International Journal of Medical and Health Research
ISSN: 2454-9142, Impact Factor: RJIF 5.54
www.medicalsciencejournal.com
Volume 3; Issue 7; July 2017; Page No. 54-60

Occlusal and incisal tooth wear in Turkish adult patients

[1] Said Karabekiroğlu, [2] Sevgi Şener, [3] Güldane Mağat, [4] Işın Akdemir, [5] Nimet Ünlü

[1, 4] Necmettin Erbakan University, Faculty of Dentistry, Department of Restorative Dentisty, Konya, Turkey
[2, 3] Necmettin Erbakan University, Faculty of Dentistry, Department of Oral Radiology, Konya, Turkey
[5] Selçuk University, Faculty of Dentistry, Department of Restorative Dentisty, Konya, Turkey

Abstract
The aim of this study was to determine the prevalence of tooth wear (TW) in a sample of subjects attending two university dental clinic in Turkey and to investigate the relationship to age, gender, socioeconomic status, oral care, medical history, parafunction and dietary habits. The group of study had 1094 patients (647 female and 447 male), structured on the following subgroups of age: 18- 30 years, 30-50, and 50-74. Each patient had a clinical exam and a questionnaire for age, gender, oral care, medical history, diet, parafunctional habits and socioeconomic data, spotlighting the etiology of tooth wear. We recorded the prevalence and severity of tooth wear. TW was measured clinically by Smith and Knight Index. Data were analyzed using Spearman Correlation and Chi Square tests. 1094 subjects (mean age 33.1 years) were examined of whom 64.9% had some degree of TW with the majority, 33.2% exhibiting mild, 21.5% with moderate and 10% with severe TW. TW is frequent at two gender (p=0.225). There were associations found between TW and age (p<0.001), acidic beverages (p=0.001), gastric reflux (p=0.001), bruxism (p=0.000), medical problem (p=0.001) and medicament usage (p=0.001). TW in this Middle of Anatolian population group appears to be common. Data supports an association between TW and age, parafunction, dietary, medical history and medicament usage. Tooth wear is significantly associated with age, gender, dietary habits, medical history, bruxism.

Keywords: tooth wear, prevalence, etiologic factors, smith and knight ındex

Introduction
Tooth wear (TW) is a complex, multifactorial phenomenon with the interplay of bilogical, mechanical, chemical and tribological factors. Tooth wear describes the non-carious loss of tooth tissue as a result from the interaction of three processes which may occur in isolation or in combination; attrition, erosion and abrasion [1-2]. These terms reflect the specific etiologic factors that are associated with the loss of tooth tissue. Attrition is the loss of tooth tissue due to tooth to tooth contact with no foreign substance intervening and it's usually due to parafunctional habits such as bruxism or grinding of the teeth [2,4]. Abrasion is the pathological loss of tooth substance caused by abnormal and repetitive mechanical wears other than tooth contact [5]. And erosion is the progressive loss of hard dental tissue by a chemical process not involving bacterial action [6]. It has recently been stated that erosion is playing an increasingly important role in tooth wear [7]. Most cases of tooth wear have a multifactorial aetiology [4-7].
Occlusal and incisal surface of teeth expose to TW more frequently. The extensive tooth wear found among primitive peoples has mainly been attributed to abrasive particles in the diet [8]. In present day abrasive components in the diet may be the cause of occlusal breakdown in only a few cases. However, many factors have been found to cause incisal and occlusal breakdown; including dietary variables, the composition of the saliva, muscular forces and parafunctions [9-12]. Gradual wear of incisal and occlusal surfaces of the teeth is physiologic process. There are indications that occlusal wear in general is a slow process [12].
It has been estimated that the normal vertical loss of enamel resulting from natural wear is about 65µm/year [13]. Tooth wear is considered pathologic when the loss of tooth surface is excessive to the extent that it affects the appearance or function of the dentition or causes discomfort. An extremely worn dentition is uncommon, but when it occurs, it is considered to be a great esthetic and clinical problem [10]. It is therefore important in clinical practice to identify an accelerated rate of tooth wear at early stage, diagnose its cause if possible, apply preventive measure and monitor carefully over a long period of time.
There are a few prevalence studies of occlusal and incisal tooth wear reports in the literature and none from Turkey. Hugoson *et al*, in a study of a group of Swedish adults, reported that the lowest score were 13.6% in 20-29 year olds and highest score were 24,1% in 50-59 year olds, respectively [14]. Therefore, it was stated the percentage of teeth with extensive occlusal/incisal TW increased with age. Study suggested that men showed more teeth with incisal or occlusal wear of any degree than women, the difference being significant (p<0.05 to p<0.001) for all age groups except the 20- and 60- year olds.
As a candidate for the European Union, Turkey is a developing country, which is between Asia and Europe. There has not been study in the literature about Turkish adult patient's occlusal tooth wear prevalence. This study's objective was to determine the prevalence of occlusal tooth wear (TW) in a sample of an adult subjects attending a university dental clinic in Turkey and to investigate the relationship to age, gender, socioeconomic status, tooth brushing, medical history, parafunction and dietary habits.

