

# CAUSES FOR TOOTH SURFACE LOSS IN A GROUP OF JORDANIAN POPULATION

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## ABSTRACT

*Aim of this study was to determine the causes for tooth surface loss in a group of adult Jordanian population. Three hundred and six patients aged 29-59 years who came to the out-patient clinics of King Hussein Medical Center over a period of two months were examined for tooth surface loss (TSL). Data were collected by taking general medical and dental history and by examining the teeth. Evidence of tooth surface loss (TSL) were recorded and analyzed.*

*Data analysis included descriptive statistics of etiology, location and distribution of tooth surface loss in Jordanian population aged between 29-59 years. The study groups were composed of 142 (46.4%) males between 29-58 years ( $SD \pm 9.4$ ) and 164 (53.6%) females aged between 29-59 years ( $SD \pm 7.9$ ) with a mean age of 38 were examined. Data showed that out of the 306 subjects interviewed, 245 (80%) subjects showed clinical evidence of TSL. Table 2 shows a detailed description of the chief complaints of the patients 46. (15%) came as emergency patients, 94 (29.4%) came for fillings peri-odontal treatment and for scaling. 47 (15.4%) required extractions of teeth, 35 (12.4%) needed surface fixed and removable prosthodontics. 65 (21.2%) wanted esthetic treatment for anterior teeth, 27 (8.8%) required endodontic treatment and 73 (23.9%) wanted routine checkup.*

**Key Words:** *Tooth, Attrition, Erosion.*

## INTRODUCTION

Tooth Surface loss (TSL) is defined as silent and multifactorial irreversible loss of dental hard tissues by combination of mechanical or chemical processes not involving trauma or bacteria.<sup>1</sup>

Tooth surface loss is not a new pathology; however with the change in life style, eating habits and socio-economic factors, it is becoming more evident and prevalent in modern societies. Clinical research and scientific evidence suggest that TSL is becoming

a serious problem, and therefore forming an increasing percentage of the modern dental practice. It is also forming serious concerns for the practicing dentist regarding the diagnosis, identification of the etiological factors, prevention, and execution of an adequate treatment.<sup>2</sup>

The better understanding of the pathophysiology of TSL along with the increase in the dental awareness, increasing numbers of population are retaining their natural teeth for significantly longer time. That has contributed to the increasing rate of tooth surface loss in the elderly population. Knowing that tooth surface loss is no longer the pathology of the elderly population, there has been a gradual realization in recent years that younger population may also be increasingly affected. This might be attributed to the increase in dental erosion, rather than attrition and abrasion.<sup>3,4</sup>

Owing to the change in the life style and increased consumption of sour fruit juices and carbonated drinks, there has been until recently a special concentration by authors on the tooth surface loss in children and adolescence<sup>5</sup> and most of these studies addressed the erosion part in particular.<sup>3,4,6,7,8</sup>

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Tooth surface loss in the moderate and advanced form has an esthetic problem and patients are increasingly concerned about their appearance and generally wish to delay the aging process which manifest on teeth.

The aim of any treatment provided is to prevent further tooth surface loss, restore aesthetics and function, and provide a stable occlusal relationship. Whilst attempting to fulfill these goals, it is important to protect the remaining tooth structure by using restorations which are conservative and do not cause further damage to teeth which are already compromised.<sup>9</sup> The implication for dentists is that early diagnosis and prevention are essential for the wellbeing of patients. Overwhelmingly the evidence indicates that tooth wear and erosion affect most people but fortunately only a relatively small proportion is seen with severe loss.<sup>2</sup>

The aim of this study was to determine the prevalence of tooth surface loss and to provide a descriptive analysis of the predisposing and etiological factors that lead to the non-bacterial non-traumatic loss of tooth structure (tooth wear) in a group of adult Jordanian population between 30-59 years.

## METHODOLOGY

King Hussein Medical Center is milestone in medical identity of Jordan, and it is considered the prime and end line referral center for a group of military hospitals in the ten governorates, and it contains all medical and surgical specialties. This center primarily receives patients from the military medical insurance and their parents and families. However, anyone can be admitted to any clinic if they presented a suitable insurance card. The out-patient clinics/department of dentistry is a very busy polyclinic center dealing with patients at the specialty level in restorative dentistry and endodontics, prosthodontics, periodontics, orthodontics and oral surgery. There is also a diagnosis and screening clinic which refer patients for two general dental clinics for routine treatment. Specialty consultation or referral is also possible when needed. Ethical approval for this study was obtained from the Ethical Committee of the Jordanian Royal Medical Services.

