Oral Diseases (2005) 11, 81–87

http://www.blackwellmunksgaard.com

Oral Medicine

Prevalence and distribution of oral lesions: a cross-sectional study in Turkey

G Mumcu[1], H Cimilli[2], H Sur[3], O Hayran[4], T Atalay[5]

[1]*Department of Basic Health Science, Faculty of Health Education, University of Marmara, Istanbul, Turkey;* [2]*Department of Endodontics, Faculty of Dentistry, University of Marmara, Istanbul, Turkey;* [3]*Department of Health Management, Faculty of Health Education, University of Marmara, Istanbul, Turkey;* [4]*Department of Public Health, Faculty of Medicine, University of Marmara, Istanbul, Turkey;* [5]*Oral Diagnosis and Radiology, Faculty of Dentistry, University of Marmara, Istanbul, Turkey*

OBJECTIVES: The purpose of this study was to evaluate the prevalence and distribution of oral lesions (OLs) in Turkish population.

SUBJECTS AND METHODS: In this cross-sectional study, 765 residents (F/M: 375/390) were selected by the cluster sampling method and examined according to WHO criteria.

RESULTS: Excessive melanin pigmentation (6.9%) was the most common lesion in the study population. The tongue lesions observed in this study were as follows: fissured tongue (5.2%), varices (4.1%), hairy tongue (3.8%), geographic tongue (1.0%), atrophic tongue papillae (0.7%) and ankyloglossia (0.3%). The denture-related lesions were denture stomatitis (4.3%), suction irritation (0.8%), denture hyperplasia and torus palatinus as bony lesion (0.5%) and traumatic ulcers (0.3%). In regression analysis, being 65 years old and over was found as a statistically significant risk factor for the occurrence of pigmentation, fissured tongue, varices, hairy tongue, denture stomatitis and petechiae ($P < 0.05$).

CONCLUSIONS: Pigmentation, fissured tongue and denture stomatitis were observed to be the most common lesions in Turkish population. Elderly population was a significant risk factor for occurrence of some OLs.

Oral Diseases (2005) **11**, 81–87

Keywords: oral lesions, prevalence, elderly, Turkey, cross-sectional study

Introduction

Epidemiological studies can provide an important vision for understanding the prevalence, extent and severity of oral diseases in the population (Pack, 1998; Kulak-Özkan *et al*, 2001).

Correspondence: Gonca Mumcu, Garanti mah. Tepecik yolu sok, Evim sitesi, A Blok, Daire 17 Etiler, Istanbul 34337, Turkey. Tel.: 90 216 399 93 71 or 84 (128), Fax: 90 216 399 62 42, E-mail: gmumcu@yahoo.com, goncamumcu@marmara.edu.tr
Received 19 December 2003; revised 10 May 2004; accepted 29 June 2004

Although dental and periodontal health problems were recorded in cross-sectional studies (Saydam *et al*, 1990; Kulak-Özkan *et al*, 2001), oral lesions (OLs) were not evaluated by field studies in Turkish population. In addition, there is no nation-wide information regarding the prevalence of oral diseases due to lack of health has been information system in our country. One study has been published about the prevalence of tongue lesions in Turkish dental patients (Avcu and Kanli, 2003).

Consequently, there are no data regarding the prevalence of OLs in Turkish population. The purpose of the present study, therefore, was to investigate the prevalence and the distribution of oral mucosal lesions in selected Turkish population by a field study.

Materials and methods

Study area and sampling

In this cross-sectional study, 765 residents (F/M: 375/390, mean age: 35.6 ± 26.6 years, age range: 5–95 years) were selected by multistage sampling methods in Kartal region of Istanbul, a province of Turkey. The population of Istanbul (10 072 447), is 16.02% of total (62 865 574). Kartal is one of 32 districts of Istanbul which is located in Asian side with a population of 334 950.

The sample group of residents was selected by the cluster sampling method around Kartal Health District Unit. First, some streets of this region were randomly selected; secondly, households were selected by systematic sampling. All households were included in clinical examinations.

The minimum sample size for such a study was calculated to be 384 at 95% confidence level with an absolute precision of 5%. The design effect of cluster sampling was taken as 2; as the first stage of sampling was designed as cluster sampling. The calculated size was 768 (Hayran, 1993). Response rate was 765/768 for participants.

Data were collected by oral examinations and questionnaires via home visits. The dentist (GM), a specialist on oral medicine, carried out oral examinations by using mouth mirror and explorer, cotton swaps and portable

light. Cotton swaps were used for removing debris and examining whether white lesions could be wiped off.

World Health Organisation (WHO) guidelines (WHO, 1980, 1997) were used in the methodological procedure of oral examination and the description of OLs. The color atlas of OLs prepared with photographs for each condition was also used for the confirmation of established diagnosis of lesions in examinations (Scully, 1999).