Materials and Methods
The study was performed on Selcuk University Dentistry Faculty. Patients were informed for the research. A total of 1094 subjects attended to the dental hospital for the general

dental examination were examined; 647 were women and 447 were men, the group of study structured on the following subgroups of age: 18- 30, 30-50, and 50-74 years old. All patients were clinically examined by one observer under standard illumination from mouth mirrors. The occlusal surfaces of all teeth present in the mouth were scored for dental wear according to the criteria based on the Tooth Wear Index of Smith and Knight (Table 1).

The questionnaire was developed to cover dental history, oral hygiene practises and habits of consuming beverages that were used by the patients. These included frequency of toothbrushing (rarely, once a week, once a day, twice a day, three times a day); hardness of tooth brush (hard, medium-hard, soft); the form of toothpaste (paste and gel); whether or not using mouthwash and tooth floss; frequency of eating (once a day, twice a day, three times a day); consumption of acidic foods (never, rarely, frequently); frequency of alcohol consumption (never, rarely, frequently); consumption of acidic beverages (never, rarely, frequently) and whether or not bruxism.

After undertaking the clinical examination, the data were collected through a self-reported questionnaire completed by patients. The data were recorded by a trained assistant. In cases of doubt the lower score was assigned. All patients were classified into one of the following groups based on their individual tooth surface scores;

- Patient with scores of 1 was placed in the Low TW group.
- Patient with scores of 2 was placed in the Moderate TW group.
- Patient with scores of 3 and/ or 4 was placed in the Severe TW group.

Data were analyzed using Spearman Correlation and Chi Square tests in SPSS13.0 (SPSS Inc, Chicago, IL, USA) software system. Significance was accepted at the $p < 0.05$ level.

Results

27324 teeth (occlusal and incisal surfaces) at 1094 patients were examined. A 64.9% of patients had some degree of TW. It was found that the prevalence of TW was 33.2% with low, 21.5% had moderate and only 10% had severe. The majority of tooth surfaces showed loss of enamel surface characteristics (score 1) in both upper and lower teeth and occlusal and incisal surfaces. The incisal edges of most anterior teeth (central incisors, lateral incisors and canine teeth) had more tooth wear with visible dentine (score 2, score 3). TW into dentine was most common on the upper and lower incisal surfaces of anterior teeth compared with posterior teeth. Very little tooth wear was seen on premolars and molars. Table 2 presents the results for the degree of tooth surface loss in the different age groups.

When the proportions of female and male subjects with tooth wear were compared it was found not statistically significant differences between two genders. Tooth surface loss affected 64.7% of women and 65.4% of men. There were associations found between TW and age ($p<0.001$), acidic beverages ($p=0.001$), bruxism ($p=0.000$), medical history ($p=0.001$), reflux ($p=0.002$) and medicament usage ($p=0.001$).

Twenty thousand subjects (93.3%) used hard or medium toothbrush and most subjects (84.3%) brushed their teeth at least once a day. The results showed that there were not association with frequency of tooth brushing and TW. Eighty six subjects reported suffering from gastric reflux (7.8%) which indicates an association with TW. There were a significant associations was found between TW and bruxism (Table 4). There were a significant associations was found TW and medical problem ($p=0.001$) and medicament usage ($p=0.001$). Table 3 showed TW and medical history and medicament usage relations. There was a significant relationship between TW and consumption of acidic beverages (Table 4).

Table 1: Smith and Knight Tooth Wear İndeks (TWI)

Code Scores	Surface	Criteria
0	B/L//I	No loss of enamel surface characteristics
1	B/L/O/I	Loss of enamel surface characteristics
2	B/L/OI	Loss of enamel, visible dentine for less than 1/3 of the surface. Loss of enamel just exposing dentine.
3	B/L/OI	Loss of enamel, visible dentine for > 1/3 of the surface. Loss of enamel and substantial loss of dentine but not exposure of pulp or secondary dentine.
4	B/L/OI	Complete loss of enamel, or pulp exposure, or secondary dentine. Pulp exposure or exposure of secondary dentine.

