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Dental erosion in alcoholic patients under addiction rehabilitation therapy

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Abstract

Objective: To determine the occurrence and severity of dental erosion in alcoholic patients undergoing detoxification at the North Alcoholic Regional Centre (CRAN), Porto, Portugal, and to assess socioeconomic and behavioural covariates of dental erosion occurrence. Design: A cross-sectional descriptive study was carried out in one centre (CRAN) for addiction rehabilitation therapy in the north of Portugal. A sample of 1064 teeth was examined. The condition of the dental erosion was classified by means of severity and anatomic location, according to the Eccles and Jenkins dental erosion index, and a dichotomous outcome assessing the occurrence of dental erosion (severity dental erosion levels > 0). Dental erosion results were linked to data supplied by a questionnaire assessing socio-demographic characteristics, behaviour related to alcohol and drug use, including a history of drug and alcohol abuse, and oral health promotion using logistic multivariate regression analysis. Results: Enamel and/or dentine erosion lesions were present on 49.4% of the teeth. Among these, 36.9% of occlusal surfaces presented dental erosion with a severity level of 1, 11.4% with a severity level 2 and 1.1% with a severity level 3. The highest occurrence of severity level 3 was found to exist in palatal dental surfaces (1.9%). Dental erosion on teeth surfaces was found to be independently associated with intra oral location (by arch, tooth type), patients' socio-demographic characteristics, behaviour associated with a history of alcohol and drug abuse, and oral health promotion. Maxillary teeth, more so than mandibular teeth, presented moderate to higher severity erosion injuries (Wilcoxon test; $p< 0.001$); and significant differences in the severity of dental erosion were found between anterior and posterior teeth, in both the maxillary and the mandibular arches (Friedman test, $p< 0.001$). Conclusions: Alcohol-dependent patients undergoing a detoxification programme presented a high occurrence and a low severity of dental erosion lesions.The palatal surfaces of the anterior teeth, followed by incisive/occlusal surfaces in both anterior and posterior teeth, respectively, were most affected by erosion injuries.

Key words: *Dental erosion, alcoholism, risk factors, logistic multivariate regression.*

Introduction

Alcohol is an allowed drug therefore its consumption is socially accepted. However, it is a toxic substance having medical and social side effects. According to WHOROE (2006) the European Region has the highest alcohol intake in the world. Alcohol is the third-largest risk factor for death and disability in the Region and the largest risk factor among young people (1). Yip and Burt (2006) revealed that patients present related problems and side effects due to alcohol consumption and beverages, and in approximately 15% of patients with established cirrhosis, hepatocellular carcinoma develops (2). The detrimental effect of alcohol seems also to be more pronounced in interaction with poverty and malnutrition (1).

Alcoholic patients are a risk group for dental erosion injuries, because alcohol consumption has the potential for increasing the degradation rate mechanisms and by the direct and indirect ethanol effects in the organic systems (3,4). These drug addition patients have high risk for dental erosion lesions, being particularly susceptible to that dental chemistry wear, as indirect and direct results of vomits and frequent acidic beverages consumption (5-7). The dental erosion is defined as a gradual structure dental wear caused by a chemical process, that does not involve bacteria activity (6,8).

Published studies concerning the alcoholic patient oral health are rare, as well as that about the etiologic and risk factors associations between oral health indicators, particularly dental erosion and the alcohol beverage consumption.

The aim of this study was to determine the experience and severity of dental erosion lesions in alcoholic patients under an addiction rehabilitation therapy in one centre (CRAN) located in Porto, north of Portugal, and to assess socioeconomic and behavioural covariates of dental erosion experience.

Material and Methods

Before implementation, this study was approved by the Ethics Committee of the Faculty of Health Sciences, University Fernando Pessoa (FCS-UFP).

