Palatal surfaces involved were mainly on incisors. Cervical surfaces of canines and premolars had higher prevalence of tooth wear. Tooth wear on buccal surface was hardly observed in other teeth than incisors. Tooth wear that involved more than two surfaces was mostly on incisors and canines (Table 10).

Table 10. Percentage distribution of tooth wear by tooth surfaces and tooth type

	Incisor (%)	Canine (%)	Premolar(%)	Molar (%)	Total (%)
Buccal	7 (0.7)	1 (0.1)	0 (0.0)	1 (0.1)	9 (0.9)
Cervical	10 (0.9)	16 (1.5)	13 (1.2)	2 (0.2)	41 (3.9)
Palatal	14 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	14 (1.3)
Incisal/occlusal	441 (41.8)	163 (15.5)	118 (11.2)	237 (22.5)	959 (91.0)
2 or more surfaces	18 (1.7)	10 (0.9)	3 (0.3)	0 (0.0)	31 (2.9)
Total surfaces	490 (46.4)	190 (18.0)	134 (12.7)	240 (22.8)	1054 (100.0)

7.7 Extent of tooth wears using the modified exact tooth wear index

The extent of tooth wear on teeth using the modified exact tooth wear score is shown in Table 11. Enamel wear was abscent in 69.6%, however it was observed in 12.6 % of teeth with score 4, score 3 (7.2%), score 2 (6.9%) and score 1 (3.7%) respectively. Dentine wear was seen in majority of teeth (score 0 = 93.1%) and teeth with dentine wear was more in score 2 (2.9%), than other scores.

Table 11. Prevalence of extent of tooth wear on teeth using the modified exact tooth wear index

Explanation of the exact tooth wear score	Score	Enamel		Dentine	
		No. Of Teeth	Percent	No. Of Teeth	Percent
No wear	0	2335	69.6	3121	93.1
≤10% of Tooth Surface	1	124	3.7	57	1.7
Between 10% to <1/3 of Tooth Surface	2	233	6.9	97	2.9
Between 1/3 to <2/3 of Tooth Surface	3	241	7.2	45	1.3
2/3 of Tooth Surface and above	4	421	12.6	34	1.0
Total		3354	100.0	3354	100.0

CHAPTER SIX

8.0 Discussion

This cross-sectional hospital-based study was chosen because of easy accessibility to target group, shortage of funds, manpower, and time. To capture the diversity of characteristics, different dental clinics across Dar es Salaam were selected (Table 3). Findings provide an insight of magnitude of tooth wear in adults who attended dental clinics in Dar es Salaam, however generalization of the results to the population can not be made. Use of self-administered questionnaire are known to have limitations as participants may have difficulties in understanding and responding to some questions. Likewise participants may respond in a way that will please the researcher or leaving several questions unfilled. The sample size obtained was smaller than the required size, this may have reduced the power of the study in detecting differences between groups studied.

Awareness on tooth wear among participants in this study was generally low (39.1%), and was not influenced by age or sex (Figure 4). This finding is slightly higher than that reported by Lussi et al [17] in the U.K, and Seligman et al [22] in the U.S.A . Over half of respondents were aware that tooth wear could be prevented, however awareness on causes and outcome was low. According to Wickens [18], prevention requires understanding of the etiology and recognition of early signs and symptoms. Effective prevention also includes early detection and intervention by dental health professional, however it is difficult to predict which individuals will be affected and therefore community approach to prevention may be appropriate as high-risk approach to prevention is difficult to achieve [49]. Population-based strategies of prevention, such as educational campaigns to increase awareness on the causes of tooth wear will limit further tooth wear in individuals already affected by this condition and prevent it from occurring to those not yet affected.