Recurrent aphthous stomatitis and herpes labialis were recorded only when they appeared during the oral examinations. No biopsies and laboratory tests were done in the present study. At the time of examination all participants received information about their oral conditions and instructions for proper oral hygiene. The participants were referred to the appropriate departments in schools of dentistry according to their treatment needs.

Questionnaires included items such as age, gender, medical and oral health history medications, cigarette smoking and type of denture and denture cleaning habits of participants and were applied by face-to-face interviews.

Interviewers ($n = 12$) were students of the Faculty of Health Education, department of Health Education in Marmara University. All of them were trained on interviewing and methodology for minimizing the inter-observer variations.

The collected data were analyzed by SPSS 11.5 program. Mann–Whitney U, chi-square tests and regression analysis were used. In multivariate analysis of predicting the various independent variables on OLs, logistic regression analysis was used. The presence of OLs, being male, being 65 years old and over, cigarette smoking, having denture were recorded as 1, others were coded 0. A P-value <0.05 was accepted to be significant.

Results

A total of 765 residents participated in this cross-sectional study. Forty-nine percent ($n = 375$) of participants were female and 51% ($n = 390$) were male. Age groups were as follows: 47.7% ($n = 365$) of the participants aged between 5 and 17, 22.6% between 18 and 44, 8.6% between 45 and 64 and 21.1% in 65 years and over. The mean age of the whole group was 35.6 ± 26.6 years.

Twenty-six percent of participants had removable dentures (total dentures: 22.7%, $n = 152$ and partial dentures: 3.8%, $n = 26$) and 22.4% ($n = 172$) had fixed dentures. Completely edentulism was observed to be 15.1% (F/M: 62/54) in the whole group. Of complete edentulous participants, 87.1% were 65 years old and over. Thirty-three participants had cardiovascular disease and 15 had diabetes mellitus in elderly participants.

Oral lesions

The distribution and prevalence of OLs were seen in Table 1. In the whole group, 41.7% ($n = 319$) of participants had some oral pathologies. The prevalence of OLs within each sex was similar, 40.5% in females and 42.8% in males. Of these participants 22.5% ($n = 172$) had one lesion, 7.6% ($n = 58$) had two and 4.6 ($n = 35$) had three or more lesions.

Excessive melanin pigmentation (6.9%) was the most common lesion seen in the group (Table 1). The prevalence of pigmentation was higher in males (8.5%) than in females (5.3%) ($P = 0.021$). Cigarette consumption was higher in participants with pigmentation (22.5 ± 11.4) than those without pigmentation (1.3 ± 7.1) ($P = 0.000$).

After excessive melanin pigmentation, the next most common lesion was fissured tongue. The prevalence of fissured tongue was 5.2% in the whole group (Table 1) and 13.9% in elderly females (Table 2). No significant difference was found according to gender ($P > 0.05$). The other tongue lesions were varices (4.1%) and hairy tongue (3.8%), and geographic tongue (1%), atrophic tongue papillae (0.7%) and ankyloglossia (0.3%). Total tongue lesions were seen in 15.1% of the whole group (Table 1). The mean cigarette consumption per day was 28.3 ± 20.8 in participants with hairy tongue and 1.4 ± 5.5 in participants without hairy tongue ($P < 0.000$).

Denture stomatitis was observed in 4.3% of whole group and in 20.5% of the participants wearing dentures. The prevalence of denture stomatitis was found to be 5.1% in females and 3.6% in males (Table 1). In 65 and over age group, denture stomatitis (14.1%) was observed in 15.1% of females and in 13.1% of males (Table 2). Almost two-thirds of participants with denture stomatitis (63.6%) had complete dentures. A localized type of denture stomatitis was observed in 36.3% ($n = 12$), generalized type in 45.5% ($n = 15$) and papillamatous type in 18.2% ($n = 6$) of the participants with denture stomatitis. Lack of cleaning of dentures was observed in 27.2% of participants with denture stomatitis ($n = 9$) and 22.4% ($n = 40$) in denture wearers. The other denture-related lesions were suction irritation (0.8%), denture hyperplasia and torus palatinus (0.5%), traumatic ulcers due to dentures (0.3%) (Table 1). Total denture-related lesions were found in 6.4% of the whole group.

Petechiae were seen in 3.4% (Table 1). The prevalence of haemangioma on the lips and fibroma on the buccal mucosa were seen to be 1.4 and 0.8% in the whole group (Table 1). Hypertrophic freanelum was observed to be 1% in the study population. The prevalence of clinically detected recurrent aphthous stomatitis was found to be 1.2% in the whole group (Table 1). The recorded white OLs were as follows: Fordyce spot and frictional keratosis (1.3%), reticular type of oral lichen planus (0.5%) and leukoedema (0.4%) (Table 1).