** Participants*

This cross-sectional study about dental erosion experience and severity was carried through a population of 50 patients, 15 (30%) women and 35 (70%) men, which were interned for alcoholic addiction detoxification programme in the CRAN, between February and May of 2006. After signature of the informed consent, data were collected through the fulfilment of a questionnaire, during a personal interview to each participant and by visual dental examination (dental erosion lesions location by arch (maxillary, mandibular), tooth type (anterior, posterior) and surface (Palatine/lingual, Buccal, occlusal/incisal)). A sample of 1064 teeth was constituted and examined. To assure standardization criteria during data collection, questionnaires and visual examination data were always carried through by the same examiner. At the beginning of the study, intra-examiner calibration was done, by repeating the visual dental examination of 10 patients' teeth and fulfilling the questionnaire of the first 10 patients, with a one week interval between two collecting moments, showing an intra-examiner agreement coefficient Kappa of Cohen of 0.90.

** Non-clinical data*

Non-clinical data were registered (questionnaire) and included information about patient gender, age and socio-demographic characteristics as education level, civil and employment status. Education levels were classified according to UNESCO, by the International Standard Classification of Education (ISCED) (9). This data was dichotomized as level "2" or less (academic education ≤ 9 years), and more than level "2" (academic education > 9 years). This questionnaire also gathered information about alcohol beverages consumption, quantities and qualities of consumption, as well as behaviour related to smoking and drugs of abuse history and oral health promotion. The daily consume of pure alcohol (pure alcohol dose) was calculated through equation 1 (Eq.1), by using the amounts of different drinks reported for each patient, where k is the number of different types of alcohol beverages.

$$dose(g/day) = \sum_{i=1}^{k} (Volume(mL)_i \times Alcohol\ content(\%\ or\ gL)_i \times 0.8) \quad \text{Eq.1}$$

Eq.1

Clinical data

Tools for clinical examinations were of visual assessment (with the aid of a mirror, clamp, cotton rolls, air gauzes and air spray) and a CPI probe inspection, sliding the probes end gently across a tooth surface to confirm the presence of a cavity or discontinuity, apparently confined to enamel, both done through natural light. The dental erosion lesions were classified by means of severity and anatomic localization, according to dental erosion indicators, namely Eccles and Jenkins criteria (10). For this classification the occlusal, palatine/lingual and buccal surfaces in all teeth had been observed, and a severity level was attributed according to: level 0 (zero) "Normal surface, without enamel wear", level 1 (one)" Surface with enamel wear, but without dentin wear", level 2 (two) "Surface with dentin wear, less than 1/3 of the surface" and the highest severity, level 3 (three) "Surface with dentin wear, more than 1/3 of the surface". Teeth dental erosion experience was considered when at least one tooth surface showed enamel or dentin structures erosion wear (levels one, two or three of severity). Teeth dental severity was classified as low if at least one surface of the teeth showed enamel erosion wear (severity level of one) and moderate to high sever-

ity of teeth dental erosion was considered when at least one teeth surface shows a dentin erosion wear (level two or three of severity).

Data statistics analysis

All statistic analysis procedures were carried out through the statistical package for the social sciences software, SPSS® v.15.0 (SPSS Inc., IL. Chicago, USA). A statistic significance level of 0.05 was considered, that is, the null hypothesis (considered in each test) was rejected in all the situations where the probability associated with tthe statistics of the test (p-value) was inferior to this value. Comparison of dental erosion by several intra-oral locations (Fig.1) was assed by means of Friedman test, and if significant differences were obtained, the identification of which dental locations showed differences of dental erosion was assessed using the Wilcoxon test. Associations between dental surface outcomes and covariates (bivariate analysis) were assessed by unadjusted odds ratio (Table 1). The independent effect of significant variables or covariates ($p < 0.05$) on dental surface erosion (severity level >0) being assessed using backward stepwise binary logistic multivariate regression analysis (0.05 for covariate inclusion and 0.1 for exclusion). The result multivariate models (Table 2) for teeth surface dental erosion comprised intra oral location by arch, tooth type, and patients' socio-demographic characteristics, behaviour related to alcohol and drugs of abuse history and oral health promotion. Their goodness-of-fit assessment used -2loglikelihood test, Cox & Snell R2, Nagelkerke's R2, and the area under the curve (AUC) derived from the model after applying a ROC analysis.