B,Buccal or Labial; L, Lingual or Palatal; O, Occlusal; I,Incisal.

Table 2: Percentage of subjects with tooth wear by age group and gender.

	No	Low	Moderate	Severe	Total	p-value
18 - 30	292 (51.6)	183	75	15	565	p<0.001
31 - 50	78 (19.7)	154	116	46	394	
50 - 74	14 (10.3)	27	45	49	135	
Female	229 (35.3)	228	129	61	647	p=0.225
Male	155 (34.6)	136	107	49	447	
Total	384 (35.1)	364	236	110	1094	

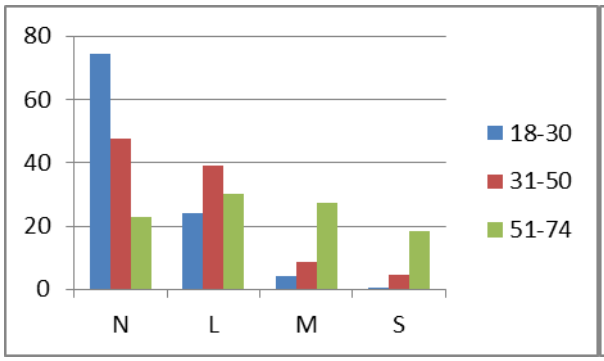
Tables 3: Tooth wear and relation of different factors.

		No	Low	Moderate	Severe	Total	p-value
Medical Problem	No	338 (37.4)	315	185	65	903	0.001
	Yes	46 (24)	49	51	45	191	
Medicament Usage	No	345 (37.1)	313	189	81	928	0.001
	Yes	39 (23.4)	51	47	29	166	

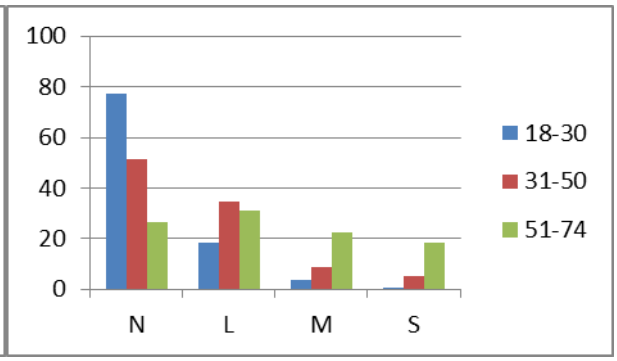
Reflux	No	367 (36.4)	332	220	89	1008	0.002
	Yes	17 (54.6)	32	16	21	86	
Brushing Frequency	Rarely	33 (28.4)	34	33	16	116	0.210
	Twice a week	13 (23.6)	17	12	13	55	
	Once a day	159 (35.1)	139	103	51	452	
	≥ Twice a day	179 (38)	174	88	30	471	
Toothbrush Hardness	Hard	27 (44.2)	16	10	8	61	0.752
	Medium	324 (33.7)	330	212	94	960	
	Soft	34 (46.5)	18	13	8	73	
The form of toothpaste	Paste	374 (35.3)	350	230	104	1058	0.356
	Gel	10 (27.7)	14	6	6	36	
Toothfloss	No	348 (35.4)	321	209	104	982	0.847
	Yes	36 (32.1)	43	27	6	112	
Mouthwash	No	361 (36)	326	210	105	1002	0.686
	Yes	23 (25)	38	26	5	92	

Table 4: Tooth wear and relation of different factors.