The percentage of subjects who reported clenching and grinding of teeth (Table 4), is lower than that reported in the U.S.A by Seligman et al [22], and in Trinidad by Rafeek et al [4]. The frequency of chronic vomiting reported by Lussi et al [35] was higher than that found in this study. Over quarter of the subjects reported to consume citrus fruits, fruit juices, soft drinks on

a daily basis or more often, and it has been reported citrus fruits, fruit juices, and carbonated drinks produce erosion when taken in excess and this has been demonstrated in a number of studies [27, 35]. However, in order to assess properly the risk factors, patient should record their dietary intake for a distinct period of time [17]. Based on these analyses, an individualized preventive program may be suggested to patients and may comprise dietary advice, optimization of fluoride regimes, stimulation of salivary flow rate, use of buffering and medicaments. Additional habits, such as chewing bones as observed in this study group, have been shown in another study to be associated with tooth wear [32].

Manual plastic tooth brush was commonly used (Table 5), this finding is similar to earlier studies from Tanzania [50] and the findings from the U.K. [51]. Thirty percent of respondents use horizontal movement to brush their teeth and only few reported using excessive force during brushing. This is different from an earlier study [50], from Tanzania that indicated horizontal movement to be used by 98% of subjects. The difference noted may be due to different understanding of methods of toothbrushing. Excessive brushing force especially using horizontal movement are destructive tooth brushing habits and were associated with tooth wear abrasion in early studies [9], more recent laboratory studies deny this argument [6, 9]. However Lussi et al [17] recommend individual tailored preventive program including non-destructive tooth brushing habits. Participants of this study reported to replace tooth brush within three months is similar to findings that were reported in a study done in the U.K. [51]

Prevalence of tooth wear in this study (Table 6), is lower than indicated by other studies [4, 14, 52] as well, it is higher compared to one study from Nigeria [40]. However, comparison between these studies cannot be made directly because of differences observed between them. Some studies did study tooth wear without making diagnosis [3, 4, 14], others only focus on certain type of tooth wear like erosion [27, 34], attrition [26, 37] or abrasion [38, 39]. Therefore, it is logical to compare prevalence of tooth wear from this study by treating each type of tooth wear separately.

Oginni et al [40] from Nigeria reported tooth wear due to attrition, abrasion and erosion. The prevalence of tooth wear in this study is higher than that indicated by Oginni et al [40]. This

could be due to small sample size (126 participants) used by Oginni and colleagues. That study from Nigeria indicated that attrition was the leading type of tooth wear followed by abrasion and erosion respectively whereas in this study, attrition is followed by erosion and abrasion respectively (Table 7). In both studies, only few participants had combination of types of tooth wear.

Since attrition is main type of tooth wear in this study group (Table 6 and 9), and very few had exposed dentine, the wear observed in this study group could be functional rather than pathological. Contrary to this study, most studies from Europe reported more on erosion as the main cause of tooth wear [35, 41]. Findings that only few participants have erosion, compares well with one study from Nigeria[40], and differ very much from most studies in Europe [10, 27, 53], therefore further research with bigger sample size is needed to enable comparison to other studies too. However, there are several reasons that could results in this difference. Choice of study sample and criteria used to assess the tooth wear could result in this difference [1]. Also could be geographical differences between populations [2] and life style of a particular study group especially on type of food eaten in different geographical area do differ such as soft and non abrasive diet used in western societies[54].

The findings that molars showed more tooth wear due to attrition than the anterior teeth and the premolars (Table 9), is in agreement with previous reports [46, 55]. This is an expected finding because under normal circumstances, anterior teeth are used for cutting food, while molars and to some extent premolars, are used to crush food substances hence more cycles of mastication. Usually most of food substances eaten do not need to be cut first by anterior teeth before chewing by posterior teeth. However, other studies indicated that anterior teeth have more wear than posterior teeth [3, 43, 56]. This often occurs when some one has reduced number of posterior teeth due any reason; tend to adapt to chew using anterior teeth. Another reason could be due to malocclusion, in which anterior teeth meets edge to edge tend to have more tooth wear on anterior teeth. Malocclusion such as Angles class II have shown to be associated with posterior tooth wear [22, 36]. However, individuals with malocclusion were not excluded in this study and therefore the effect of malocclusion is also accounted in this study.