Selection criteria were based in assessment of tooth surface loss in adult middle aged group of Jordanian population, so patients younger than 29 years and patients older than 59 were excluded from the data collection. Those participants who had received any professional advice or restorative care for tooth loss were excluded from the study.

Three hundred and six (306) patients aged 29-59 years attended the general dentistry department at King Hussein Medical Center/out-patient clinics between

2<sup>nd</sup> February 2014 to 1<sup>st</sup> April, 2014 as complaining of different dental and oral problems and conditions. Patient consent was obtained before starting the charting and examination. Two hundred and forty five were diagnosed to have tooth surface loss for some reason.

A questionnaire and data sheet was filled for each patient who was diagnosed as having TSL during the interview which contains a sequence of questions regarding name, age, gender, gastrointestinal problems (reflux, vomiting etc) dietary factors (carbonated drinks, fruit juices, citrus fruits, etc.), smoking and oral hygiene methods occupation and life style followed by a clinical examination. The clinical examination was performed in the screening clinic under standard protocol.

The diagnostic criteria of tooth surface loss were thoroughly reviewed and discussed with examiners before and during the examination process to determine the type of tooth wear by combining the patient history, life style and dietary habits with the clinical picture.

The sequence of examination was as following: maxillary anterior segment, mandibular anterior segment, right maxillary and mandibular posterior segment, left maxillary and mandibular posterior segment. Each examination lasted for about five minutes.

The aim of the clinical examination was to search for clinical evidence of tooth surface loss and to determine its reasons, prevalence and distribution in the dental arches.

## RESULTS

Data analysis included descriptive statistics of etiology, location and distribution of tooth surface loss in Jordanian population aged between 29-59 years. The study group were composed of 142 (46.4%) males aged between 29-58 years (SD  $\pm$  9.4) and 164 (53.6%) females aged between 29 and 59 years (SD  $\pm$  7.9) with a mean age of 38 (Table 1).

Data showed that out of the 306 subjects examined, 245 (80%) subjects showed a clinical evidence of TSL. Table 2 shows a detailed description of the chief com-

TABLE 1: GENDER AND AGE GROUP OF THE STUDY SUBJECT

				Frequency (%)
Males				
Mean	Min. age	Max. age	SD	
40.4	29	58	$\pm$ 9.4	142 (46.4%)
Females				
Mean	Min. age	Max. age	SD	
38.2	29	59	$\pm$ 7.9	164 (53.6%)
				306 (100%)

TABLE 2: DISTRIBUTION OF CHIEF DENTAL COMPLAINTS AND MEDICAL HISTORY AMONG THE STUDY SUBJECTS

Chief Complaint	Frequency (%)*
Tooth pain	46 (15%)
Filling	94 (29.4%)
Periodontal treatment	47 (15.4%)
Extraction	35 (11.4%)
Prosthodontics	65 (21.2%)
Esthetic	27 (8.8%)
Endodontics	73 (23.9%)
Routine checkup	15 (4.9%)
<b>Systemic Conditions</b>	
None	257 (84%)
Diabetes	14 (4.8%)
Gastrointestinal	19 (6.2%)
Asthma	9 (2.9%)
Other	7 (2.3%)

\*Note that the numbers do not add to 100% or 306 because there could be more than one complaint or systemic disease for the same subject (person)

TABLE 3: DISTRIBUTION OF TOOTH SURFACE LOSS BETWEEN DENTAL ARCHES SEXTANTS (SEGMENTS)

Maxillary Right	Maxillary Anterior	Maxillary Left
53 (17.3%)	118 (38.6%)	62 (20.3%)
Mandibular Right	Mandibular Anterior	Mandibular Left
73 (23.9%)	125 (40.5%)	87 (28.4%)

TABLE 4: NUMBER OF PATIENTS VERSUS THE NUMBER OF SEXTANTS AFFECTED BY TOOTH SURFACE LOSS

Number of Sextants affected by TSL	Frequency (%)
None	61(19.9%)
One sextant	39 (12.7%)
Two sextants	55 (18%)
Three sextants	69 (22.6%)
Four Sextants	43 (14.5%)
Five sextants	22 (7.2%)
Six sextants	17 (5.6%)
Total	306 (100%)