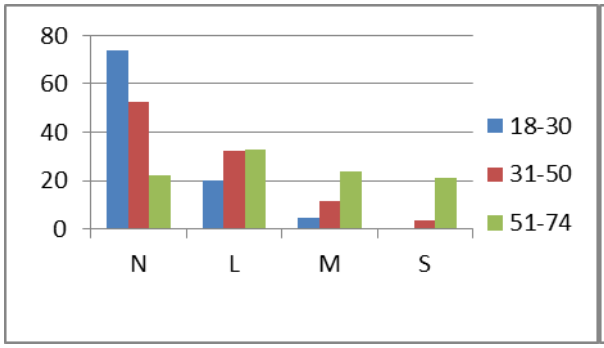
		No	**Low**	**Moderate**	**Severe**	**Total**	**p-value**
Frequency of Eating in day	Once	4 (66.6)	0	0	2	6	0.153
	Twice	59 (28.3)	68	52	29	208	
	Three	321 (36.4)	296	184	79	880	
Consumption of acidic foods	never	172 (38.7)	121	100	51	444	0.704
	rarely	194 (32.3)	235	119	51	599	
	frequently	18 (35.2)	8	17	8	51	
Frequency of alcohol consumption	No	368 (34.8)	353	228	108	1057	0.138
	Yes	16 (43.2)	11	8	2	37	
Consumption of acidic beverages	never	201 (33)	192	141	75	609	0.001
	rarely	163 (36.6)	160	141	32	445	
	frequently	5 (12.5)	17	15	3	40	
Bruxism	No	306 (39.7)	265	126	72	769	0.000
	Yes	78 (24)	99	110	38	325	



