ORAL DISEASES

Oral Diseases (2011) 17, 210–216 doi:10.1111/j.1601-0825.2010.01724.x

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ORIGINAL ARTICLE

The prevalence of tongue lesions in Malaysian dental outpatients from the Klang Valley area

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OBJECTIVES: To determine the prevalence of tongue lesions in Malaysian dental outpatients from the Klang Valley area.

SUBJECTS AND METHODS: A cross sectional study was conducted on 600 Malaysian outpatients (257 men, 343 women, mean age, 37.7 years) attending the Primary Dental Care Unit at the Faculty of Dentistry, University of Malaya. Demographic and medical data were recorded for all respondents.

RESULTS: One hundred eighty-one patients (30.2%) (81 men, 100 women, mean age 42.0 years) were diagnosed with at least one tongue lesion (*n* = 207) at the time of examination. Of these, 24 patients (4%) had two or more tongue lesions present synchronously. Seven different lesions were diagnosed: fissured tongue (13.8%), crenated tongue (7.8%), pigmented tongue (6.2%), geographic tongue (2.2%), ankyloglossia (1.7%), hairy tongue (1.0%) and median rhomboid glossitis (0.2%). Their racial prevalences were Malays (*n* = 65, 10.8%), Indians (*n* = 62, 10.3%), Chinese (*n* = 53, 8.8%) and other race (*n* = 1, 0.2%). A significant relationship was observed between crenated tongue and race; between four types of tongue lesions (fissured tongue, geographic tongue, crenated tongue and pigmented tongue) and age; and between fissured tongue and gender (*P* < 0.05).

CONCLUSIONS: Distribution characteristics of tongue lesions in Malaysians are important as local reference data in the daily clinical practice.

Oral Diseases (2011) **17**, 210–216

Keywords: tongue lesions; prevalence; outpatients

Introduction

The tongue is an accessible organ of the oral cavity and it has been used for millennia as an indicator of health in both Western and Eastern medical philosophies. Prevalence of tongue lesions has been traditionally considered as a disorder of primary concern regarding oral and general health and a good reflect of systemic diseases. Although easily examined, the tongue and its lesions often present a diagnostic and therapeutic dilemma to the clinician. Therefore recognition and diagnosis of common lesions that may occur on the tongue is important to obviate from unnecessary or over treatment.

Most epidemiological studies on the prevalence of tongue lesions were from countries including United States of America (Shulman and Carpenter, 2006), Iraq (Ghose and Baghdady, 1982), Hungary (Bánóczy *et al*, 1993; Vörös-Balog *et al*, 2003), Jordan (Darwazeh and Pillai, 1993), Thailand (Jainkittivong and Langlais, 2005) and Turkey (Avcu and Kanli, 2003; Mumcu *et al*, 2005; Parlak *et al*, 2006). These reports have enumerated the prevalence of fissured tongue (Aboyans *et al*, 1993; Bánóczy *et al*, 1993; Vörös-Balog *et al*, 2003; Matthews *et al*, 2008), geographic tongue (van der Waal *et al*, 1988; Jainkittivong and Langlais, 2005; Parlak *et al*, 2006; Shulman and Carpenter, 2006), hairy tongue (Kullaa-Mikkonen *et al*, 1982; Darwazeh and Pillai, 1993), and median rhomboid glossitis (Bánóczy *et al*, 1993; Pontenero *et al*, 2006; Matthews *et al*, 2008). Less well-known are studies on pigmented tongue (Amir *et al*, 1991), crenated tongue (Crespo *et al*, 2005), and ankyloglossia (Ruffoli *et al*, 2005; Klockars, 2007).