Mucoceles were seen in 0.1% of the whole group. Papilloma or angular chelitis were found in 0.4% of the whole group (Table 1). Angular chelitis (0.4%) was observed in participants with denture stomatitis. There were no malignancies found in the clinical examinations of participants.

Table 1 The distribution of oral lesions according to gender

	Female (n = *375, 49%*)		*Male* (n = *390, 51%*)		*Total* (n = *765*)	
Lesions	n	*%*	n	*%*	n	*%*
Pigmentation						
Excessive melanin pigmentation	20	5.3	33	8.5	53	6.9*
Tongue lesions						
Fissüred tongue	22	5.9	18	4.6	40	5.2
Varices	15	4.0	16	4.1	31	4.1
Hairy tongue	12	3.2	17	4.4	29	3.8
Geographic tongue	4	1.1	4	1.0	8	1.0
Atrophic tongue papillae	3	0.8	2	0.5	5	0.7
Ankyloglossia	1	0.3	1	0.3	2	0.3
Denture-related lesions						
Denture stomatitis	19	5.1	14	3.6	33	4.3
Suction irritation	2	0.5	4	1.0	6	0.8
Denture hyperplasia	3	0.8	1	0.3	4	0.5
Torus palatinus	2	0.5	2	0.5	4	0.5
Traumatic ulcers due to dentures	–	–	2	0.5	2	0.3
Red mucosal lesions						
Petechiae	15	4.0	11	2.8	26	3.4
Tumors						
Hemangioma	8	2.1	3	0.7	11	1.4
Fibroma	3	0.8	3	0.7	6	0.8
White mucosal lesions						
Frictional keratosis	4	1.1	6	1.5	10	1.3
Fordyce spots	1	0.3	9	2.3	10	1.3
Lichen planus	2	0.5	2	0.5	4	0.5
Leukoedema	1	0.3	2	0.5	3	0.4
Recurrent aphthous stomatitis	4	1.1	5	1.3	9	1.2
Hypertrophic frenulum	4	1.1	4	1.0	8	1.0
Salivary gland diseases						
Mucocele	–	–	1	0.3	1	0.1
Infections						
Papilloma	1	0.3	2	0.5	3	0.4
Angular cheilitis	2	0.5	1	0.3	3	0.4
Others						
Xerostomia	2	0.5	3	0.7	5	0.7
Burning mouth syndrome	2	0.5	1	0.3	3	0.4
Total	152 (40.5)		167 (42.8)		319	41.7

*Statistically significant, according to gender ($P < 0.05$).

The other pathologies detected in the study were xerostomia (0.7%) and burning mouth syndrome (0.4%). Participants with xerostomia were receiving antihypertensive agents and did not have any connective tissue and autoimmune diseases and other etiologic factors. Burning mouth syndrome (0.4%) was found in participants with diabetes mellitus ($n = 2$) and xerostomia ($n = 1$) (Table 1).

Varices, excessive melanin pigmentation and fissured tongue were found to be the most common three OLs in elderly Turkish participants (Table 2). The results of logistic regression analysis of factors regarding OLs are presented in Table 3. As seen in the table, being 65 years old and over was a statistically significant predictive factor for denture stomatitis [odds ratio (OR): 4.5], varices (OR: 8.3) and hairy tongue (OR: 3.5), fissured tongue (OR: 2.8), pigmentation (OR: 2.2) and petechiae (OR: 25.4) ($P < 0.05$) (Table 3). Cigarette smoking was a statistically significant risk factor for hairy tongue (OR: 9.3) and pigmentation (OR: 7.1) ($P < 0.05$). In addition, male participants were more likely to have pigmentation than female (OR: 1.8) ($P = 0.042$) (Table 3).

Discussion

The comparison of the findings of the present study with other epidemiological studies is difficult, as categorizations and sampling methods vary from one to other in epidemiological studies.

In the present study group, although the prevalence of OLs (41.7%) was higher than those observed in Asian regions such as Cambodian (Ikeda *et al*, 1995) and Malaysian (Zain *et al*, 1997) (4.9 and 9.7%, respectively) and Vietnamese population (14%) (Nair *et al*, 1996), it was lower than that found in Spanish population (51.1%) (Vallejo *et al*, 2002).