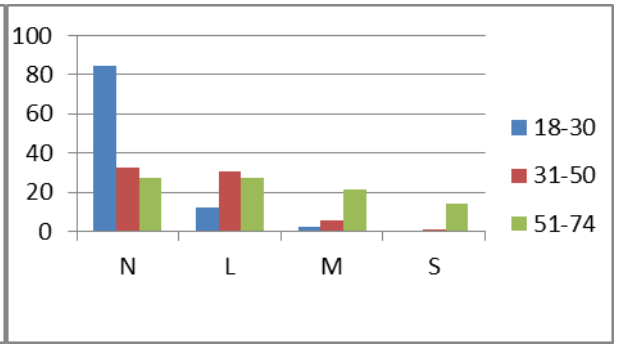
Upper central incisors



Upper lateral incisors



Upper canines



Upper first premolars

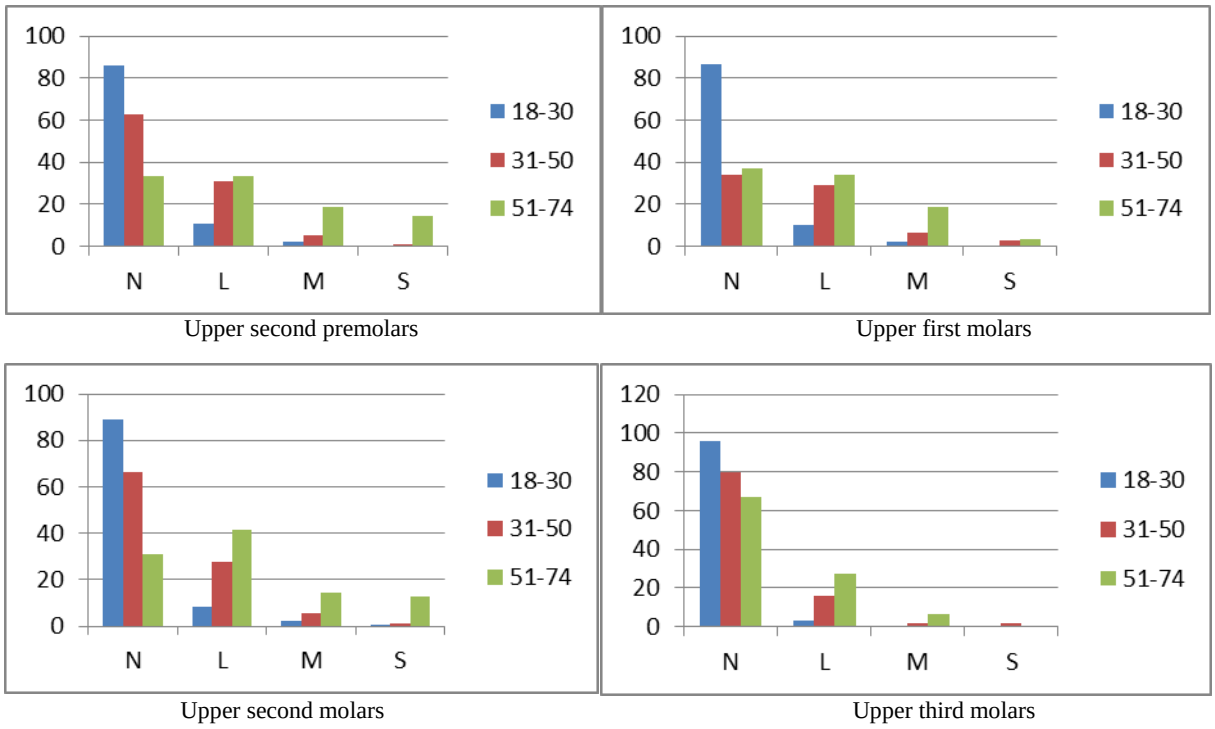
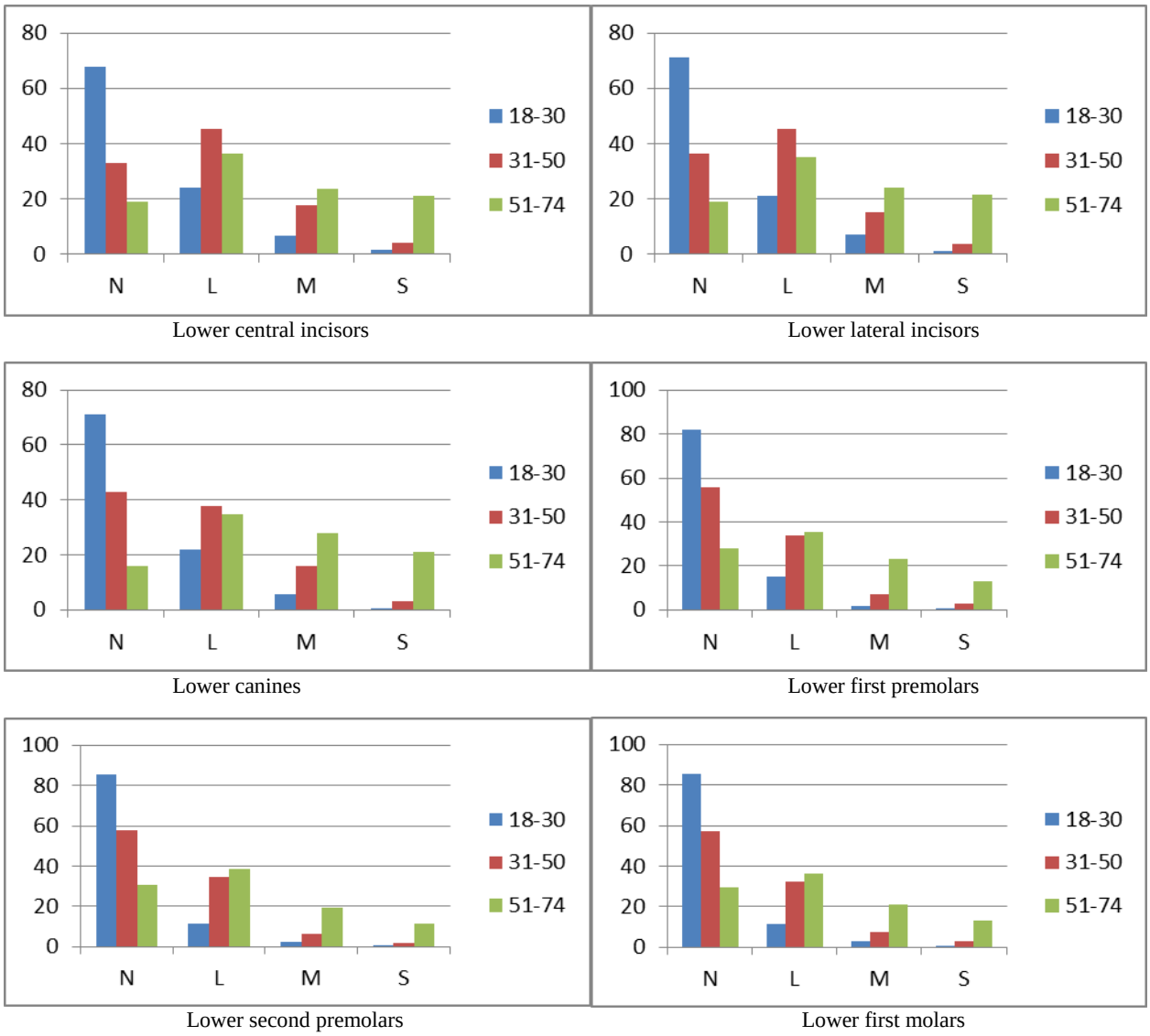
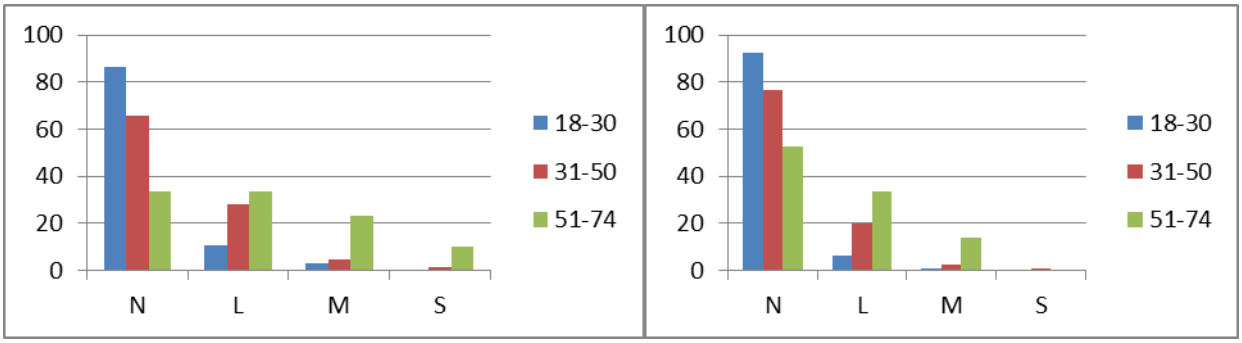