Results

In the present survey a total of 50 patients, with an average age of 42 years (24 (minimum) to 67 (maximum) years old), were inquired and observed, 15 (30%) women and 35 (70%) men. No statistic differences were found in age, for patient's gender (t test, p=0.079), civil state (ANOVA, p=0.686), level of education (ANOVA, p=0.237) and their professional situation (ANOVA, p=0.513). Observed patients presented an average of 21.3 (sd=7.0) teeth. No significant statistical differences in the mean teeth number were found for patient's gender (t test, p=0.771), civil state (ANOVA, p=0.734), level of education (ANOVA, p=0.826) and their professional situation (ANOVA, p=0.270). In this study smoker female patients had the highest average of alcohol ingestion, 324.1 (sd=199.8) g/day, while non smoker ingested 176.5 (sd=66.7) g of alcohol/day. This difference was not as high for smoker and non smoker men, with an average daily alcohol intake of 266.9 (sd=173.1) g/day and 256.9 (sd=214.2) g/day, respectively. Average alcohol intake for all patients was 265.7 (sd=171.4) g/day. The expected alcohol g/day consumption was not different for smoker and non smoker women (t test, p=0.108), for smokers between gender (Mann-Whitney U test, p=0.867), and for non smoker men and women (t test, p=0.585).

Clinical data revealed that 49.4% of 1064 teeth had enamel and/or dentin erosion lesions. From these, 36.9% of occlusal surfaces presented dental erosion with a level 1 of severity, 11.4% with a severity level 2 and 1.1% with a severity level 3. Although occlusal dental surface globally presented higher experience of erosion lesions, severity level 3 was found to have the highest experience in palatine dental surfaces (1.9%). Significantly more severe erosion lesions (Fig. 1) were observed in

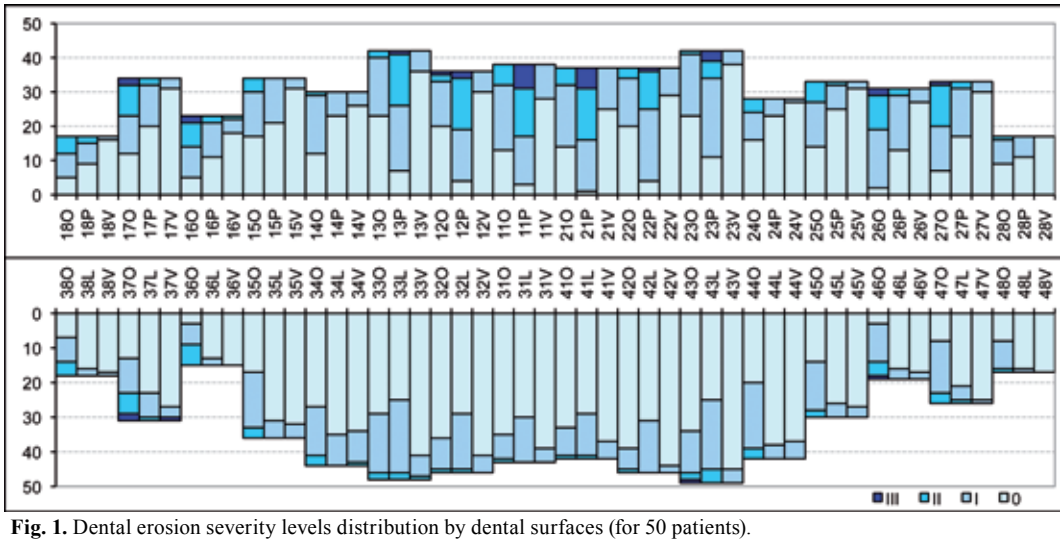

Fig. 1. Dental erosion severity levels distribution by dental surfaces (for 50 patients).