Malaysia, geographically located in the South-East Asian archipelago, is a multiracial multicultural nation with a population of approximately 28 million. According to the Malaysian Department of Statistics, the three main racial groups are the Malays (65.0%), Chinese (26.0%) and Indians (8.0%) (Department of Statistics, Malaysia). The Klang Valley area refers to the capital city, Kuala Lumpur and its suburbs as well as adjoining cities and towns in the state of Selangor. It has a population of approximately 6 million people (Department of Statistics, Malaysia). The Primary Dental Care Unit at the Faculty of Dentistry, University of Malaya is located in the Kuala Lumpur metropolitan area and easily accessible to residents living in the Klang Valley. Earlier oral mucosal surveys reported that 10.7% of

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Received 14 April 2010; revised 3 May 2010; accepted 10 May 2010

Malaysian elderly patients presented with tongue lesions (Taiyeb *et al*, 1995) while 3.3% of the general population had median rhomboid glossitis (Zain *et al*, 1997). However an epidemiological study on the prevalence of tongue lesions per se among Malaysians remains unknown. Data on tongue lesions are important as local reference to aid the clinician in their daily practice and for national health policy development. The primary objective of this study was to determine the prevalence of these tongue lesions in Malaysian dental outpatients and to compare these findings with similar reports from other regions.

Materials and methods

Approval from the Research Ethics Committee (Ethics ID: DF OP0804/0017), Faculty of Dentistry, University of Malaya, was obtained before the commencement of this study. The first two authors (CLK and JAL) were trained by an Oral Medicine Specialist (SCH). All three examiners were calibrated. Their cohort consisted of 600 Malaysian dental outpatients attending the Primary Dental Care Unit at the Faculty of Dentistry, University of Malaya, Kuala Lumpur, Malaysia. All patients gave their consent to participate in this study.

All patients were interviewed by the trained examiners. A pre-designed structured questionnaire was used to record details on age, gender, race, medical background and habits. Questions were asked on the patients' medical histories pertaining to any underlying systemic diseases, allergies and medications while habits on tobacco smoking and alcohol drinking were also recorded. The patients were classified as having the above if they answered 'yes' to these questions. Details on the frequency of tobacco smoking or alcohol drinking habits were not asked.

After the interview, a systematic comprehensive oral clinical examination aided by dental light, mouth mirrors and gauze was carried out on all patients. Diagnosis of tongue lesions was made based on the consensus of all three examiners. Seven types of tongue lesions namely fissured tongue, geographic tongue, crenated tongue, hairy tongue, pigmented tongue, ankyloglossia and median rhomboid glossitis were identified in this series (Figures 1–7). The diagnostic criteria were based on those defined in previous studies and reviews (Bánóczy *et al*, 1993; Darwazeh and Pillai, 1993; Vörös-Balog *et al*, 2003; Jainkittivong and Langlais, 2005).

In those cases where there were differences in the diagnoses reached by the examiners, the case was discussed and re-evaluated until a common diagnosis was achieved. Where this failed, the case was excluded from the study series.

Statistical analysis

The data collected was analyzed using SPSS version 12.0. Chi-square or Fisher's exact tests were applied to compare the occurrence of tongue lesions with age, ethnicity, gender, medical histories and habits. The level of significance was set at $P < 0.05$.

Figure 1 Fissured tongue: Dorsum tongue showing numerous fissures of variable depth extending laterally from a median groove

Figure 2 Geographic tongue with crenations: Dorsum tongue showing irregularly-shaped erythematous areas surrounded by whitish circinate borders. Note the scalloped lateral margins of tongue

Results

Oral findings

Six hundred dental outpatients were examined in this study. These consisted of 257 (42.8%) male and 343 (57.2%) female patients. Their ages ranged from 3 to 85 years. There were 239 (39.8%) Chinese, 226 (37.7%) Malays and 127 (21.2%) Indians. The remaining eight (1.3%) outpatients were from other racial groups.

One hundred and eighty-one dental outpatients (30.2%) were diagnosed with at least one type of tongue lesion at the time of examination. Their prevalence rates in males and females were 13.5% and 16.7% respectively. Of these, 24 (4%) had two or more types of tongue lesions present synchronously.