Fig 1: Tooth wear pattern according to different age groups for each teeth in maxilla. (N=No TW, L=Low TW, M=Moderate TW and S= Severe TW)





Lower second molars Lower third molars

Fig 2: Tooth wear pattern according to different age groups for each teeth in mandibula. (N=No TW, L= Low TW, M=Moderate TW and S= Severe TW)

Discussion

There is some evidence that the presence of tooth wear is growing steadily. It is difficult to compare the results of epidemiological studies because of different examination standards used (calibration of examiner(s), scoring system, number and site of teeth) and different nonhomogeneous groups examined (age, gender, number of examined individuals, geographical location). There is a great need for well-defined and generally accepted criteria for evaluation of tooth wear for use in research and in diagnosing incisal or occlusal wear in individual patients [5, 10]. The index used in this study is Tooth Wear Index (TWI) developed by Smith and Knight is the most widely used. Smith and Knight introduced the tooth wear index (TWI), which attempted to provide a solution to some of the problems associated with measuring wear at individual and community level. The TWI and modified versions of it have been used in a large number of studies, which suggests widespread acceptance [15-17]. But, the prevalence of tooth wear has not been well documented. There are a few prevalence studies of occlusal and incisal tooth wear reports in the literature and none from Turkey.

In this study the prevalence of incisal and occlusal tooth wear was studied in 1094 randomly selected Turkish dental adult patients aged 18 to 65 + years. The results of our study showed that 65% percent of patient had occlusal and incisal TW. Hugoson *et al*. reported that 13–24% of surfaces showed evidence of occlusal wear [18]. Other studies have observed that between 25% and 50% of subjects had evidence of TW [19]. However, findings from our study show that 31.5% had moderate and severe TW and this is nearly triple the amount compared to the UK (11 %) [20]. Differences in prevalence data between studies may be partly explained by the differences in diagnostic criteria and indexes used, as well as varying socio-economic, cultural and geographical factors that could influence the outcome of prevalence data.

It is generally accepted that the prevalence of TW increases with age [18, 21]. However, the exact prevalence is unclear, primarily because of differing assessment criteria [22]. In our study incisal wear with score 1 (Low TW group), mainly affecting the front teeth, could be found as early as in the 18-30 year-olds. Comparing the results from the different age groups, there was an increase in the number of teeth with incisal or occlusal wear with age and also an increase in the severity of wear. The main increase occurred between 31 and 50 years (Moderate TW group). With increasing age there was also a change in the distribution of wear within the dentition, with more premolars and molars affected in the older age groups. But extensive occlusal wear was only found in subjects aged 50 years or older (Severe TW group). These results are in accordance with Swedish adult patient's results. The most impressive finding of this investigation was the high prevalence of extensive occlusal wear (Score 3 + Score 4): 110 out of 1094 subjects examined (10%). This result is four times greater than the Swedish adults [18]. But maybe this differences caused by the use of different types of index and scoring scale. Occlusal surfaces of molar and premolar teeth, together with incisal surfaces of canine and incisor teeth, may be grouped together as the functional surfaces of the dentition. This term indicates their role in mastication and providing guidance in excursive movements of the mandible. It is used to facilitate the discussion of tooth wear in the study population. An increase in tooth wear was observed on functional (occlusal and incisal) surfaces of the sample with increasing age of the subject, although the pattern of wear varied between the arches and between tooth groups [18]. Thus functional surface wear was seen to be more marked among anterior teeth (incisors and canines) than among posterior teeth (molars and premolars), while between the arches, incisal surfaces of mandibular anterior teeth displayed higher mean wear scores than incisal surfaces of maxillary anteriors. This pattern of wear of the functional surfaces might be partially explained by the active role of lower incisors and canines in both masticatory and excursive jaw movements during function and parafunction [22].