Table 1. Unadjusted assessment of association between risk factors and dental erosion (severity level >0) for different dental surfaces in alcoholic patients under addiction rehabilitation therapy.

Dental Erosion		Occlusal Surface				Palatine Surface				Buccal Surface			
		Erosion level >0		OR (CI 95%)	*p*	Erosion level >0		OR (CI 95%)	*p*	Erosion level >0		OR (CI 95%)	*p*
		no	yes			No	yes			no	yes		
Intra oral location													
Arch	mandibular	326	226	1.00		404	148	1.00		495	57	1.00	
	maxillary	212	300	2.04 (1.60-2.61)	< 0.001	203	309	4.16 (3.21-5.38)	< 0.001	440	72	1.42(0.98-2.06)	0.062
Type of tooth	posterior	219	339	1.00		408	150	1.00		502	56	1.00	
	anterior	319	187	0.38 (0.30-0.48)	< 0.001	199	307	4.20 (3.24-5.43)	< 0.001	433	73	1.51(1.04-2.19)	0.028
Socio-demographic characteristics													
Gender	Feminine	172	153	1.00		173	152	1.00		287	38	1.00	
	Masculine	366	373	1.15 (0.88-1.45)	0.307	434	305	0.80 (0.62-1.04)	0.095	648	91	1.06(0.71-1.59)	0.775
Age	< 40 years	251	190	1.00		231	210	1.00		389	52	1.00	
	≥ 40 years	287	336	1.55 (1.21-1.98)	< 0.001	376	247	0.72 (0.56-0.92)	0.010	546	77	1.05(0.73-1.54)	0.780
Civil state	maried	237	189	1.00		245	181	1.00		387	39	1.00	
	single or divorced	301	337	1.40 (1.08-1.80)	0.007	362	276	1.03 (0.80-1.32)	0.803	548	90	1.63(1.10-2.43)	0.015
Academic Education	≥ 9 years	146	191	1.00		177	160	1.00		286	51	1.00	
	< 9 years	377	311	0.63 (0.48-0.82)	0.001	410	278	0.75 (0.56-0.98)	0.032	617	71	0.65(0.44-0.95)	0.025
Employment status	employed	381	335	1.00		422	294	1.00		619	97	1.00	
	unemployed / retired	157	191	1.38 (1.07-1.79)	0.013	185	163	1.26 (0.98-1.64)	0.074	316	32	0.65(0.42-0.99)	0.041
Behaviour related to alcohol and drugs of abuse history													
Daily alcohol intake	<240 g/day	294	267	1.00		322	239	1.00		491	70	1.00	
	≥ 240 g/day	222	230	1.14 (0.89-1.46)	0.298	250	202	1.09 (0.85-1.40)	0.505	398	54	0.95(0.65-1.40)	0.798
Years of alcohol daily consumption	≤ 10 years	236	198	1.00		251	183	1.00		385	49	1.00	
	> 10 years	275	326	1.41 (1.10-1.81)	0.006	336	265	1.08 (0.84-1.39)	0.537	523	78	1.17(0.80-1.71)	0.414
Heroine	No	503	475	1.00		554	424	1.00		855	123	1.00	
	Yes	35	51	1.54 (0.99-2.41)	0.056	53	33	0.81 (0.52-1.28)	0.371	80	6	0.52(0.22-1.22)	0.127
Cocaine	No	513	489	1.00		568	434	1.00		878	124	1.00	
	Yes	25	37	1.55 (0.92-2.62)	0.097	39	23	0.77 (0.45-1.31)	0.337	57	5	0.62(0.24-1.58)	0.313
Smoking habits	No	163	82	1.00		151	94	1.00		228	17	1.00	
	Yes	375	444	2.35 (1.75-3.17)	< 0.001	456	363	1.28 (0.95-1.71)	0.099	707	112	2.12(1.25-3.62)	0.005
To drink before breakfast	No	185	150	1.00		200	135	1.00		300	35	1.00	
	Yes	353	376	1.31 (1.01-1.70)	0.039	407	322	1.17 (0.90-1.52)	0.236	635	94	0.81(0.63-1.04)	0.093
To drink before sleeping	No	319	292	1.00		362	249	1.00		542	69	1.00	
	Yes	219	234	1.16 (0.927-1.49)	0.212	245	208	1.23 (0.96-1.59)	0.093	393	60	1.20(0.83-1.72)	0.335
Vomits due to alcohol intoxication	No	216	196	1.00		264	148	1.00		363	49	1.00	
	Yes	322	330	1.13 (0.88-1.45)	0.334	343	309	1.61 (1.25-2.07)	< 0.001	572	80	1.04(0.71-1.51)	0.854
Gastrooesopha-geal reflux	No	423	362	1.00		477	308	1.00		701	84	1.00	
	Yes	115	164	1.67 (1.26-2.20)	< 0.001	130	149	1.78 (1.35-2.34)	< 0.001	234	45	1.60(1.09-2.37)	0.017
Oral health promotion													
Brushes teeth	≥ 2 times/day	138	87	1.00		153	72	1.00		198	27	1.00	
	< 2 times/day	400	439	1.74 (1.29-2.35)	< 0.001	454	385	1.80 (1.32-2.46)	< 0.001	737	102	1.01(0.65-1.60)	0.904
Use of mouthwash	No	424	362	1.00		450	336	1.00		685	101	1.00	
	Yes	114	164	1.68 (1.28-2.22)	< 0.001	157	121	1.03 (0.78-1.36)	0.882	250	28	0.76(0.49-1.18)	0.223

