

# Preliminary Assessment of Risk Factors for Tooth Wear

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## ABSTRACT

**Background:** Epidemiological studies have reported an increasing prevalence of tooth wear, and general dental practitioners see a greater number of patients seeking treatment with worn dentition. Improper oral hygiene, unhealthy habits, occupational hazards, and potentially erosive processed foods seem to play a major role in the non-carious loss of dental hard tissue. The aim of this study is to assess the factors and cofactors that may play a major role in the genesis of dental attrition, dental abrasion, and, especially, dental erosion. **Material and methods:** Seventy-nine consecutive patients, aged between 17 and 78 years, have enrolled in our study, completing a questionnaire regarding chronic illnesses, eating habits, and dental hygiene, followed by a dental clinical examination. **Results:** The male-female ratio was 1.4:1, with a mean age of 35.6 years. Forty-four (55.7%) patients presented objective signs of tooth wear. Regarding oral hygiene habits, the use of a hard toothbrush is linked to increased tooth wear, while brushing in a circular motion seems to be the least abrasive. We found a considerable prevalence of bruxism (19%), which led to severe generalized attrition in almost half of such patients. The most popular drinks with erosive potential were coffee (58.2%), soft drinks (57%), and tea (24.1%), and extrinsic erosion was more frequent in patients younger than 30 years. Understandably, physiological tooth wear was more common in older patients. The questionnaire revealed that over 60% of patients have inaccurate knowledge of tooth wear. **Conclusions:** Tooth wear is partially a progressive physiological process. Unfortunately, we see it increasing in younger patients due to pathological influencing factors. These include improper tooth brushing technique and materials, bruxism, dental prosthesis, dietary habits. Primordial and primary prevention is the key to reducing morbidity, health education being an essential part of it.

**Keywords:** tooth wear, dental erosion, dental abrasion, dental attrition

## INTRODUCTION

Tooth wear is a form of regressive alteration of teeth, where due to physical and/or chemical effects the hard tissue of the teeth is being chronically and irreparably lost. The English reference literature uses the general term “non-carious loss of dental hard tissue” as well to describe this phenomenon.<sup>1-3</sup>

Relying upon the experience acquired during the recent years, we may affirm that even in the general dental practice we encounter more and more frequently — even extensive and severe — the tooth wear phenomenon. Nowadays, dental erosion may be regarded as an actual civilization disease, although its prevalence is far lower than that of caries. Its importance is also reflected by the ever-growing number of publications on this subject matter during the last twenty years. However, there are lots of differences among age groups, and while several assessments refer to the age groups of children and adolescents, less data are available concerning the age group of adults.

Tooth wear may be of a physical (abfractions caused by abrasion, attrition, and occlusal trauma) and of a chemical nature (erosion). Improperly performed oral hygiene activities, bad habits, and occupational hazards are the most important factors that contribute to physical tooth wear.<sup>4,5</sup> Foods that are naturally acidic are part and parcel of a healthy regimen. However, everyday eating and drinking habits may be contrary to all what is called a balanced diet. Along with the spreading of the healthy lifestyle concept, fresh citrus fruits and 100% fruit juices are systematically consumed on a day-by-day basis.<sup>6,7</sup> Some medicine taken frequently over long periods of time may also cause predilection to dental erosion. Moreover, non-alcoholic soft drinks containing acids become more and more part of our everyday diet, but the way they are consumed greatly influences the adverse effects exercised upon dentition. Also, acids of an intrinsic origin play an important role in the ever-growing number of issues due to psychiatric backgrounds (alcoholism, bulimia, anorexia, eating disorders) as well as due to gastrointestinal diseases such as gastro-esophageal reflux disease (GERD).<sup>8-14</sup> This is the very reason why the dental tissues should be diagnostically assessed from time to time (every 4–6 months) for non-carious defects (detailed anamnesis and accurate clinical examination), so that we can perform the proper preventive interventions as applicable and avoid thereby the necessity of an invasive treatment. Our aim is to assess the occurrence and frequency of tooth wear of various origin among the subjects of an adult population covering different age groups, who are treated in a private dental office

in Romania, analyzing each and every correlation between tooth wear and everyday activities, consumed food and beverages, as well as other such phenomena which provoke tooth wear on a conditional basis.