Similar proportions of males (64%) and females (65%) presented with TW, but there was not a significant difference between the gender in the total number of teeth with different degrees of incisal or occlusal wear. This is in accordance with clinical experience and observation made in other studies [17, 20], but is in contrast to others [18, 22]. Many studies suggested that tooth wear was observed to be greater among males than among females [13, 18]. This increase in severity of tooth wear may be related to increased tooth retention among men. In addition, males may generate greater forces during functional and perhaps more importantly parafunctional activity. Producing greater stresses to which the dentition is exposed [22]. On the other hand 1041 subjects (93%) used hard or medium toothbrush and most subjects (84.3%) brushed their teeth at least once a day. No association was found with the frequency of tooth brushing and TW in occlusal and incisal surfaces. Other studies reported an increase in the frequency of cervical surface wear in those who brushed their teeth at least twice a day compared to those who brushed less often [24, 25].

This study showed that gastric reflux is associated with

occlusal and incisal tooth wear. This is in agreement with other study they found that significant association between gastric reflux and palatal surface wear [17, 21]. In our study 325 patients (29.7%) stated that had a bruxism and this is closed to another study [26]. However, in that study bruxism was not significantly associated with TW whereas in our study, there was a significant association with occlusal and incisal tooth wear and subjects reporting a parafunctional habit. While some subjects may know about their parafunctional habit, many more probably do not.

It is suggested that patients most at risk of tooth wear have work and sports dehydration, caffeine addiction, asthma, diabetes mellitus, hypertension or other systemic diseases or syndromes that predispose to xerostomia [27]. In our study, it was found that there was a significant association with TW and medical problem. The use of chronic medicaments with an acidic composition or that causes reduction in salivary flow rate could increase the risk for TW [7]. In this investigation, few subjects reported the use of chronic medicaments and it was significantly associated with TW.

Citrus fruits, fruit juices and carbonated drinks are thought to produce occlusal, incisal and palatal tooth wear when taken in excess and this has been demonstrated in a number of studies [28, 29]. Nearly one-third to one-half of the subjects consumed citrus fruits, fruit juices or soft drinks on a rarely or more often. However, there were only significant associations found in relation to consumption of acidic beverages, but not acidic foods. On the other hand, the frequency of alcohol consumption has been found to be a significant risk factor for TW [30]. Alcohol may cause tooth surface loss in two ways: by causing vomiting and by the erosive potential of the alcohol itself. In this study, there was not an association between TW and the daily consumption of alcohol.

In this study, most of the teeth affected by wear were found in the anterior regions of both the upper and lower jaws. This distribution of occlusal and incisal wear in modern people differs from that found in primitive people or skeletal material from prehistoric times, in which molars were affected to a higher extent [8]. The results of this study and other investigations [11] also point to the fact that incisal or occlusal wear is a slow process occurring over many years, and few individuals develop severe occlusal and incisal surface wear. It is therefore important in clinical practice to identify an accelerated rate of tooth wear at early stage, diagnose its cause if possible, apply preventive measure and monitor carefully over a long period of time.