Table 2. Multivariate model of logistic regression assessing risk factors for dental erosion (severity level >0) for different dental surfaces in alcoholic patients under addiction rehabilitation therapy.

Covariates		Occlusal Erosion level >0			Palatine Erosion level >0			Buccal Erosion level >0		
		n	Adjusted OR (95% CI)	*p*	n	Adjusted OR (95% CI)	*p*	n	Adjusted OR (95% CI)	*p*
Arch	mandibular	552	1.00		552	1.00		552	1.00	
	maxillary	512	2.52 (1.89-3.36)	< 0.001	512	7.77 (5.47-11.05)	< 0.001	512	1.62 (1.07-2.43)	0.021
Type of tooth	posterior	558	1.00		558	1.00		558	1.00	
	anterior	506	0.36 (0.27-0.48)	< 0.001	506	7.75 (5.47-10.98)	< 0.001	506	1.93 (1.27-2.91)	0.002
Age	< 40 years	441	1.00		441	1.00				
	≥ 40 years	623	1.52 (1.12-2.08)	0.008	623	0.46 (0.32-0.66)	< 0.001			
Civil state	maried				426	1.00		426	1.00	
	single or divorced				638	1.56 (1.07-2.27)	0.021	638	2.06 (1.31-3.24)	0.002
Academic Education	≥ 9 years	337	1.00		337	1.00		337	1.00	
	< 9 years	688	0.5 (0.37-0.68)	< 0.001	688	0.48 (0.33-0.7)	< 0.001	688	0.48 (0.3-0.75)	0.001
Employment status	employed	716	1.00		716	1.00				
	unemployed/ retired	348	1.64 (1.2-2.25)	0.002	348	1.68 (1.13-2.51)	0.011			
Daily alcohol intake	<240 g/day				561	1.00				
	≥ 240 g/day				452	1.62 (1.11-2.36)	0.012			
Years of alcohol daily consumption	≤ 10 years	434	1.00							
	> 10 years	601	1.59 (1.18-2.16)	0.003						
Heroine	No				978	1.00		978	1.00	
	Yes				86	0.06 (0.02-0.2)	< 0.001	86	0.1 (0.01-0.78)	0.028
Cocaine	No				1002	1.00				
	Yes				62	6.72 (1.68-26.92)	0.007			
Smoking habits	No	245	1.00					245	1.00	
	Yes	819	3 (2.02-4.47)	< 0.001				819	2.16 (1.16-4.05)	0.016
To drink before breakfast	No				335	1.00				
	Yes				729	0.63 (0.41-0.98)	0.039			
To drink before sleeping	No	611	1.00		611	1.00		611	1.00	
	Yes	453	2.7 (1.96-3.85)	< 0.001	453	1.67 (1.18-2.38)	0.005	453	1.85 (1.90-2.86)	0.006
Vomits due to alcohol intoxication	No							412	1.00	
	Yes							652	0.59 (0.37-0.94)	0.027
Gastro-oesophageal reflux	No	785	1.00		785	1.00		785	1.00	
	Yes	279	2.15 (1.53-3.02)	< 0.001	279	2.84 (1.87-4.31)	< 0.001	279	2.91 (1.75-4.85)	< 0.001
Brushes teeth	≥ 2 x/day	225			225	1.00				
	< 2 x/day	839			839	1.72 (1.02-2.91)	0.043			
Constant			0.50	0.006		0.13	< 0.001		0.06	< 0.001
Goodness-of-fit indicators										
-2 Log likelihood			1121.48			941.62			640.90	
Cox & Snell R^2			0.18			0.31			0.06	
Nagelkerke R^2			0.24			0.42			0.12	
Area under the curve (95% CI)			0.73 (0.70-0.76)			0.83 (0.81-0.85)			0.70 (0.65-0.75)	