## MATERIAL AND METHODS

For the purposes of this research, a questionnaire planned at the Department of Tooth Morphology, Dental Technology and Materials within the University of Medicine and Pharmacy of Țirgu Mureș, as well as clinical examinations have been used. We performed all clinical examinations only after having obtained the relevant approval of the Research Ethics Committee within the University of Medicine and Pharmacy of Țirgu Mureș and the informed consent provided by each adult subject who participated in the study. The provisions concerning the confidentiality of the study subjects' personal data have been met at all times. Before filling out the questionnaire, the subjects underwent a clinical examination in a private dental office in Brașov (Romania) under artificial illumination conditions, using dental mirror and probe. We have objectively recorded the examination results, showing the tooth wear types according to etiologic factors and the erosion index according to Lussi referring to tooth wear due to erosion.

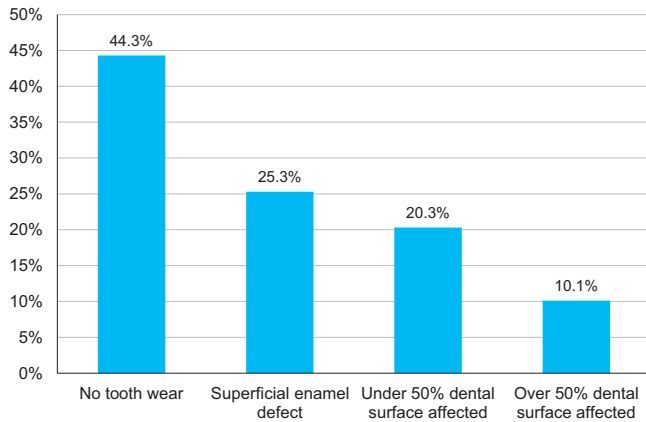
The questionnaire, comprising of twenty questions, covered the study subjects' oral hygiene habits, diet types, and various psychiatric issues, with a special emphasis on the critical factors for tooth erosion. The questionnaire has been filled in by 79 adults seeking dental medical care. Using the detailed anamnesis and the clinical examination, we wished to get an overall picture as far as dental erosion risk factors are concerned. We summarized the acquired data in a table and processed it in Microsoft Excel using Analysis ToolPak.

## RESULTS

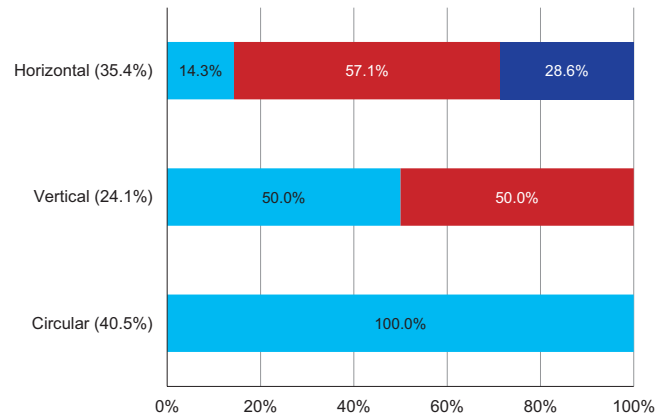
A total number of 79 subjects participated in our study, i.e. 33 male and 46 female subjects, between 17 and 78 years of age, with an average age of 35.6 (SD 14.2) years. Tooth wear was present in more than half of the cases (55.7%, Figure 1).

The age groups where tooth wear was detected was between 23 and 78 years with an average of 38.6 years versus the group between 17–36 years, average 26.3 years, where tooth wear was not characteristic.