Figure 3 Crenated tongue: Lateral margins of tongue showing shallow indentations due to impressions caused by neighboring teeth

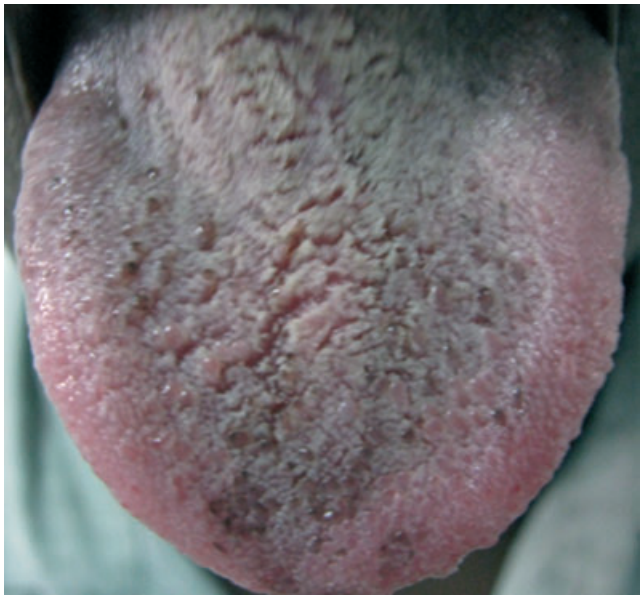

Figure 4 Fissured and hairy tongue: Dorsum of tongue showing numerous fissures of variable depth and hairy appearance. Note pigmentation present at the anterior part of tongue

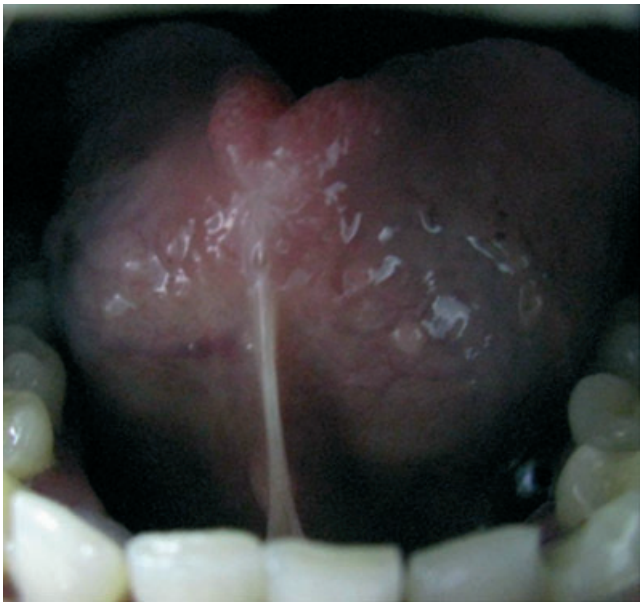

Figure 5 Ankyloglossia: The lingual frenulum is inserted close to the anterior tip of tongue

Figure 6 Pigmented tongue: Dorsum tongue showing numerous randomly scattered pin-point pigmentations

Seven different types were diagnosed and their prevalence rates were: fissured tongue (13.8%), crenated tongue (7.8%), pigmented tongue (6.2%), geographic tongue (2.2%), ankyloglossia (1.7%), hairy tongue (1.0%) and median rhomboid glossitis (0.2%). The distribution of these lesions according to the various age groups, gender, race and medical histories are detailed in Tables 1–4.

Habits in relation to tobacco smoking and alcohol drinking were recorded. There were 65 smokers comprising 63 male and two females (male–female ratio was 31.5:1; $P < 0.05$) with an overall mean age of 37.8 years. Their racial composition was 37 Malays, 15 Indians, 12 Chinese and one of other ethnic group. Twenty-six smokers (40.0%) presented with tongue lesions. The most frequently encountered lesion was fissured tongue ($n = 15$; 23.1%) followed by pigmented tongue ($n = 4$; 6.2%), crenated tongue ($n = 3$; 4.6%) and ankyloglossia ($n = 3$; 4.6%). Details on the frequency of tobacco smoking were not recorded. Only one case of alcohol drinking was recorded. This was a 60-year-old male but he had no tongue lesions. Details of his frequency of alcohol consumption were not investigated here.

Medical histories of patients were recorded. There were 239 patients with a history of an underlying systemic disease (e.g. diabetes mellitus). Eighty-four (35.1%) patients presented with tongue lesions (Table 4). There were 189 patients on medications (e.g. oral hypoglycemics) but only 71 (37.6%) had tongue

Figure 7 Median rhomboid glossitis: The lesion occurs as a roughly symmetric red lesion involving the midline of the posterior dorsum tongue

lesions (Table 4). Allergies (e.g. allergy to medicines, food and dust) were recorded in 93 patients and 31(33.3%) cases had tongue lesions (Table 4).

