

Prevalence and Factors Related to Tongue Coating among a Sample of Jordanian Royal Medical Services Dental Outpatients

Rana A. Omor BDS, Musab A. Arabeyat BDS*, Ayman N. Hiasat BDS**, Mahasen S. Ajarmeh BDS*, Hind H. Abu Fanas Dental hygienist**

ABSTRACT

Objective: The aim of this study was to investigate prevalence of tongue coating using Winkel tongue coating index and their relation to age, gender, smoking, systemic disease such as diabetes mellitus as well as oral hygiene habits.

Methods: We prepared a chart according to the criteria determined by WHO (1980), which used to record details on age, gender, smoking, medical history, and oral hygiene habits. Clinical examination was performed in dental clinic with plain mouth mirror and probe under artificial light, by drying tongue using gauze and air spray the status of tongue was recorded using Winkel tongue coating index.

Results: A total of 353 subjects (187 female, 166 males) were included in this study, tongue coating was detected in 77 (21.8%) subjects, Winkel tongue coating index scores mean value was 6.77 ± 2.145 . There was a strong correlation between tongue coating and increasing age. Tongue coating was significantly higher in males. There was also a strong association between tongue coating and smoking, diabetes mellitus as well as oral hygiene status. Tongue coating was strongly related to subject oral hygiene habits such as tongue brushing and using mouth wash.

Conclusion: A strong correlation was found between tongue coating and age, gender, diabetes mellitus, smoking as well as oral hygiene status in Jordanian Royal Medical Services dental patients. Both, regular using of mouth wash and regular tongue brushing improves tongue hygiene and decreased probability of tongue coating.

Key words: Coating, Prevalence, Smoking, Tongue.

JRSM March 2015; 22(1): 35-40 / DOI: 10.12816/0009784

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.⁽¹⁾ In recent years, epidemiological studies have shown that tongue

lesions constitute a remarkable proportion of oral mucosal lesions and that prevalence rates vary in different parts of the world.⁽²⁾ The difference in the prevalence rates has been related to ethnic or racial factors, smoking habit and gender differences between populations studied, in

From the Departments of Dentistry:

*Princess Aisha Medical Complex, Marka-Jordan

**Prince Ali Bin Al-Hussein Hospital, Karak-Jordan

Correspondence should be addressed to Dr. R. Omor, P.O. Box 563 Amman 11947 Jordan E-mail : ranaalomor@yahoo.com

Manuscript received January 2, 2013. Accepted May 30, 2013

addition to the general health status and the diagnostic criteria used.⁽³⁾

The color of a normal tongue is pink-to-slightly white, and is very often covered with a coating.⁽⁴⁾ Tongue coating is a visible white-brownish layer adherent to the dorsum of the tongue comprised of desquamated epithelial cells, blood cells, metabolites, nutrients and bacteria.^(5,6)

The papillary structure of the tongue dorsum forms a unique ecological site that provides a large surface area favoring the accumulation of oral debris and microorganisms.^(7,8)

Evaluation of tongue-coating status is necessary in assessing the effect of oral health care and motivating patients to clean their tongues. Several methods have been developed for assessing tongue coating status, such as visual methods, bacterial count on the tongue surface⁽⁹⁾ and wet weight measurement of scrapings collected from the dorsum of the tongue.⁽⁵⁾ Of the various methods, the visual methods are predominantly used in clinical practice because of their simplicity, rapidity and convenience.⁽¹⁰⁾ The Winkel tongue coating index (WTCI) was recently introduced, in which the tongue is divided into six sections.⁽¹¹⁾ The utility of the WTCI seems to be potentially high because its scores are relatively easy to interpret.⁽¹⁰⁾

Reviewing the literatures we found that these studies did not provide a well described assessment of prevalence and status of tongue coating and their relation to age, gender, smoking, systemic disease such as diabetes mellitus and oral hygiene habits especially in Jordan.

The objective of the present study was to investigate prevalence and degree of tongue coating among a sample of Jordanian Royal Medical Services dental outpatients using Winkel tongue coating index, as the scores of this index are comparatively easy to interpret due to the clear criterion, and their relation to age, gender, smoking, systemic disease such as diabetes mellitus and oral hygiene habits.

Methods

Prior to commencing the study, ethical approval by the Human Research Ethics Committee at the Royal Medical Services was obtained. All subjects were informed about the aims and methods of this study, and they provided written

consent to participate. In this cross-sectional study, a total of 353 Royal Medical Services dental clinics outpatients (F/M: 187/166, age range: 13 –85 years) were examined within a period of three months from April to June 2012. All subjects attended for routine dental check up or for dental treatment were included in this study. Examiners collected data through questionnaires and oral examinations in dental clinics. The age, sex, history of any systemic disease, details on history and duration of tobacco smoking and oral hygiene habits such as teeth brushing, tongue brushing and using of mouth wash and their frequencies were recorded, age was divided into two groups equal or less than 45 years and more than 45 years, oral hygiene habits considered yes when subject regularly did at least once daily. The oral examinations of tongue coating and dental plaque were performed in dental clinics with plain mouth mirrors & dental probes under artificial light.