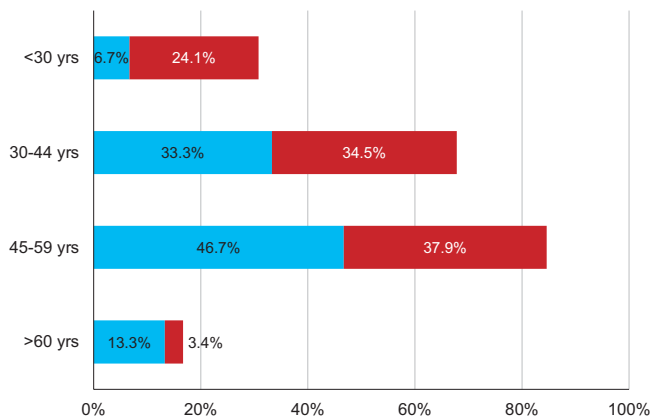
Specifically, we identified abrasion in 30.4% of cases, which can be attributed to dental prosthesis (13.9%), parafunction (3.8%), and harmful tooth brushing (12.7%).



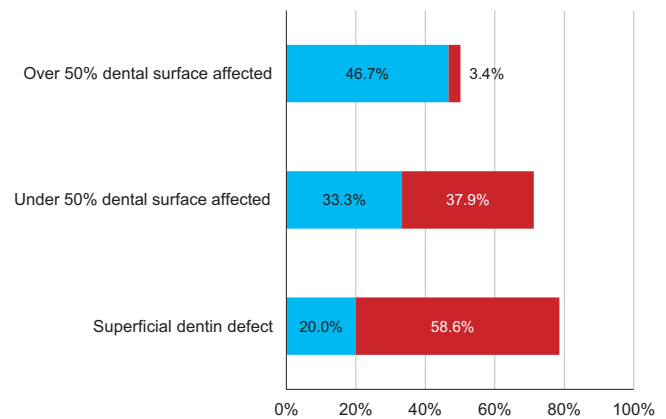
**FIGURE 1.** Extent of tooth wear in the study population (n = 79)



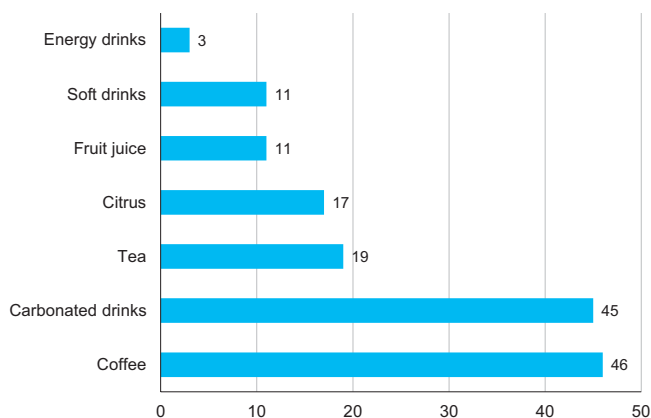
**FIGURE 2.** Toothbrushing technique and the resulting abrasion and tooth wear



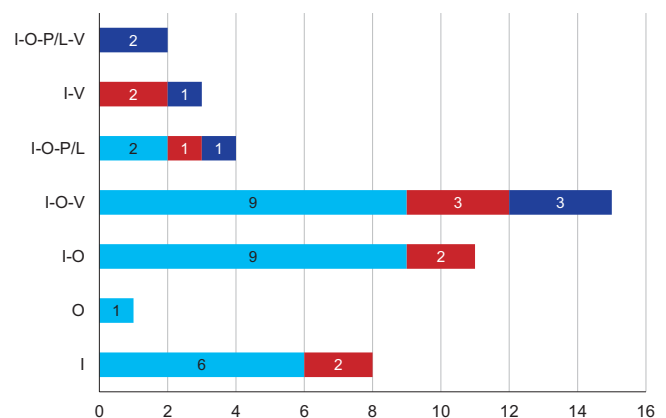
**FIGURE 3.** Age groups affected by bruxism and physiological tooth wear



**FIGURE 4.** Tooth wear extent shown by those suffering from bruxism, according to loss of material



**FIGURE 5.** Number of subjects consuming beverages which cause erosion (n = 79)



**FIGURE 6.** Occurrence of erosion on various dental surfaces: I – incisive, O – occlusal, P/L – palatal/lingual, V – vestibular (labial/buccal) according to the index of Lussi

Eighty per cent of this last group of patients has been using hard bristled toothbrushes, the rest medium type, none of them opting for soft toothbrushes. Around 65% of all pa-

tients prefer circular and vertical brushing which seem to cause less extensive damage to the enamel. In turn, only a small percentage (14.3%) of patients using horizontal

movement had merely superficial enamel defect (Figure 2).