Statistical analysis

Statistical analysis revealed a significant relationship between the occurrence of two tongue lesions (crenated tongue and pigmented tongue) and race (Table 3); between four types of tongue lesions (fissured tongue, geographic tongue, crenated tongue and pigmented tongue) and age (Table 1); and between fissured tongue and gender (Table 2) ($P < 0.05$). Prevalence of ankyloglossia and hairy tongue did not show any statistically significant correlation with age, gender or race ($P > 0.05$). About 59.3% of patients with fissured tongue presented with an underlying systemic disease, and of these 31.3% had diabetes mellitus and this association was statistically significant ($P < 0.05$) (Table 4). In addition 81.5% of patients with fissured tongue were non-smokers while 18.5% were smokers and this difference was statistically significant ($P < 0.05$). There was no significant link between prevalence of other tongue lesions and alcohol habit or tobacco exposure ($P > 0.05$).

Discussion

To the best of our knowledge, this is the only study to determine the prevalence of tongue lesions in Malaysian dental outpatients. Previous limited reference to tongue lesions or median rhomboid glossitis in Malaysians was part of a nationwide oral mucosal survey (Taiyeb *et al*, 1995; Zain *et al*, 1997). In this study, data on seven types of tongue lesions were collected and analyzed with respect to age, gender, race, medical history and habits. In view of the fact that prevalence studies may follow different methodological lines (patient selection, diagnostic criteria, different ages of assessment for diagnosis), and may show considerable geographic variation, differences between the current and published data from other regions are not unexpected.

Fissured tongue was the most prevalent tongue lesion encountered in our series. The observed prevalence rate (13.5%) falls within the reported range (2.56–29.20%). It was higher than the prevalence rate reported in Iranian dental outpatients (2.56%) (Aboyans and Ghaemmaghami, 1973), Iraqi schoolchildren (2.6%) (Ghose and Baghdady, 1982), Jordanian dental outpatients (11.4%) (Darwazeh and Pillai, 1993) and South Indian dental patients (5.7%) (Matthew *et al*, 2008), but lower compared to those in Mexican children (15.7%) (Sedano *et al*, 1989), Hungarian population (18.52%) (Bánóczy *et al*, 1993) and Hungarian schoolchildren (29.20%) (Vörös-Balog *et al*, 2003). The variability in prevalence rate for fissured tongue in different populations implies considerable geographic variation for this oral anomaly. Furthermore, fissured tongue in Malaysians occurred more frequently in males than in females (M:F = 1.19:1) ($P < 0.05$). This male predominance was also found in Israeli schoolchildren (M:F = 1.3:1) (Chosack *et al*, 1974), Mexican children (M:F = 1.16:1) (Sedano *et al*, 1989) and South Indian patients (M:F = 1.8:1) (Matthews *et al*, 2008). In the present series, the occurrence of fissured tongue strongly correlated with age ($P < 0.05$) and this trend was similarly observed in previous studies (Bánóczy *et al*, 1993; Darwazeh and Pillai, 1993; Matthew *et al*, 2008).

Table 1 Prevalence of tongue lesions according to age groups

		Tongue lesions (some patients had two or more lesions)							
Age groups (years)	*Patients* (n)	*Fissured* n *(%)*	*Geographic* n *(%)*	*Crenated* n *(%)*	*Hairy* n *(%)*	*Ankyloglossia* n *(%)*	*Pigmented* n *(%)*	*MRG* n *(%)*	*No lesions* n *(%)*
1–19	137	4 (2.9)	2 (1.5)	3 (2.2)	0 (0)	1 (0.7)	10 (7.3)	0 (0)	118 (86.1)
20–29	121	10 (8.3)	6 (5.0)	17 (14.0)	2 (1.7)	3 (2.5)	10 (8.3)	0 (0)	77 (63.6)
30–39	70	10 (14.3)	0 (0)	3 (4.3)	1 (1.4)	2 (2.9)	2 (2.9)	0 (0)	54 (77.1)
40–49	75	10 (13.3)	1 (1.3)	11 (14.7)	2 (2.7)	1 (1.3)	6 (8.0)	1 (1.3)	48 (64)
50–59	83	18 (21.7)	2 (2.4)	10 (12.0)	1 (1.2)	2 (2.4)	6 (7.2)	0 (0)	50 (60.2)
60+	114	31 (27.2)	2 (1.8)	3 (2.6)	0 (0)	1 (0.9)	3 (2.6)	0 (0)	72 (63.2)
Total	600	83 (13.8)*	13 (2.2)*	47 (7.8)*	6 (1)	10 (1.7)	37 (6.2)*	1 (0.2)	419 (69.8)

MRG, median rhomboid glossitis.
*Statistically significant, according to age ($P < 0.05$).