Dental plaque on all teeth was evaluated using Silness and Loe Plaque Index (PI) which is divided into four scores from 0-3. By drying patient tongue using air syringe and dry gauze tongue coating was assessed, if tongue coating was present Winkel tongue coating index is used to evaluate tongue coating status by dividing the dorsum of tongue into 6 sextants three anterior and three posterior, A score between zero and two was given to each sextant according to the amount of deposits and these scores were added giving a total ranging from zero to 12. The data collected was analyzed using SPSS version 16.0 (SSPS® Inc., Chicago, IL, USA). Chi-square was applied to compare the prevalence and status of tongue coating with age, gender, medical history, smoking history, oral hygiene status as well as oral hygiene habits such as tongue brushing and mouth wash using. P value < 0.05 was considered statistically significant.

Result

A total of 353 dental out-patients were included in this study (Table I) shows numbers of patients according to age group, gender, smoking status, diabetic status, presence of tongue coating, tongue brushing and using of mouth wash. Tongue coating were diagnosed in 77 (21.8%) subjects with (6.77±2.145) mean value of the Winkel tongue coating index scores.

Table I: Variables distribution

Variables		Statistics
Age	≤45	224 (63.5%)
	>45	129 (36.5%)
Gender	Male	166 (47%)
	Female	187 (53%)
Smoker	Yes	73 (20.7%)
	No	280 (79.3%)
Diabetic	Yes	45 (12.7%)
	No	308 (87.3%)
Tongue coating	Yes	77 (21.8%)
	No	276 (78.2%)
Mouth wash	Yes	67 (19%)
	No	286(81%)
Tongue brushing	Yes	62 (17.6%)
	No	291 (82.4%)

Table II: Sociodemographic and relevant characteristics and tongue coating relationship.

Variables		Tongue Coating (n=77) N (%)	P-value
Gender	Female N=187	23 (12.3%)	<0.0001*
	Male N=166	54 (32.5%)	
Age	45 or less N=224	36 (16.1%)	0.001*
	Above 45 N=129	41 (31.8%)	
Smoking status	Non-smoker N=280	34 (12.1%)	<0.0001*
	Smoker N=73	43 (58.9%)	
Diabetic status	Non-diabetic N=308	59 (19.2%)	0.002*
	Diabetic N=45	18 (40%)	

P < 0.05 Significant

Table III: Plaque index and tongue coating relationship

Variables		Tongue Coating (n=77) N (%)	P-value
Plaque index	No plaque N=84	4 (4.8%)	<0.0001*
	Plaque seen by probing N=157	14 (8.9%)	
	Moderate plaque N=87	45 (51.7%)	
	Abundance of plaque N=25	14 (56%)	

* P < 0.05 Significant

Tongue coating was determined according to age of subjects (Table II). Statistical analysis showed that the prevalence of tongue coating was significantly increased with age.

The prevalence of tongue coating was significantly increased in diabetic subjects compared with non-diabetic subjects (Table II).

Tongue coating were determined according to smoking status of subjects (Table II). The prevalence of tongue coating was significantly higher in smokers than non-smokers in all subjects.

Subjects with poor oral hygiene plaque index 2 or 3 were more frequently have tongue coating than subjects with good or fair oral hygiene, plaque index 0 or 1 (Table III).

Tongue brushing significantly decrease prevalence of tongue coating (Table IV), only two (3.2%) of 62 subjects brush their tongue regularly once or more per day have tongue coating.

Subjects who regularly use mouth wash once or more per day were significantly less likely to have tongue coating (Table IV), only three (4.5%)out of 67 subjects have tongue coating.

Table IV: Oral hygiene habits and tongue coating relationship

Variables		Tongue Coating (n=77) N (%)	P-value
Tongue brushing	Yes N=62	2 (3.2%)	<0.0001*
	No N=291	75 (25.8%)	
Mouth wash	Yes N=67	3 (4.5%)	<0.0001*
	No N=286	74 (25.9%)	

* P < 0.05 Significant

Discussion

In spite of the fact that the tongue occupies one third of the oral cavity it seems to be unnoticed. Tongue coating appears clinically as presence of whitish or yellowish layer consist of desquamated epithelium, food debris and microorganism on the dorsum surface of the tongue.⁽¹²⁾ Tongue microorganisms may contribute to dental plaque formation and of influence on the flora of the entire oral cavity.⁽⁷⁾ as suggested by some investigators, tongue appears to be the principal source of oral malodour, also subjects with periodontal disease are more likely to have a thicker layer of tongue coating compared to subjects with healthy periodontal tissues.⁽¹³⁾

After a review of many studies about tongue coating in Jordan this is the only study that determines the relation of tongue coating with

gender, age, smoking status, diabetes mellitus, subject plaque index and oral hygiene habits.