In this study females were more affected by tooth wear, than males, and this differs from other studies reported previously indicated that males had a higher prevalence than females [26, 27]. This is not surprising since, majority of females reported more risk habits to tooth wear than males (Table 4). Other authors argue that males have more masticatory forces than females as main reason for having more tooth wear [28], and this is not reflected in this study. The results probably show that risk habits contribute more to tooth wear than gender itself. However, there was no statistical significance of differences observed between males and females.

Though it was not statistically significant, the findings that participants who are aged have more tooth wear than younger ones (Table 6), is in agreement with other studies [8, 25, 26]. This is expected findings, for teeth in the mouth faces various challenges from erosion, abrasion and attrition, hence the older the age the more the challenges faced. This kind of wear is also called physiological tooth wear. The amount of physiological tooth wear at any given period in an individual's life will vary between subjects; however, in some, excessive or "pathological" tooth wear is seen. Some researchers tried to establish normal values of physiological tooth wear for various ages to distinguish it from pathological wear [8].

Incisal and occlusal surfaces were most commonly affected sites (Table 10), this is in agreement with other studies [8, 29, 46]. Studies indicate that the cause of incisal/occlusal wear is associated with attrition [22, 36]. In this study group, the cause of incisal/occlusal wear is presumed to be functional rather than pathological, because the reported risk factors for attrition were not statically associated to the observed wear. As well, most of teeth with wear have been present in the mouth for more than 10 years. It is estimated that tooth wear of about 30 micrometers per year, or about 0.3 millimeters occurs in 10 years [57]. Another reason for incisal/occlusal wear could be due to parafunctional habits. Habits like clenching, bruxism, chewing hard food substances like bones and unilateral chewing causes wear on occluding and cutting surfaces of teeth. However, the few participants reported tooth grinding, clenching, chewing bones and unilateral chewing could not explain the observed wear on incisal/occlusal surface in this study. There is no statistical significance difference of tooth wear observed between sex and age

Tooth wear was assessed by grading both enamel and dentine separately (Table 11), as was first done by Fares et al [14], therefore the grades could be directly compared to this study. Grading wear in enamel provided an indication of the spread or surface area involvement of the wear, whereas dentine exposure gave an indication of the depth [14]. In Fares study enamel wear score 0 was absent in all subjects while in this study it is 69.6%. Majority of participants in Fares study had score of 1 in enamel, followed by score 2, 3 and 4 respectively, while in this study majority had score 4, followed by score 3, 2 and 1 respectively. The results from this study on enamel wear is not a good sign especially with assumption that tooth wear is progressive [58] Later these people with enamel wear score 4, are going to have dentine exposure. Therefore, any preventive program will logically benefit people with enamel wear to reduce or stop the progression of tooth wear. In dentine tooth wear score 0 from this study is similar to Fares et al [14] findings. Enamel and dentine involvement more than one third of the surface (score 3 and above) is in higher than that by Fares and colleagues. This shows that wear in this study group is more advanced compared to that indicated by Fares and colleagues. The percentage of dentine exposure in this study is in agreement with Fares and colleagues, with exception that, the largest proportion accounting for between 10% and 1/3 of tooth surface in this study, while in Fares and colleagues study the largest proportion accounted for less than 10% of tooth surface.

CHAPTER SEVEN

9.0 Conclusion

The prevalence of tooth wear in this study group was 41.8% of which attrition was leading type of tooth wear. Tooth surface most affected was incisal/occlusal with molars having more tooth wear than other tooth types. Enamel was frequently involved than dentine. Awareness on tooth wear among participants is low. Risk habits frequently reported were chewing bones, unilateral chewing, and use of citrus fruits/juice respectively.

10.0 Recommendations

1. There is a need to raise public awareness on causes and risk habits related to tooth wear.
2. There is a need to develop a universally acceptable tooth wear index that will be able to determine prevention and treatment need
3. There is a need of more studies tooth wear using much bigger sample sizes to be conducted to in Tanzania
4. An item of tooth wear to be included in Oral Health Survey in Tanzania.

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