Table 2 Prevalence of tongue lesions according to gender

		Tongue lesions (some patients had two or more lesions)							
Gender groups	*Patients* (n)	*Fissured* n (%)	*Geographic* n (%)	*Crenated* n (%)	*Hairy* n (%)	*Ankyloglossia* n (%)	*Pigmented* n (%)	*MRG* n (%)	*No lesions* n (%)
Males	257	45 (17.5)	4 (1.6)	14 (5.4)	2 (0.8)	6 (2.3)	13 (5.1)	1 (0.4)	176 (68.5)
Females	343	38 (11.1)	9 (2.6)	33 (9.6)	4 (1.2)	4 (1.2)	24 (7.0)	0 (0)	243 (70.8)
M:F	1:1.3	1:0.8	1:2.3	1:2.3	1:2	1:0.6	1:1.8	-	1:1.4
Total	600	83 (13.8)*	13 (2.2)	47 (7.8)	6 (1)	10 (1.7)	37 (6.2)	1 (0.2)	419 (69.8)

M, males, F, females, MRG, median rhomboid glossitis.
* Statistically significant, according to gender ($P < 0.05$).

Table 3 Prevalence of tongue lesions in different racial groups

		Tongue lesions (some patients had two or more lesions)							
Racial groups	*Patients* (n)	*Fissured* n (%)	*Geographic* n (%)	*Crenated* n (%)	*Hairy* n (%)	*Ankyloglossia* n (%)	*Pigmented* n (%)	*MRG* n (%)	*No lesions* n (%)
Malays	226	24 (10.6)	3 (1.3)	27 (11.9)	3 (1.3)	4 (1.8)	7 (3.1)	0 (0)	161 (71.2)
Chinese	239	28 (11.7)	7 (2.9)	14 (5.9)	0 (0)	3 (1.3)	2 (0.8)	1 (0.4)	186 (77.8)
Indians	127	31 (24.4)	3 (2.4)	5 (3.9)	3 (2.4)	3 (2.4)	28 (22.0)	0 (0)	65 (51.2)
Others	8	0 (0)	0 (1.3)	1 (12.5)	0 (0)	0 (0)	0 (0)	0 (0)	7 (87.5)
Total	600	83 (13.8)	13 (2.2)	47 (7.8)*	6 (1)	10 (1.7)	37 (6.2)*	1 (0.2)	419 (69.8)

MRG, median rhomboid glossitis.
* Statistically significant, according to race ($P < 0.05$).

Table 4 Prevalence of tongue lesions according to medical history of systemic diseases, allergies and medications

		Tongue lesions (some patients had two or more lesions)							
Factors	*Patients* (n)	*Fissured* n (%)	*Geographic* n (%)	*Crenated* n (%)	*Hairy* n (%)	*Ankyloglossia* n (%)	*Pigmented* n (%)	*MRG* n (%)	*No lesions* n (%)
Systemic diseases	239	49 (20.5)*	3 (1.3)	19 (7.9)	1 (0.4)	5 (2.1)	16 (6.7)	1 (0.4)	155 (64.9)
Allergies	93	13 (14.0)	2 (0.2)	8 (0.9)	0 (0.0)	2 (0.2)	9 (9.7)	0 (0.0)	62 (66.7)
Medications	189	42 (22.2)	3 (1.6)	15 (7.9)	1 (0.5)	4 (2.1)	10 (5.3)	1 (0.5)	118 (62.4)
Total	600	83 (13.8)	13 (2.2)	47 (7.8)	6 (1)	10 (1.7)	37 (6.2)	1 (0.2)	419 (69.8)

MRG, median rhomboid glossitis.
* Statistically significant, according to systemic diseases ($P < 0.05$).