TABLE 5: PREDISPOSING FACTORS FOR TSL OBTAINED BY DENTAL HISTORY AND CLINICAL EXAMINATION

Factors associated with TSL	Frequency (%)*
<b>GENERAL FACTORS</b>	
<b>Chemecial Factors</b>	90 (29.4%%)
Carbonated drinks and fruit juices	37 (12.1%)
Pickles & eating lemon	12 (3.9%)
Acidic medications	5 (1.6%)
Alcohol	10 (3.3%)
Intrinsic acids	26 (8.5%)
<b>Abrasive Factors</b>	32 (10.5%)
Industrial/occupational	6 (2%)
Tooth brushing	14 (4.8%)
Dental Abrasives	12 (3.9%)
<b>Occlusal Factors</b>	99 (32.4%)
Bruxism/Parafunctional movements	17 (5.6%)
Clenching	47 (15.4)
Loss of posterior support	7 (2.3%)
Abfraction	28 (9.2%)
TMD	15 (4.9%)
<b>LOCAL FACTORS</b>	
<b>Mechanical Factors</b>	95 (31%)
Biting objects	11 (3.6%)
Seeds and nuts	25 (8.1%)
Habits/ others	8 (2.6%)
Opposing ceramic restorations	51 (16.7%)

\*Note that the numbers do not add to 100% or 306 because there could be more than one factor for the same subject (person)

plains of patients attending the general dental clinic. Table 3 and 4 show the distribution of TSL between the six segments (sextants).

Sixty one patients (19.9%) showed no pathological signs of tooth surfassimilar pattern of TSL distribution between segments, where 39 patients (12.7%) exhibited TSL in one sextant, 55 patients (18%) TSL in two sextants, 69 patients (22.6%) TSL in three sextants, 43 (14%) TSL in four sextants, 22 patients (7.2%) TSL in five sextants and 17 patients (5.6%) exhibited a TSL in all the six sextants or in all teeth.

Predisposing factors to tooth surface loss (TSL) were divided into four main categories (Table 5), three of which were general factors involving chemical factors 90 patients (29.4%), abrasive factors 32 (10.5%) and

Occlusal factors 99 (32.4%), where the local mechanical factors were 95 patients (31%).

## DISCUSSION

It is well-known that tooth wear is a clinical problem that is becoming increasingly important in the aging population due to the increase in dental awareness and interest in retaining natural teeth.<sup>10</sup> It is a multi-factorial process, suggesting that most cases of tooth wear will have more than one cause, and a predominant cause could not always be detectable. Cross-sectional studies of tooth wear can show associations and suggest risk indicators, but cannot identify definite risk factors.<sup>1</sup>

Data from prevalence studies have demonstrated high levels of tooth wear in adults<sup>12</sup>, adolescents<sup>6</sup> and children<sup>3</sup>, indicating that tooth wear is a common clinical finding in all age groups. However, most of TSL studies dealt with the prevalence of the condition in children and adolescents, but only very few referred to tooth wear in adults.<sup>5</sup>

Based on the available literature, between 5% and 100% of children and adolescents, and between 76 and 100% of adults showed erosive tooth wear<sup>1,13</sup>. However, increasing levels of tooth wear are significantly associated with age, therefore the percentage of adults presenting with severe tooth wear generally increases from 3% in young people in their early 20s, to 17% in those over the age of 70<sup>14</sup>.

Younger population is usually not affected by the attrition process; therefore TSL that result from mechanical deprivation of the tooth structure is unlikely.<sup>5</sup> However, erosion is well expected due to increased consumption of carbonated drinks and other sport and acidic energy beverages.<sup>3,4,6,7,8</sup> On the other hand, in elderly population mechanical component of the TSL may be more evident than chemical factors.<sup>15</sup> For these reasons, incorporating too young and too old population may affect the final outcome of the data in this study.

Many studies were conducted in Jordan to determine the prevalence of tooth surface loss, most of which addressed this problem in school children<sup>16,17</sup> and medically compromised or psychologically compromised patients<sup>18</sup>, which we cannot compare or discuss our results in relation to their findings due to the difference in methodology and/or the studied age group.

The distribution of TSL in this Jordanian (Tables 3 & 4) group showed that generally, the mandibular arch exhibited tooth wear more than the maxillary arch, and the anterior segments exhibited more tooth loss than the posterior segments. This is in agreement with many other studies in different population groups.<sup>19,20,21</sup> Patients exhibited no tooth surface loss were 19.9% of the group, while more than half (53.3%) exhibited tooth wear in three sextants or less. Patients who demon-

strated a more generalized form of TSL, such as those who have five or six sextants were 12.8%.

An earlier study dealt with a localized form of TSL in a group of adult population in Jordan aged between 15-70 years, authors found that almost 65% of population has a certain level of tooth surface loss compared to more than 80% in the present study. The authors investigated the effect of cracking dried roasted watermelon seeds on tooth surface loss and found that 56.7% subjects reported regular eating of dried-roasted seeds<sup>22</sup> which is higher than the prevalence of all localized mechanical factors that cause TSL which are shown in this study (44.5%).