Other studies in Jordan determine prevalence of tongue coating only without relationship with other elements, so these findings can be compared with the existing literatures of other populations.

In this study the prevalence of tongue coating was (21.8%) in comparison with previous study in North Jordan where the prevalence of tongue coating was much lower than our study (8.1%).⁽³⁾ This may be explained that other studies included only healthy patients, percentage of smokers were less than our study and the criteria used to diagnose tongue coating were different. The prevalence of tongue coating in 5,150 Turkish dental out patient was slightly higher than the result of our study (23.2%).⁽²⁾ In another Italian study results show much higher prevalence of tongue coating (51.4%)⁽¹⁴⁾ this may explain that this study included male subjects (≥ 40 years) with high percentage of tobacco smokers (58.5%), another study in Malaysia prevalence of tongue coating is much higher than our study (45%).⁽¹⁵⁾ This is the only study that recorded status and degree of tongue coating using Winkel tongue coating index and recorded mean value of all tongue coating subjects which was 6.77 ± 2.145 . We use Winkel index because the scoring system of this index appears useful, as the scores of this index are comparatively easy to interpret because of the clear criterion.⁽¹⁶⁾ Our finding that tongue coating was significantly higher among males compared to females was similar to previous study in north Jordan⁽³⁾ but differ from Turkish study that found tongue coating to be slightly higher in females⁽²⁾ this may be explained by the percentage of tobacco smoking among females was much less in Jordan than males who also had poorer oral hygiene than females. Prevalence of tongue coating was higher in subject above 45 years (31.8%) which was in agreement with results of Turkish subjects⁽²⁾ and Italian subjects.⁽¹⁴⁾ Our study showed that diabetic patients have higher prevalence of tongue coating (40%) which is in agreement with a Brazilian study who found tongue coating significantly higher in diabetic patients group (28.7%) than control group (8.1%),⁽¹⁷⁾ this could be associated with a reduction of salivary flow and a high salivary viscosity that can lead to

reduced cleaning capacity and reduced action of salivary antimicrobials factors.⁽¹⁸⁾

In our study tongue coating in smokers (58.9%) was significantly higher than non-smokers (12.1%) while in a Turkish study was slightly higher in smokers (28.6%) than non-smokers (21%).⁽²⁾ In another Turkish study it was found that 64% of tongue coating subjects were smokers,⁽¹⁹⁾ and in a Malaysian study they found that prevalence of tongue coating among male smokers was (73%),⁽¹⁵⁾ this could be due to tobacco smoking that precipitated tar on tongue surface and decrease salivary flow rate.⁽²⁰⁾ Oral hygiene is a very important factor affecting prevalence and status of tongue coating, in our study we use plaque index (Silness and Loe) to assess patient oral hygiene, subjects with good oral hygiene whose plaque index was 0 had significantly lower prevalence of tongue coating (4.8%) than subjects with poor oral hygiene whose plaque index were 3 (56%), same relation was found in Turkish subjects, subjects with good oral hygiene had a lower prevalence of tongue coating (10.5%) than subjects with poor oral hygiene (45.8%).⁽²⁾ Oral hygiene habits such as regular tongue brushing have the potential to successfully reduce tongue coating⁽²¹⁾ our study shows that subjects who regularly brushed their tongue have a lower prevalence of tongue coating (3.2%). A Belgian study demonstrated that one can achieve a significant reduction in tongue coating but, only have a limited reduction of the bacterial load when using a tongue cleanser such as a brush or a scraper⁽²²⁾ another study reported that scraping the tongue resulted in reduction of the tongue coating scores amounting to 70–80%.⁽²³⁾ Subjects who regularly use mouth wash also have lower prevalence of tongue coating (4.5%), Hakuta *et al.* who reported that ‘gargling’ with water everyday reduced the tongue coating of the elderly subjects in her study of oral function.⁽²⁴⁾

Reviewing the literatures about tongue coating we found wide variation in prevalence of tongue coating from 8% up to 70%, this may be due to differences between populations in oral hygiene practices, smoking habits, age distribution, as well as mistaken consideration of other tongue lesions such as geographic tongue or hairy tongue that were misdiagnosed as tongue coating.

Conclusion

The present study showed a strong correlation between tongue coating and age, sex, diabetes mellitus, smoking as well as oral hygiene status in Jordanian population. Both, regular use of mouth wash and regular tongue brushing improves tongue hygiene and decreases probability of tongue coating formation.