The prevalence of oral melanin pigmentation (6.9%), the most common OML in present study, was lower than Swedish population (Axell and Heidin, 1982) (9.9%) and Thai and Malaysian dental patients (70.5 and 88.4%, respectively) (Axell *et al*, 1990). In the occurrence of pigmentation, being 65 years old and over (OR: 2.2), male gender (OR: 1.8) and cigarette smoking (OR: 7.1) were found to be significant risk factors. Tobacco smoking is known to be the main cause of oral melanin pigmentation (Salonen *et al*, 1990; Heidin and

Table 2 The distribution of oral lesions according to gender and age groups

Lesions	*5–17 years*		*18–44 years*		*45–64 years*		*65–95 years*		
	Female (n = 126)	*Male (n = 143)*	*Female (n = 109)*	*Male (n = 64)*	*Female (n = 37)*	*Male (n = 29)*	*Female (n = 79)*	*Male (n = 84)*	*Total (n = 765)*
Pigmentation									
Excessive melanin pigmentation			12 (11.0)	12 (18.7)	3 (8.1)	5 (17.2)	5 (6.3)	16 (19.1)	53
Tongue lesions									
Fissüred tongue	3 (2.8)	4 (3.2)	5 (4.6)	3 (4.7)	3 (8.1)	3 (10.3)	11 (13.9)	8 (9.5)	40
Varices					3 (8.1)	3 (10.3)	12 (15.1)	13 (15.5)	31
Hairy tongue			6 (5.5)	1 (1.6)	2 (5.4)	5 (17.2)	4 (5.1)	11 (13.1)	29
Geographic tongue		1 (0.8)	1 (0.9)	1 (1.6)	2 (5.4)		1 (1.3)	2 (2.4)	8
Atrophic tongue papillae							3 (3.8)	2 (2.4)	5
Ankyloglossia					1 (2.7)			1 (1.2)	2
Denture-related lesions									
Denture stomatitis			2 (1.8)	1 (1.6)	5 (13.5)	2 (6.9)	12 (15.1)	11 (13.1)	33
Suction irritation							2 (2.5)	4 (4.8)	6
Denture hyperplasia					1 (2.7)		2 (2.5)	1 (1.2)	4
Torus palatinus					1 (2.7)		1 (1.3)	2 (2.4)	4
Traumatic ulcers								2 (2.4)	2
Red mucosal lesions									
Petechiae					3 (8.1)	2 (6.9)	12 (15.1)	9 (10.7)	26
Tumors									
Hemangioma					1 (2.7)	1 (3.4)	7 (8.8)	2 (2.4)	11
Fibroma		1 (0.8)				1 (3.4)	3 (3.8)	1 (1.2)	6
White mucosal lesions									
Frictional keratosis			1 (0.9)	1 (1.6)	1 (2.7)		1 (1.3)	6 (7.2)	10
Fordyce spots				3 (4.7)		1 (3.4)	1 (1.3)	5 (5.9)	10
Lichen planus			1 (0.9)		1 (2.7)	1 (3.4)		1 (1.2)	4
Leukoedema	1 (0.8)	1 (0.8)		1 (1.6)					3
Recurrent aphthous stomatitis	1 (0.8)	1 (0.8)	3 (2.7)	1 (1.6)		3 (10.3)			9
Hypertrophic frenulum	2 (1.6)	3 (2.9)	2 (1.8)					1 (1.2)	8
Salivary gland diseases									
Mucocele				1 (1.6)					1
Infections									
Papilloma	1 (0.8)	1 (0.8)						1 (1.2)	3
Angular cheilitis							2 (2.5)	1 (1.2)	3
Others									
Xerostomia							2 (2.5)	3 (3.6)	5
Burning mouth syndrome							2 (2.5)	1 (1.2)	3

Values are expressed as *n* (%).

Axell, 1991) and is the predominant type of smoking habit in Turkey (World Development Indicators, 2003). Similarly, in China, smoking was relatively common in the elderly (Lin *et al*, 2001). Pigmentation was more common in the Thai and Malaysian male dental patients (Axell *et al*, 1990).

Epidemiological surveys have shown that tongue lesions constitute a considerable proportion of OLs, and their prevalence rates vary in different parts of the world (Axell *et al*, 1990; Banoczy *et al*, 1993; Darwazeh and Pillai, 1993; Taiyeb *et al*, 1995; Campisi and Margiotta, 2001; Jainkittivong *et al*, 2002; Vallejo *et al*, 2002; Avcu and Kanli, 2003).

The prevalence of fissured tongue (5.2%) was lower than figures reported in the Hungarian (8.8%) (Banoczy *et al*, 1993) and Swedish populations (6.5%) (Axell *et al*, 1990), Jordanian (11.4%) (Darwazeh and Pillai, 1993) and Slovenian dental patients (21.1%) (Kovac-Kavcic and Skaleric, 2000) while it was higher than the prevalence of Spanish population (3.9%) (Vallejo *et al*, 2002). Being 65 years old and over (OR: 2.8) was found to be a significant risk factor in fissured tongue. A similar finding was observed in Slovenian dental patients (Kovac-Kavcic and Skaleric, 2000).