17.8% of patients had dental prosthesis and in 12.7% tooth wear on the antagonist side could be identified. Esthetically, it is of an utmost importance what materials are used for dental prosthetics, and only 7.7% have chosen the less appealing, but less abrasive metal in favor of ceramic and metal-ceramic.

The cause of attrition falls into two groups. The first group covers subjects suffering from bruxism (19%, almost 3/4 of which are known to have some kind of chronic psychiatric condition), while the second group covers individuals featuring physiological tooth wear (36.7%) (Figures 3 and 4).

Relying upon the questionnaire and upon the clinical examination, we assessed the occurrence, etiology, and prevalence of dental erosion, according to age groups. The consumption of different beverages which cause erosion is shown in Figure 5. The occurrence of erosion on tooth surfaces is presented in Figure 6.

Our questionnaire included the question what does tooth wear as a concept mean according to their opinion (a genetic disease, gradual loss of the hard tissue in teeth, a piece of enamel breaks off in worn teeth); only 60.8% of patients managed to answer correctly. When asked if the condition their teeth are in is satisfying, 21.5% answered no, the rest were equally divided between yes and more-or-less.

## DISCUSSION

In different international studies, the frequency of dental erosion varies within wide limits, and various methods (erosion indices) are used during the assessments.<sup>15</sup> Between 6–10% of kindergarten children, 11–100% of adolescents, and 4–84% of adults seem to be affected.<sup>16</sup> These significant deviations are originating in population differences; however, an important role is played by the applied diagnosing criteria and different threshold values. In recent years, several publications dealt with the issue of tooth wear.<sup>7,17–19</sup>

In our study, signs of tooth wear have been found in more than half of the subjects. Since age groups of both young and elderly people have been involved in the assessment, the respondents' age varied within a wide scale of values. Incipient enamel erosion was rarely present within the age group of elderly people, while the ratio of lesions penetrating deeply into the enamel or into the dentin was higher, which means that tooth wear severity increases with age. Although most of the reference literature shows

that in Europe tooth wear is more frequent in young boys and men, in the case of our study population there was no significant difference between genders as far as this aspect is concerned.<sup>20–23</sup> The fact that men are more affected may be explained by their more developed masticatory muscles, their greater force of mastication, and their different eating habits.

According to our results, the number of worn teeth was higher in subjects who brushed their teeth using only the horizontal method compared to those who used vertical, horizontal, or circular movements. The clinical examination has proven that regarding tooth wear, the least adverse tooth brushing is the one using circular movements, since only superficial enamel defect is caused, unlike using horizontal movements, where dentin may also be affected on even more than half of the tooth surface.

On the one hand, hard bristle toothbrushes cause tooth wear at a greater extent (80%) than medium bristle toothbrushes (20%); on the other hand, there are no signs of abrasion in the case of soft bristles. The most adverse interaction is where mechanical and chemical processes are present at the same time. A surface that is demineralized due to an acidic effect becomes vulnerable subsequently to a mechanical effect, and it is possible to easily remove the softened superficial layer.<sup>24</sup> This happens when we brush our teeth right after having consumed acidic food. This process results in an even greater loss of material if we perform powerful horizontal movements using a hard bristle toothbrush.<sup>25</sup> Under such circumstances, abrasion and abfraction are present together, thus the tooth neck areas are weakened by the stress incurred due to occlusal load forces, and the said vulnerable portion is exposed to an external force of friction, for instance while brushing the teeth.