maxillary than in mandibular dental arches (Wilcoxon test, p<0.001). Median values of dental erosion severity in all maxillary dental surfaces were significantly different (Fridman test, p<0.001 followed by Wilcoxon test, p<0.033 for all the comparisons), being the most severe erosion lesion found in anterior teeth palatine surfaces (Wilcoxon test, p<0.001) followed by posterior teeth occlusal surfaces (Wilcoxon test, p<0.001), and by anterior teeth incisive edges (Wilcoxon test, p<0.003). In mandibular dental arches, the most severe dental erosion lesions evidence were found in posterior teeth occlusal surfaces (Wilcoxon test, p<0.001) followed by anterior teeth incisal and lingual surfaces (Wilcoxon test, p<0.04).

From the unadjusted assessment of associations between dental erosion experience and measures/covariates of interest (Table 1) for occlusal surface, the maxillary (OR=2.04), anterior teeth (OR=0.38), age 40 years or higher (OR=1.55), being single or divorced (OR=1.4), academic education of less than 9 years of study (OR=0.63), being unemployed/retired (OR=1.38), alcohol addiction of more than 10 years (OR=1.41), to smoke (OR=2.35), to drink before breakfast (OR=1.31), having gastro-oesophageal reflux (OR=1.67), brushing teeth less than 2 times a day (OR=1.74) and the use of mouthwash (OR=1.68) were statistically significant. For palatine surface, the maxillary (OR=4.16), anterior teeth (OR=4.20), age 40 years or higher (OR=0.72), academic education of less than 9 years of study (OR=0.75), having vomits due to alcohol intoxication (OR=1.61), having gastro-oesophageal reflux (OR=1.78) and brushing teeth less than 2 times a day (OR=1.8) were statistically significant. For buccal surface, the anterior teeth (OR=1.51), being single or divorced (OR=1.63), academic education of less than 9 years of study (OR=0.65), being unemployed/retired (OR=0.65), to smoke (OR=2.12) and having gastro-oesophageal reflux (OR=1.67) were statistically significant.