In this study, the prevalence of varices (4.1%) was observed to be lower than in Spanish population (21.1%) (Vallejo *et al*, 2002). Being 65 years old and over (OR: 8.3) was found significantly predictive for the occurrence of varices. This result was in accordance with the previous study (Jainkittivong *et al*, 2002).

Hairy tongue was seen in 3.8% of our population. This percentage was higher than that described in Swedish population (0.6%) (Axell *et al*, 1990) and in a Jordanian population (3.4%) (Darwazeh and Pillai, 1993). Being 65 years old and over (OR: 3.5) and cigarette smoking were the significant risk factors for hairy tongue. Similarly, the prevalence of hairy tongue was higher in Turkish dental patients being 60 years old and over and heavy smokers than the others (Avcu and Kanli, 2003). Hairy tongue (51.4%) was the mainly observed lesions in the male subjects with smoking habits in Italy (Campisi and Margiotta, 2001). It was found to be related with tobacco smoking (Salonen

Table 3 Results of regression analysis for predicting oral lesions

					95% CI for odds ratio	
	B	*s.e.*	P	*Odds ratio*	*Lower*	*Upper*
Pigmentation						
Age (≥65 years)	0.803	0.312	0.010*	2.233	1.211	4.117
Gender (being male)	0.628	0.310	0.042*	1.874	1.022	3.439
Cigarette consumption (yes: 1, no: 0)	1.963	0.364	0.000*	7.118	3.488	14.526
Constant	−3.355	0.279	0.000	0.035		
Fissured tongue						
Age (≥65 years)	1.047	0.247	0.000*	2.848	1.757	4.617
Gender (being male)	−0.227	0.213	0.288	0.797	0.525	1.211
Cigarette consumption (yes: 1, no: 0)	0.612	0.367	0.096	1.843	0.898	3.785
Having denture (yes: 1, no: 0)	−0.087	0.365	0.811	0.916	0.448	1.873
Constant	−1.849	0.163	0.000	0.157		
Varices						
Age (≥65 years)	2.128	0.434	0.000*	8.396	3.584	19.668
Gender (being male)	0.108	0.382	0.777	1.114	0.527	2.356
Cigarette consumption (yes: 1, no: 0)	−1.055	1.068	0.323	0.348	0.043	2.822
Having denture (yes: 1, no: 0)	0.129	0.503	0.797	1.138	0.425	3.049
Constant	−4.022	0.385	0.000	0.018		
Hairy tongue						
Age (≥65 years)	1.276	0.491	0.009*	3.582	1.368	9.381
Gender (being male)	0.317	0.410	0.440	1.373	0.614	3.069
Cigarette consumption (yes: 1, no: 0)	2.235	0.465	0.000*	9.350	3.758	23.263
Having denture (yes: 1, no: 0)	0.416	0.577	0.471	1.516	0.489	4.698
Constant	−4.218	0.388	0.000	0.015		
Denture stomatitis						
Age (≥65 years)	1.513	0.465	0.001*	4.539	1.825	11.290
Gender (being male)	−0.288	0.387	0.456	0.749	0.351	1.599
Cigarette consumption (yes: 1, no: 0)	0.438	0.586	0.445	1.549	0.491	4.886
Having denture (yes: 1, no: 0)	1.427	0.469	0.002*	4.166	1.662	10.441
Constant	−3.861	0.355	0.000	0.021		
Petechiae						
Age (≥65 years)	3.237	0.567	0.000*	25.452	8.384	77.265
Gender (being male)	−0.457	0.431	0.289	0.633	0.272	1.474
Cigarette consumption (yes: 1, no: 0)	0.389	1.114	0.727	1.475	0.166	13.081
Having denture (yes: 1, no: 0)	−0.922	0.592	0.119	0.398	0.125	1.269
Constant	−4.655	0.526	0.000	0.010		

*Statistically significant.

et al, 1990) and advancing in age (Jainkittivong *et al*, 2002).

Geographic tongue was observed in 1% of our population, which was less than those found in Swedish (8.5%) (Axell *et al*, 1990) and Hungarian populations (3%) (Banoczy *et al*, 1993) and in Slovenian (2.2%) (Kovac-Kavcic and Skaleric, 2000) and 6.8% Jordanian dental patients (Darwazeh and Pillai, 1993).

Atrophic tongue papilla was seen in 0.7% of our study group. This figure was lower than the prevalence of Thai (3%) and Malaysian (1.3%) dental patients and Swedish populations (1.1%) (Axell *et al*, 1990).