Among the questioned subjects, 17.8% had some kind of prosthetics and in 12.7% the prosthetics have worn out the occlusal surfaces of the antagonist teeth. Among the subjects, 19% suffer from bruxism, frequently associated with psychological disturbances. Attrition and abfraction mechanisms act together in the case of bruxism. During this repeated grinding and clenching of the teeth, tooth-tooth contact stress and friction act at the same time. The 30–59 years age group is the most affected by bruxism, and the less affected are those below 30 years of age. It has been proven that tooth wear in subjects suffering from bruxism is generalized, namely each and every tooth is affected, and the occlusal surface of the teeth is worn to the greatest extent. Thus, in 46.7% of the examined subjects the teeth were so worn that on over more than half of the tooth surface dentin was also affected, in 33.3% dentin was affected

over less than a half of the tooth surface, while in 20% a superficial enamel defect was noticeable.

Physiological tooth wear was present at the greatest percentage in the 45–59 years age group (37.9%) and the 30–44 years age group (34.5%), and the lowest prevalence (24.1%) was shown by the generation under 30 years of age. In this study, tooth wear manifested itself mostly in superficial enamel defects.

As a general rule, one can ascertain for each age group that the most frequently and most severely affected teeth are the incisor and first molar teeth. This may be explained by the fact that these are the first to erupt and therefore, are exposed for a longer period of time to various wearing effects. Extrinsic acids reaching the mouth get most intensively in contact with the frontal teeth.

12.7% of patients answered yes to the question whether they showed symptoms of GERD. It should be mentioned that according to the most recent assessments, GERD is highly spread in welfare states. A representative assessment in Germany revealed that about 20% of the population encounters reflux complaints from time to time; however, in over half of them these symptoms occur only a few times a year. Data in Hungary are similar, i.e. showing a 20–40% prevalence of GERD in the adult population, including both the typical (esophageal) and the atypical (extra-esophageal) symptoms.<sup>14</sup>

Relying upon endoscopic examination and the presence of GERD symptoms, a Japanese study found a 17.9 % GERD prevalence in the adult population, among which 7.1 % were diagnosed with esophagitis and 10.8% not.<sup>26</sup>

Regarding the consumption of beverages causing erosion, coffee (58.2%), carbonized drinks (57%), tea (24.1%) and, to a lesser extent, fruit juice (13.9%), soft drinks (13.9%) and energy drinks (3.8%) were relevant in the present study. The tooth surface examination has shown that in case of extrinsic and intrinsic acidic effects, mainly frontal and molar teeth featured enamel alterations, on the occlusal surface, as well as on the buccal tooth neck areas, mainly on the mandible. Dentin wear was frequent on the incisive surface of the incisor teeth. Enamel lesions showed correlation with drinking from the bottle in terms of buccal surface wear and with consuming beer and wine in terms of the incisive and occlusal surfaces. Dentin wear can be attributed to apple, orange drinks, and fruit juice consumption.

The percentage of those who answered incorrectly the question what characterizes tooth wear was relatively high, which lets us draw the conclusion that most of the patients are not aware of tooth wear as a concept. Due to the limitations of our study, we set the aim to increase the number of cases.

## CONCLUSIONS

Tooth wear is of a multifactorial and irreversible process, which may occur equally among youngsters and elderly people. We found a close connection between the consumption of carbonated drinks, fruit juices, fruits, and acidic food, the study subjects suffering from psychological diseases, those having prosthesis, and the phenomenon of erosion.

We must raise awareness of the fact that it is not brushing the teeth itself which causes tooth wear but rather cleaning the teeth incorrectly, using inappropriate techniques, and also, too frequently, using aggressive toothbrushes that may expose our teeth to risk.

Relying upon the assessed data and the screening examinations, we can confirm that the number of patients presenting for dental medical care showing tooth wear is substantial, thus increased attention should be given to the issue in everyday dental medical practice, since a detailed case history can identify avoidable risk factors through which disease progression may be slowed down or even halted.

## CONFLICT OF INTEREST

Nothing to declare.

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