References

1. Shellis RP, Addy M. The interactions between attrition, abrasion and erosion in tooth wear. Monogr Oral Sci. 2014; 25:32-45.
2. Eccles JD. Tooth surface loss from abrasion, attrition and erosion. Dent Update. 1982; 9:373-381.
3. Ramalho A, Miranda J. The relationship between wear and dissipated energy in sliding systems. Wear. 2006; 260:361-367.
4. Bartlett D, Dugmore C. Pathological or physiological erosion—is there a relationship to age?. Clin Oral Investig. 2008; 121(1):S27-S31.
5. Smith BGN, Knight JK. A comparison of patterns of tooth wear with aetiological factors. Br Dent J 1984;157:16-19.
6. Barbour ME, Rees GD. The role of erosion, abrasion and attrition in tooth wear. J Clin Dent. 2006; 17:88-93.
7. Lussi A, Carvalho TS: Erosive tooth wear: a multifactorial condition of growing concern and increasing knowledge. Monogr Oral Sci. 2014; 25:1-15.
8. Beyron H. Occlusal relations and mastication in Australian aborigines. Acta Odontol Scand. 1964; 22:597-678.
9. Petersen PE, Gormsen C. Oral conditions among German battery factory workers. Community Dent Oral Epidemiol. 1991; 19:104-106.
10. Smith BGN, Knight JK. An index for measuring the wear of teeth. Br Dent J. 1984; 156:435-438.
11. Carlsson GE, Johansson A Lundqvist S. Occlusal wear: a follow-up study of 18 subjects with extensively worn dentitions. Acta Odontol Stand. 1985; 43:83-90.
12. Oilo G, Hatle G, Gad AL, Dahl BL. Wear of teeth in a mentally retarded population. J Oral Rehabil. 1990; 17:113-171.
13. Ekfeldt A, Hugoson A, Bergendal T, Helkimo M. An individual tooth wear index and an analysis of factors correlated to incisal and occlusal tooth wear in an adult Swedish population. Acta Odontol Scand. 1990; 48:343-9.
14. Hugoson A, Ekfeldt A, Koch G, Hallonsten AL. Incisal and occlusal tooth wear in children and adolescents in a Swedish population. Acta Odontol Scand. 1996; 54:263-70.
15. Smith BGN, Robb ND. The prevalence of tooth wear in 1007 dental subjects. J Oral Rehabil. 1996; 23:232-239.
16. Milosevic A, Bardsley PF, Taylor S. Epidemiological studies of tooth wear and dental erosion in 14 year old children in North West England. Part 2: Association of diet and habits. Br Dent J. 2004; 197:479-483.
17. Bartlett DW, Evans DF, Anggiansah A *et al*. A study of the association between gastro-oesophageal reflux and palatal dental erosion. Br Dent J. 1996; 181:125-131.
18. Hugoson A, Bergendal T, Ekfeldt A, Helkimo M. Prevalence and severity of incisal and occlusal wear in an adult Swedish population. Acta Odontol Scand. 1988; 46:255-65.
19. O'Brien M. Children's dental health in the United Kingdom 1993. Office of Population Censuses and Surveys. London, Social Survey Division, HMSO, 1994.
20. Kelly M, Steele J, Nuttall N *et al*. Adult Dental Health Survey- Oral Health in the United Kingdom. London: The Stationery Office, 2000, 1998.
21. Robb ND, Cruwys E, Smith BG. Regurgitation erosion as a possible cause of tooth wear in ancient British populations. Arch Oral Biol. 1991; 36:595-602.
22. Donachie MA, Walls AWG. Assessment of tooth wear in an ageing population. J Dent. 1995; 23:157-164.
23. Rafeek RN, Marchan S, Eder A, Smith WA. Tooth surface loss in adult subjects attending a university dental clinic in Trinidad. Int Dent J. 2006; 56:181-6.
24. Bergstrom J, Lavstedt S. An epidemiologic approach to toothbrushing and dental abrasion. Community Dent Oral Epidemiol. 1979; 7:57-64.
25. Sangnes G, Gjermo P. Prevalence of oral soft tissue and hard tissue lesions realted to mechanical tooth cleansing procedures. Community Dent Oral Epidemiol. 1976; 4:77-83.

26. Milosevic A, Soo Fong Lo M. Tooth wear in three ethnic groupsin Saban (Northern Borneo). Int Dent J 1996;46: 572-578.
27. Young WG. The oral medicine of tooth wear. Aust Dent J. 2001; 46:236-50.
28. Lussi A, Schaffner M, Hotz P, *et al*. Dental erosion in a population of Swiss Adults Comm Dent Health Oral Epidemiol. 1991; 19:286-290.
29. Millward A, Shaw L, Smith AJ, *et al*. The distribution and severity of toothwear and the relationship between erosion and dietary constituents in a group of children. Int J Paediatr Dent. 1994; 4:151-157.
30. Chuajedong P, Kedjarune-Leggat U, Kertpon V, *et al*. Associated factors of tooth wear in Southern Thailand. J Oral Rehabil. 2002; 29:997-1002.