The prevalence of ankyloglossia (0.3%) in the present study was lower than was seen in Mexican children (0.8%) (Sedano *et al*, 1989).

In the present study, being 65 years old and over (OR: 4.5) and denture wearing (OR: 4.1) were found to be significant risk factors in occurrence of denture stomatitis. It is known that denture wearing is associated with a higher prevalence of OLs (Salonen *et al*, 1990; MacEntee *et al*, 1998; Lin *et al*, 2001; Jainkittivong *et al*, 2002). Denture stomatitis is a particular problem in the elderly and denture-related lesions are the most common types of OLs of the aging population (Jorge Junior *et al*, 1991; Corbet *et al*, 1994; Jeganathan *et al*, 1997; Reichart, 2000; Jainkittivong *et al*, 2002; Vallejo *et al*, 2002). Denture stomatitis was seen in 4.3% of the whole group and 14.1% in elderly participants in our study. These prevalences were lower than those observed in Spanish (6.5%) (Vallejo *et al*, 2002) and Swedish populations (16%) (Axell *et al*, 1990); in Brazilians (20%) (Jorge Junior *et al*, 1991) and German elderlies (18.3%) (Reichart, 2000).

The denture wearing was also a risk factor for denture hyperplasia (Vallejo *et al*, 2002). The prevalence of denture hyperplasia (0.5%) was lower than the observed in Spanish population (2.6%) (Vallejo *et al*, 2002).

Petechiae were observed in 3.4% in the whole group. Being 65 years old and over was found to be a risk factor for the occurrence of petechiae. As it is known, petechia is usually caused by trauma or suction, haematological problems and occurs especially in elderly (Scully and Porter, 2000).

The prevalence of haemangioma and fibroma of the oral mucosa in the present study (1.4 and 0.8%, respectively) were lower than those in 65–74 years olds

in German population (2.6 and 3.7%, respectively) (Reichart, 2000). The prevalence of haemangioma (1.4%) was higher than the prevalence in American population (0.5%) while the prevalence of fibroma was lower than the figure in American population (1.2%) (Bouquot and Gundlach, 1986).

The prevalence of frictional keratosis (1.3%) in the present study was lower than those of Slovenian dental patients (2.2%) (Kovac-Kavcic and Skaleric, 2000), Swedish (5.5%) (Axell *et al*, 1990) and Spanish populations (7.5%) (Vallejo *et al*, 2002). The prevalence of Fordyce spots (1.3%) in our population was much lower than those in the Thai and Malaysian dental patients (57.7 and 61.8%) and Swedish populations (82.8%) (Axell *et al*, 1990) and Jordan populations (49%) (Darwazeh and Pillai, 1998).

The prevalence of oral lichen planus (0.5%) was found to be lower than those recorded in the Swedish (1.9%), Cambodian (1.8%) (Axell, 1976; Ikeda *et al*, 1995) and Spanish populations (3.2%) (Vallejo *et al*, 2002); in Saudi Arabian (1.7%) (Salem, 1989) and in Slovenianan (2.3%) (Kovac-Kavcic and Skaleric, 2000) and Thai and Malaysian dental patients (3.8 and 2.1%, respectively) (Axell *et al*, 1990). Yet it was higher than those recorded in white Americans (0.1%) (Bouquot and Gorlin, 1986) and Hungarian populations (0.08%) (Banoczy and Rigo, 1991).

The observed prevalence of leukoedema (0.4%) in present study was lower than the results of Swedish population (48.9%) (Axell and Henricsson, 1981) and Thai and Malaysian dental patients (23.9 and 29.6%, respectively) (Axell *et al*, 1990). Yet, it was similar to the one recorded in 65–74 years old German population (0.6%) (Reichart, 2000) and higher than the prevalence of adult Americans (0.03%) (Bouquot and Gorlin, 1986).

The prevalence of recurrent aphthous stomatitis that were clinically detected during the oral examinations (1.2%) was lower than observed in Spanish populations (1.9%) (Vallejo *et al*, 2002). Yet, the prevalence was higher than the one observed in Malaysian population (0.5%) (Zain, 2000).

The percentage of angular chelitis recorded in our study was 0.4%. It was seen only in the elderly denture wearers. It was lower than those of Finnish (6%) (Nevalainen *et al*, 1997), Spanish (2.9%) (Vallejo *et al*, 2002) Brazilian (9.3%) (Jorge Junior *et al*, 1991), Vietnamese (4%) (Nair *et al*, 1996) and Swedish populations (3.8%) (Axell *et al*, 1990). Mucocele in our population was observed to be 0.1%. A similar result was observed in Swedish population (0.1%) (Axell *et al*, 1990) whereas the prevalence was lower than was found in Vietnamese population (10%) (Nair *et al*, 1996).