In a cross-sectional study, Smith and Robb observed that up to 97% of adults experiencing some degree of tooth wear. However, only 5-7% of 1007 adults in the study had severe tooth wear.<sup>12</sup> One systematic review on prevalence of tooth wear in adults reported that the predicted percentage of adults presenting with severe tooth wear increases from 3% at age 20 years to 17% at age 70 years, indicating a tendency for accumulative wear with age.<sup>14</sup> The prevalence of TSL reported in this study was 80% which is slightly higher than the UK adult dental health survey in the year 1998, which reported that two thirds of the adult population (66%) has a certain level of TSL.<sup>23</sup> Although the 2009 UK survey<sup>10</sup> reported an increase in the overall prevalence of tooth wear extending into dentine which was over three quarters (77%) of dentate adults, this prevalence is still lower than the same Jordanian group recorded in this paper.

Available literature evidence based on case reports, clinical trials, epidemiological, cohort, animal, in vitro and in vivo studies have described acids from endogenous (gastric) and exogenous (dietary or environmental) as causative factors for tooth surface loss<sup>11,24,25</sup>, therefore between 5 and 100% of children and adolescents, and between 76 and 100% of adults had a component of erosive tooth wear.<sup>13,14</sup> In this study, erosion was seen in 29.4% of the subjects, where the extrinsic acids were the main predisposing factor 20.9% due to carbonated drinks, fruit juices and pickles compared to 8.5% intrinsic factors. The study done by Al Habahbeh et al reported up to 85.1% of subject regularly consumed carbonated drinks, fruit juices and sour diet, compared to 12.1% of subjects who gave history of gastrointestinal problems and vomiting<sup>22</sup> compared to 6.2% of patients who suffered from Gastro-esophageal reflux disease (GERD) in the present study, which is also far lower than Al and Dundar and Sengun study where prevalence was 21%-56%.<sup>26</sup> This discrepancy in results might be due to the silent and multifactorial nature of erosion part of the TSL, which is highly influenced by personal habits and lifestyles including the ingestion

of organic and inorganic acidic substances came from extrinsic as well as intrinsic sources.<sup>25</sup>

Patients who used recreational drugs is said to have an increased susceptibility for TSL, Nixon et al showed a significant increase in tooth wear among populations consuming these types of drugs. In the present study no one reported the use of such drugs.<sup>27</sup>

Frequent contact with acids in the workplace can increase the occurrence and/or the severity of dental erosion. A study carried out in Jordan by Amin WM et al showed a significant association between tooth surface loss between workers in phosphate and batteries industries. They stated that exposure to acid fumes of the work place was significantly associated with dental erosion and deteriorated oral health status.<sup>28</sup> Those workers not only showed erosion but also complained in 80% of cases about dentine hypersensitivity.<sup>28,29,30</sup>

Oral parafunction (e.g., clenching the teeth during the day, or holding the jaw rigid) was the strongest predictor of TMD and consequently tooth surface loss<sup>31</sup>, however, some authors claim that there is no association between anterior tooth wear and self-reported TMD pain in 35 to 44-year-old subjects<sup>32</sup> which is not in agreement with other studies that reported a strong association between TMD<sup>33</sup> and/or occlusal disharmony<sup>34</sup> with TSL. Orofacial factors and bruxism that lead to TSL were 32.4% in this study compared to 23.4% of subjects who gave history of oral parafunction in the Al-Hababbeh done study.<sup>22</sup>

In this descriptive analysis we found that 16.7% of patients having TSL were due to opposing full coverage ceramic restoration. Knowing that ceramic restoration is highly abrasive to enamel, this may be attributed to the increased awareness toward restoring extraction spaces and from overdoing of fixed prosthodontics by dentists.<sup>35</sup>

The local factors that lead to TSL will mostly affect on or two teeth depending on the habit or the manipulation of the object during biting. In the present study, watermelon roast seeds and other nuts were 8.1% of the total group which is less than the that given by other studies.<sup>22</sup> Knowing the multifactorial reasons for TSL, the social component and the life style of each population, different patterns and even new types and forms may be seen, therefore the spectrum of the read TSL data between countries and populations may vary according to the variety of life styles of these countries.

## CONCLUSION

According to the categories in this study, occlusal factors were the main reason for tooth surface loss in this group of Jordanian population followed by the erosive part. The local mechanical factors usually involve one or two teeth and were not included.

## Critical evaluation of the current study

King Hussein Medical Center is an end referral point, where referred for consultation and treatment from all Jordanian governorates. They are either referred from peripheral military hospitals or by their local doctors. Data collected from this center can give a clear indication about the general picture of tooth surface loss in the Jordanian population. A larger group of subjects should be examined to give a more precise numbers, this study could be considered a representative of the Jordanian population by virtue of the geo-demographic distribution of the examined subjects.

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