The multivariate model, assessed by logistic regression (Table 2), for the occlusal dental surface included the following conditions as independently associated with dental erosion experience (level >0): the maxillary (OR=2.52), anterior teeth (OR=0.36), age 40 years or higher (OR=1.52), academic education of less than 9 years of study (OR=0.5), being unemployed/retired (OR=1.64), alcohol addiction of more than 10 years (OR=1.59), to smoke (OR=3), to drink before sleeping (OR=2.7) (to drink before breakfast did not remained significant and to drink before sleeping became significant) and having gastro-oesophageal reflux (OR=2.15). For palatine surface the model included the following conditions as independently associated with dental erosion prevalence (level >0): the maxillary (OR=7.77), anterior teeth (OR=7.75), age 40 years or higher (OR=0.46), being single/divorced (OR=1.56), academic education of less than 9 years of study (OR=0.48), being unemployed/retired (OR=1.68), daily alcohol intake equal or higher than 240 g (OR=1.62), heroine use (OR=0.06) and cocaine use (OR=6.72), to drink before breakfast (OR=0.63), to drink before sleeping (OR=1.67), having gastro-oesophageal reflux (OR=2.84) and brushing teeth less than 2 times a day (OR=1.72). For this surface civil state, employment status, daily alcohol intake, heroine and cocaine use, to drink before breakfast and sleeping were new covariates included by the multivariate model. For buccal surface the model included the following conditions as independently associated with dental erosion prevalence (level >0): the maxillary (OR=1.62), the anterior teeth (OR=1.93), being single or divorced (OR=2.06), academic education of less than 9 years of study (OR=0.48), heroine use (OR=0.1), to smoke (OR=2.16), to drink before sleeping (OR=1.85) having vomits due to alcohol intoxication (OR=0.59), and having gastro-oesophageal reflux (OR=2.91).

Discussion

Despite the limitation regarding the number of patient's clinically observed (50 patients), this cohort constitutes 12.4% of the total (N=404) CRAN internment treatments patients done in the year 2005. However, it is important to enhance that, in this cross-sectional study, dental erosion experience and severity were statistically analysed by dental teeth (n=1064) according to intra-oral location. The socio-demographic CRAN patients indicators related to professional situation criteria indicate that 15 (30%) were unemployed, 32 (64%) were employed and 3 (6%) retired. These data come close to the study of Enberg et al. (2001) in 85 alcoholic patients with ages between 30 and 64 years old, where 12 (14.1%) were unemployed, 63 (74.1%) employed and 10 (11.8%) were retired (11), although statistical evidence confirm the existence of significant differences (Chi-square test, 2 d.f., p=0.004) between those and our results. The Enberg et al. (2001) survey results revealed that 85 alcoholic patients had 255.2 g/day average alcohol consumption (11). CRAN's patients had a similar daily average alcohol consumption (265.7 g/day) and no significant differences for the mean alcohol consumption (g/day) were found for these two surveys (one sample t test, p=0,673). Alcohol consumption in northern Europe is at a historical high and is continuing to increase. The decline seen in south-western Europe over past decades seems to be coming to an end. In some countries of the European Region, unrecorded consumption accounts for a substantial part of total consumption and this makes direct comparisons between countries difficult (1). Kranzler et al. (1990) said that usually alcoholic patients oral hygiene is deficient and inefficacious, translating this fact in bacterial deposits increment and consequently in high prevalence of periodontal pathology, of dental car-

ies and an associate risk increase of missing teeth (12). The Hede' study suggests that the average prevalence of dental caries in these risk patients is 3 to 5 times higher than that of the general population (13).