As it is known, xerostomia occurs with the use of some medications as antihypertensives (Guggenheimer and Moore, 2003). All patients with xerostomia were receiving antihypertensive drugs. This prevalence of xerostomia (0.7%) was higher than that observed drug associated with xerostomia (0.4%) in 65–74 years old Germans (Reichart, 2000).

In the present study, varices, excessive melanin pigmentation and fissured tongue were found to be most common OLs in elderly participants. Several age-specific oral mucosal lesions may develop in elderly (Nevalainen *et al*, 1997; Reichart, 2000; Lin *et al*, 2001). The common oral mucosal lesions in elderly vary from one study to another. In the Thai elderly dental patients, varices, fissured tongue and traumatic ulcers were the most common conditions (Jainkittivong *et al*, 2002). Yet, Fordyce granules, history of herpes labialis and fissured tongue and denture stomatitis were the most frequently recorded lesions in 65–74 years Germans (Reichart, 2000). Besides, lingual varicosities, frictional keratosis and denture stomatitis were the common lesions in Hong Kong Chinese elderly population (Corbet *et al*, 1994). In elderly Finnish population, the three most common mucosal changes were hairy tongue, angular chelitis and varices (Nevalainen *et al*, 1997).

There is a growing interest in the oral health status of elderly persons as the size of this population is increasing around the world. The prevalence of oral mucosal lesions is found to be higher in older subjects *vs* younger individuals. However, age by itself is not the only correlating factor, other findings such as trauma, medications, oral hygiene, denture status may also influence the development of oral mucosal lesions (Jainkittivong *et al*, 2002). In addition, older people's accessibility to dental services is very low than the others due to physical and financial limitations (Kiyak *et al*, 2002; Mumcu *et al*, 2004).

Consequently, the results of the present study give some information about the prevalence of OLs in the urban Turkish population. Pigmentation, fissured tongue and denture stomatitis were observed to be the most common lesions in Turkish population.

References

Avcu N, Kanli A (2003). The prevalence of tongue lesions in 5150 Turkish dental outpatients. *Oral Diseases* **9:** 188–195.

Axell T (1976). A prevalence study of oral mucosal lesions in an adult Swedish population. *Odotol Revy* **27:** 1–103.

Axell T, Heidin CA (1982). Epidemiologic study of excessive oral melanin pigmentation with special reference to the influence of tobacco habits. *Scand J Dent Res* **90:** 434–442.

Axell T, Henricsson V (1981). Leukoedema-an epidemiologic study with special reference to the influence of tobacco habits. *Community Dent Oral Epidemiol* **9:** 142–146.

Axell T, Zain RB, Siwamogstham P, Tantiniran D, Thampipit J (1990). Prevalence of oral soft tissue lesions in out patients at two Malaysian and Thai dental schools. *Community Dent Oral Epidemiol* **18:** 95–99.

Banoczy J, Rigo O (1991). Prevalence study of oral precancerous lesions within a complex screening system in Hungary. *Community Dent Oral Epidemiol* **19:** 265–267.

Banoczy J, Rigo O, Albrecht M (1993). Prevalence study of tongue lesions in a Hungarian population. *Community Dent Oral Epidemiol* **21:** 224–226.

Bouquot JE, Gorlin RJ (1986). Leukoplakia, lichen planus and other oral keratosis in 23,616 white Americans over the age of 35 years. *Oral Surg Oral Med Oral Pathol* **61:** 373–381.

Bouquot JE, Gundlach KK (1986). Oral exophytic lesions in 23,616 white Americans over 35 years of age. *Oral Surg Oral Med Oral Pathol* **62:** 284–291.

Campisi G, Margiotta V (2001). Oral mucosal lesions and risk habits among men in an Italian study population. *J Oral Pathol Med* **30:** 22–28.

Corbet EF, Holmgren CJ, Phillipsen HP (1994). Oral mucosal lesions in 65–74-year-old- Hong Kong Chinese. *Community Dent Oral Epidemiol* **22:** 392–395.

Darwazeh AM, Pillai K (1993). Prevalence of tongue lesions in 1013 Jordanian dental outpatients. *Community Dent Oral Epidemiol* **21:** 323–324.

Darwazeh AM, Pillai K (1998). Oral lesions in a Jordanian population. *Int Dent J* **48:** 84–88.

Guggenheimer J, Moore PA (2003). Xerostomia: etiology, recognition and treatment. *J Am Dent Assoc* **134:** 61–69.

Hayran O (1993). *Sağlı*k araştırmalarında örnek büyüklüğünün belirlenmesi. Marmara Üniversitesi yayın no: 522: İstanbul.