Geographic tongue was diagnosed in 2.2% of Malaysian dental outpatients. The low prevalence rate lies with the reported range (0.3–14.4%) with most showing a range between 0.2% and 5% (Vörös-Balog *et al*, 2003). More Malaysian females (2.6%) than males (1.6%) were affected. This female predilection was also reported in Hungarians (M:F = 1:2) (Bánóczy *et al*, 1993) and Thais (M:F = 1:1.5) (Jainkittivong and Langlais, 2005). A peak incidence in the third decade of life (46.2%) was recorded here, and this finding concurred with three other previous reports (Sedano *et al*, 1989; Bánóczy *et al*, 1993; Jainkittivong and Langlais, 2005). On the other hand, Lin *et al* (2001) found that geographic tongue was not common among elderly Chinese. The occurrence of geographic tongue in Malaysians also correlated positively with increasing age, but this was not statistically significant ($P > 0.05$). One reason is because most of the patients (43.0%) were aged 29 years and below. Racial analysis revealed that geographic tongue was most prevalent among Chinese (57.8%) while Malays and Indians had the same prevalence rates (23.1%). This may be due to fact that the Chinese formed the largest group of dental outpatients in our sample. In addition, of the 13 patients with geographic tongue and 81 with fissured tongue, only two patients presented with both conditions and the association was not significant ($P > 0.05$). Therefore, our results did not support the hypothesis that geographic and fissured tongue shares the same aetiological and possibly genetic influences in their development (Chosack *et al*, 1974; Vörös-Balog *et al*, 2003). It has been speculated that geographic tongue might be linked to certain risk factors including hormonal disturbances and oral contraceptives (Waltimo, 1991), allergies (Marks and Carny, 1984), dermatological diseases such as pustular psoriasis (Wysocki and Daley,

1987) and genetic disorders such as Down syndrome (Ercis *et al*, 1996). However we were unable to demonstrate a link between these factors with the cases of geographic tongue analyzed in the current series.

About 6.2% of Malaysian dental outpatients presented with pigmented tongue. These patients were mostly Indians (75.7%) followed by Malays (18.9%) and Chinese (5.4%) ($P < 0.05$). It is generally known that oral pigmentation including tongue pigmentation is very much influenced by ethnicity and is more commonly seen in dark-skinned individuals (Amir *et al*, 1991). In addition, pigmented tongue was more prevalent in Malaysian females (7.0%) compared to males (5.1%), but this difference was not statistically significant ($P > 0.05$).

Ankyloglossia formed 1.7% of tongue lesions analyzed here. Previous epidemiological studies reported a 4–5% prevalence rate for this developmental anomaly (Suter and Bornstein, 2009). More Malaysian males (2.3%) than females (1.2%) were affected ($P > 0.05$). This was similarly observed in neonates (M:F = 2.6:1) (Messner *et al*, 2000).

Only one case of median rhomboid glossitis (central papillary atrophy) was diagnosed in this series (0.2%). An earlier survey found that this lesion affected 3.3% of the Malaysian general population (Zain *et al*, 1997). Elsewhere, prevalences of median rhomboid glossitis was also variable: 0.1% in Argentinian children (Sedano, 1975), 0.35% in Hungarian population (Bánóczy *et al*, 1993) and 1.5% in South Indian patients (Matthew *et al*, 2008). Our only case of median rhomboid glossitis was a male. Other series also showed a higher frequency in males (Pentenero *et al*, 2008; Matthew *et al*, 2008).

In this survey, 7.8% of patients presented with crenated tongue. Most were females (9.6%) and a peak incidence in the age group of 20–29 years was recorded ($P < 0.05$). Crenated tongue was significantly more prevalent in Malays (11.9%) followed by Chinese (5.9%) and Indian (3.9%) ($P < 0.05$). An association with habits such as teeth clenching and tongue thrusting has been reported (Crespo *et al*, 2005) but we were unable to establish this relationship here.