In this cross-sectional study, all chronic alcoholic patients undergoing rehabilitation in the CRAN registered dental erosion experience, with 49.4% teeth showing enamel and/or dentin erosion lesions. The results showed a high experience of dental erosion and a severity erosive surface wear, located in maxillary anterior teeth, with 1.9% of palatine surface teeth having severity level 3 erosion lesions, classified by Eccles and Jenkins (10), as illustrated in (Fig.1). The observed surface teeth patients (Fig.1), in average, had a higher severity erosion wear in maxillary teeth than those located in the mandibular arch. In average, considering the maxillary teeth erosion lesions in all dental surfaces, the erosion severity was the highest in anterior teeth palatine surfaces followed by posterior teeth occlusal surfaces and anterior teeth incisal edges. In the mandibular teeth, and considering all inferior dental surfaces, severity of dental erosion lesions was more evident in posterior teeth occlusal surfaces, followed by those in anterior teeth lingual surfaces. These results are in agreement with the results related by some authors (7,10,13), that state that injuries of dental erosion are predominantly found in palatine surfaces of maxillary anterior teeth. Robb and Smith (1990) studied 37 chronic alcoholic beverages patients concerning the pathological dental structure loss prevalence, having verified that alcoholic beverages consumption patients presents more significantly dental wear lesions in comparison with the controls, being this wear of erosive nature, which in 40% of the cases affects the palatine surfaces of the maxillary anterior teeth (14). The oral health effect of alcoholic beverage consumption is associated with a high risk of dental erosion lesions, being the alcoholic patients, particularly susceptible to tooth wear lesions as result of vomits and frequent acidic beverages ingestion (5-7). In this study (Fig.1) results were similar to those obtained in the study carried out by Simmons et al. (1987), through which the authors had concluded that the maxillary anterior teeth palatine surfaces were more seriously affected by dental erosion lesions, in alcoholic patients. However, according to these authors the mandibular teeth and the buccal surfaces of maxillary teeth are hardly affected by tooth wear namely, dental erosion lesions (7).

In this study data colleted from questionnaires were used to assess the association of covariates (Table 1) obtained from these questionnaires with dental erosion. For the occlusal dental surface, the following variables were found to be positively independently associated with dental erosion (level >0): the maxillary and posterior teeth, age over 40 years, academic education higher than 9 years, being unemployed or retired, having more than 10 years of daily alcohol abuse, smoking, to drink before sleeping and having gastro-oesophageal reflux. As for the palatine dental surface, dental erosion was found to be positively independently associated with maxillary and anterior teeth, having less than 40 years, being single/divorced, academic education higher than 9 years, being unemployed or retired, having a daily alcohol intake higher than 240 g, not using heroine but using cocaine, to drink before breakfast, having gastro-oesophageal reflux and to brushing teeth less than 2 times per day. Quite strangely to drink before breakfast was negatively correlated to palatine dental erosion. Regarding the buccal dental surface, dental erosion was found to be positively independently associated with maxillary and anterior teeth, being single/divorced, academic education higher than 9 years, not using heroine, smoking habits, to drink before breakfast and having gastro-oesophageal reflux and to brushing teeth less than 2 times per day. Out of the ordinary, vomiting due to alcohol intoxication was found to be negatively correlated to palatine dental erosion.

The three multivariate models (Table 2) have a good quality. Applying a ROC analysis the area under the curve (AUC) derived from the model was 0.73 (95% CI: 0.70-0.78), 0.83 (95% CI: 0.81-0.85) and 0.70 (95% CI: 0.65-0.75), for occlusal, palatine and buccal dental erosion surfaces, respectively, which means that these models can be considered useful for predicting surface dental erosion wear (an AUC of 0.8 to 0.9 indicates excellent diagnostic accuracy).

Authors recognize a limitation regarding the results obtained, which is due to the sampling design, cluster sampling, and the fact that this sampling design increases the standard error when compared to simple random sampling, therefore reducing precision of estimate, which may possibly lead to type II errors (to not reject the null hypothesis when the null hypothesis is false, e.g., false positives). Clustering produces correlated observations, which violates the assumption of independently sampled cases. In this case the complex design module should have been used. Nonetheless, it should be noted that it is common practice to treat data from cluster sampling as if it were randomly sampled data.

Overall, alcohol-dependent patients undergoing an addiction rehabilitation therapy presented high experience and low severity of dental erosion lesions. Palatine surfaces of maxillary teeth, followed by occlusal surfaces of posterior teeth and incisal edges of anterior teeth, in average, were the more severe dental surfaces affected by erosion wear. In these patients, the mandibular teeth and maxillary teeth buccal surfaces were the less affected by erosion wear. In Portugal, no available data studies about dental erosion in this risk population were found, which justifies the deepening in this area.

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