Heidin CA, Axell T (1991). Oral melanin pigmentation in 467 Thai and Malaysian people with special emphasis on smoker's melanosis. *J Oral Pathol Med* **20:** 8–12.

Ikeda N, Handa Y, Khim SP *et al*. (1995). Prevalence study of oral mucosal lesions in a selected Cambodian population. *Community Dent Oral Epidemiol* **23:** 49–54.

Jainkittivong A, Aneksuk V, Langlais RP (2002). Oral mucosal conditions in elderly dental patients. *Oral Diseases* **8:** 218–223.

Jeganathan S, Payne JA, Thean HP (1997). Denture stomatitis in an elderly edentulous Asian population. *J Oral Rehabil* **24:** 468–472.

Jorge Junior J, Almeida OP, Bozzo I, Scully C, Graner E (1991). Oral mucosal health and disease in institutionalized elderly in Brazil. *Community Dent Oral Epidemiol* **19:** 173–175.

Kiyak HA, Kamoh A, Persson RE, Persson GR (2002). Ethnicity and oral health in community-dwelling older adults. *Gen Dent* **50:** 513–518.

Kovac-Kavcic M, Skaleric U (2000). The prevalence of oral mucosal lesions in a population in Ljubljana, Slovenia. *J Oral Pathol Med* **29:** 331–335.

Kulak-Özkan Y, Özkan Y, Kazazoğlu E, Arıkan A (2001). Dental caries prevalence, tooth brushing and periodontal status in 150 young people in Istanbul: a pilot study. *Int Dent J* **51:** 451–456.

Lin HC, Corbet HF, Lo ECM (2001). Oral mucosal lesions in adult Chinese. *J Dent Res* **80:** 1486–1490.

MacEntee MI, Glick N, Stolar E (1998). Age, gender, dentures and oral mucosal disorders. *Oral Disease* **4:** 32–36.

Mumcu G, Sur H, Yıldırım C, Söylemez D, Atlı H, Hayran O (2004). Utilisation of dental services in Turkey: a cross-sectional survey. *Int Dent J* **54**, 90–96.

Nair RG, Samaranayake LP, Philipsen HP, Graham RG, Itthagarun A (1996). Prevalence of oral lesions in a selected Vietnamese population. *Int Dent J* **46:** 48–51.

Nevalainen MJ, Narhi TO, Ainoma A (1997). Oral mucosal lesions and oral hygiene habits in the home-living elderly. *J Oral Rehabil* **24:** 332–337.

Pack ARC (1998). Dental services and needs in developing countries. *Int Dent J* **48**(suppl.)**:** 239–247.

Reichart PA (2000). Oral mucosal lesions in a representative cross-sectional study of aging Germans. *Community Dent Oral Epidemiol* **28:** 390–398.

Salem G (1989). Oral Lichen planus among 4277 patients from Gizan, Saudi Arabian. *Community Dent Oral Epidemiol* **17:** 322–324.

Salonen L, Axell T, Hellden L (1990). Occurrence of oral mucosal lesions, the influence of tobacco habits and an estimate of treatment time in an adult Swedish population. *J Oral Pathol Med* **19:** 170–176.

Saydam G, Oktay İ, Möller I (1990). *Oral health status analysis*. WHO European Region-Ministry of Health: Ankara.

Scully C (1999). *Handbook of oral disease*. Martin Dunitz: London.

Scully C, Porter S (2000). ABC of oral health: Swelling and red, white and pigmented lesions. *BMJ* **22:** 225–228.

Sedano HO, Correon FI, Garza ML *et al*. (1989). Clinical orodental abnormalities in Mexican children. *Oral Surg Oral Med Oral Pathol* **68:** 300–311.

Taiyeb ATR, Razak IA, Raja LRJ, Zain RB (1995). An epidemiological survey of oral mucosal lesions among elderly Malaysian. *Gerodontology* **12:** 37–40.

Vallejo GMJ, Diaz-Canel M, Martin GMJ, Garcia GM (2002). Risk factors for oral soft tissue lesions in an adult Spanish population. *Community Dent Oral Epidemiol* **30:** 277–285.

World Development Indicators (2003). *Health, risk factors and future challenges*. The World Bank: Washington.

World Health Organisation (1980). *Guide to epidemiology and diagnosis of oral mucosal diseases and conditions*. WHO: Geneva.

World Health Organisation (1997). *Oral health surveys: basic methods*, 4th edn. WHO: Geneva.

Zain RB (2000). Oral recurrent aphthous ulcers/stomatitis: prevalence in Malaysia and epidemiological update. *J Oral Science* **42:** 15–19.

Zain RB, Ikeda N, Razak IA *et al*. (1997). A national epidemiological survey of oral mucosal lesions in Malaysia. *Community Dent Oral Epidemiol* **25:** 377–383.