References

1. **Koay CL, Lim JA, Siar CH.** The prevalence of tongue lesions in Malaysian dental outpatients from the Klang Valley area. *Oral Dis* 2011; 17: 210-216
2. **Avcu N, Kanli A.** The prevalence of tongue lesions in 5150 Turkish dental outpatients. *Oral Dis* 2003; 9:188-195.
3. **Darwazah AM, Almelaiah AA.** Tongue lesions in a Jordanian population. Prevalence, symptoms, subject’s knowledge and treatment provided. *Med Oral Patol Oral Cir Bucal* 2011 Sep 1; 16 (6):e745-749.
4. **Kikutani T, Tamura F, Nishiwaki K, et al.** The degree of tongue-coating reflects lingual motor function in the elderly. *Gerodontology* 2009; 26: 291-296.
5. **Yaegaki K, Sanada K.** Volatile sulfur compounds in mouth air from clinically healthy subjects and patients with periodontal disease. *J Periodontol Res* 1992; 27: 233-238.
6. **Roldan S, Herrera D, Sanz M.** Biofilms and the tongue: therapeutical approaches for the control of halitosis. *Clin Oral Investig* 2003; 7: 189-197.
7. **Jacobson SE, Crawford JJ, McFall WR.** Oral physiotherapy of the tongue and palate: relationship to plaque control. *Journal of the American Dental Association* 1973; 87:134-139.
8. **Bosy A, Kulkarni GV, Rosenberg M, McCulloch CAG.** Relationship of oral malodor to periodontitis: Evidence of Independence in discrete subpopulations. *Journal of Periodontology* 1994; 65:37-46.
9. **Shimizu T, Ueda T, Sakurai K.** New method for evaluation of tongue-coating status. *Journal of Oral Rehabilitation* 2007; 34: 442-447.
10. **Kim J, Jung Y, Park K, Park J-W.** A digital tongue imaging system for tongue coating evaluation in patients with oral malodor. *Oral Dis* (2009); 15:56-569
11. **Winkel EG, Roldan S, Winkelhoff V, et al.** Clinical effects of a new mouthrinse containing chlorhexidine, cetylpyridinium chloride and zinc-lactate on oral halitosis. A dual-center, double-blind placebo-controlled study. *J Clin Periodontol* 2003; 30: 300–306.

12. The American Heritage® Medical Dictionary. 2nd edition: Houghton Mifflin Co.; 2007.
13. **Yaegaki K, Sanada K.** Biochemical and clinical factors influencing oral malodor in periodontal patients. *J Periodontology* 2002; 63:783-789.
14. **Campisi G, Margiotta V.** Oral mucosal lesions and risk habits among men in an Italian study population. *J Oral Pathol Med* 2002 Sep; 31(8):504.
15. **Mei Siang Ma.** The prevalence of tongue lesions in the outpatients of Kementah Dental Centre. *Int Poster J Dent Oral Med* 2012; 14(3): poster 602.
16. **Lundgren T, Mobilia A, Hallstroöm H, Egelberg J.** Evaluation of tongue coating indices. *Oral Diseases* 2007; 13:177-180.
17. **Bastos A, Perin Leite AR, Spin-Neto R, et al.** Diabetes mellitus and oral mucosa alterations: Prevalence and risk factors. *Diabetes Research and Clinical Practice* 2011; 92:100-105
18. **Negrato C, Tarzia O.** Buccal alterations in diabetes mellitus. *Diabetology & Metabolic Syndrome* 2010; 2:3.
19. **Gonul M, Gul U, Kaya I, et al.** Smoking, alcohol consumption and denture use in patients with oral mucosal lesions. *J of Dermatological Case Rep* 2011; 4:64-68.
20. **Rad M, Kakoie S, Brojeni FN, Pourdamghan N.** Effect of Long-term Smoking on Whole-mouth Salivary Flow Rate and Oral Health. *J Dent Res Dent Clin Dent Prospect* 2010; 4(4):110-114.
21. **Van der Sleen MI, Slot DE, Van Trijffel E, et al.** Effectiveness of mechanical tongue cleaning on breath odor and tongue coating: a systematic review. *Int J Dent Hygiene* 2010; 8:258-268
22. **Quirynen M, Avontrodt P, Soers C, et al.** Impact of tongue cleansers on microbial load and taste. *J Clin Periodontol* 2004; 31: 506-510.
23. **Che´rel F, Mobilia A, Lundgren T, et al.** Rate of reformation of tongue coatings in young adults. *Int J Dent Hygiene* 2008; 6:371-375
24. **Hakuta C, Mori C, Ueno M, et al.** Evaluation of an oral function promotion program for the independent elderly in Japan. *Gerodontol* 2009; 26:250-258.
25. **Kramer IR, Pindborg JJ, Bezroukov V, Infirri JS.** Guide to epidemiology and diagnosis of oral mucosal diseases and conditions. World Health Organization. *Community Dent Oral Epidemiol* 1980; 8:1-26.