Hairy tongue was seen in 1.0% of our patients. This percentage was lower than that described in Jordanian (3.4%) (Darwazeh and Pillai, 1993) or Turkish population (3.8%) (Mumcu *et al*, 2005) but higher than in the Swedish population (0.6%) (Axell, 1976). Unlike previous studies (Jainkittivong *et al*, 2002; Mumcu *et al*, 2005), we were unable to demonstrate a correlation between prevalence of hairy tongues with advancing age. In addition, hairy tongue affected more Malaysian females than males (M:F = 1:3).

The types of tongue lesions identified in any one survey may vary from as few as three types (Bess *et al*, 2004; Shulman *et al*, 2004) to as many as nine (Avcu and Kanli, 2003). Seven types of tongue lesions were identified in our study. However papillary atrophy of the tongue, pseudomembranous candidiasis and macroglossia were not encountered in our series. Papillary atrophy of the tongue has a reported prevalence rate ranging from 0.7% to 2.9% (Axell *et al*, 1990; Avcu and Kanli, 2003; Vörös-Balog *et al*, 2003; Mumcu *et al*, 2005). This tongue lesion is more prevalent in women than in men because it may be related to an underlying iron deficiency associated with menstruation, nutritional factors including vitamin deficiency or hormonal imbalance (Mäkilä, 1971; Avcu and Kanli, 2003). A likely explanation for the absence of this tongue lesion in our series is that all the respondents were from the urban and suburban areas of the Klang Valley district which has good nutritional health and living standards. Pseudomembranous and atrophic candidiasis affecting the tongue has a reported prevalence that ranged from 0.01% to 3.7% (Bessa *et al*, 2004; Crespo *et al*, 2004). A study on pediatric outpatients revealed that these lesions are more likely to affect children who had recent antibiotic therapy and in those who had the suction pacifier habit (Bessa *et al*, 2004). In our study, except for a single case of median rhomboid glossitis recorded, the other clinical forms of candidal infection were not observed on the tongue of our patients. As candidiasis is an opportunistic infection it is likely that the host factors and oral environment are not conducive for this to occur in our patients. Macroglossia is rarely encountered (Guinta, 1989). One Turkish study described a prevalence rate of 1.2%, mostly in elderly females with a male-female ratio of 1:1.7 (Avcu and Kanli, 2003). Our explanation for the absence of macroglossia in our series is that this is most likely a very rare anomaly among Malaysians.

In this survey, the history of systemic diseases was analyzed. A significant association was observed between fissured tongue and systemic diseases (59.3%) ($P < 0.05$). As with previous study (Albrecht *et al*, 1996), we found that fissured tongue was significantly associated with diabetes mellitus (31.3%) ($P < 0.05$). However, we were unable to demonstrate any significant link between prevalence of geographic tongue and systemic diseases including allergies (Shulman and Carpenter, 2006). Hence our results did not support previous theories that alluded to an association between geographic tongue and allergy. In addition, crenated tongue was seen more frequently in healthy individuals (4.5%) compare to those with an underlying medical history (3.3%) but this association was not significant.

Alcohol habit and tobacco exposure were also recorded in this study. Out of 83 outpatients with fissured tongue, 81.5% were non-smokers while 18.5% were smokers ($P < 0.05$). About 1.5% smokers have hairy tongue while only 0.7% of non-smokers were affected ($P < 0.05$) supporting previous findings of a strong association between smoking and hairy tongue (Darwazeh and Pillai, 1993). Mumcu *et al* (2005) found that 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. We were unable to provide information on this because the current survey did not investigate this aspect. Tobacco smoking is known to be one of the main causes of melanin pigmentation of the oral mucosa including tongue (Salonen *et al*, 1990) but we were unable to demonstrate this association with pigmented tongue in

this study. No significant link between prevalence of other tongue lesions and alcohol habit or tobacco exposure was also noted.

In summary, this study enumerated the prevalence of seven types of tongue lesions based on a survey of 600 Malaysian dental outpatients from the Klang Valley area. Fissured tongue ranked as the most prevalent tongue lesion diagnosed and this anomaly showed a significant association with age, gender and diabetes mellitus. This data would serve as an invaluable reference material to aid the clinician in their daily practice. Lack of detailed investigations into the burning sensation or other symptoms that may occur in patients with tongue lesions, frequency of tobacco exposure and alcohol habits, laboratory findings of iron or vitamin deficiencies and prevalence of Candidal carriage in patients with tongue lesions were the limitations of our study.

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