

Oral and Systemic Conditions in Elderly Population Groups in Talash, North of Iran

Original Article

Maryam Rabiei¹, Maryam Shakiba²,
Jacques Vanobbergen³

¹ Associate professor, Department of Oral medicine, Guilan University of medical sciences, Dental school, Rasht, Iran

² Epidemiologist, Department of Epidemiology, Shahid Beheshti University of medical sciences, Tehran, Iran

³ Professor, Department of Community Dentistry and Oral Public Health, Gent University, Dental School Belgium

Received: Feb 26, 2013
Accepted: Mar 18, 2013

Corresponding Author:

Rabiei Maryam, DDS

Address: Department of Oral medicine, Guilan University of medical sciences, Dental school, Rasht, Iran

Telephone: +989111318411

Fax: +981313230776

E-mail: rabiei@gums.ac.ir

Abstract

Introduction: This survey was undertaken to assess self-reported oral health behaviour, oral and systemic conditions among functionally independent population in Talash, North of Iran. The question is whether there are any relationships between these variables.

Materials and Methods: A total of 203 elderly subjects enrolled in this study; 125 (61.5%) were males and 78 (38.4%) were females. All subjects were interviewed, dentally and orally examined. Demographics data, medical background, oral hygiene practices and oral conditions were noted.

Results: from total, 78.8% were edentulous and 86.7% had different oral conditions. The mean number of retained teeth was 7.34 ± 4 . The most common oral conditions were dry mouth (41.9%), fissure tongue (30.5%), burning mouth (28.6%) and denture induced stomatitis (28.1%) respectively. Oral conditions were more prevalent in females than in males (Odds Ratio: 2.42, 95%CI 0.93-6.28). Diabetes (OR: 6.22, 95%CI 0.816- 47.49) and hypertension (OR: 2.59, 95%CI 0.834-8.07) impact and deteriorate oral lesions. Life without systemic diseases giving rise to maintain more teeth (OR: 3.43, 95%CI 1.71-6.89). Oral diseases were more prevalent in uneducated people (OR: 2.67, 95%CI 0.948-7.5). Reported oral hygiene behaviour showed a significant relationship with oral lesions (OR: 5.25, CI95%: 1.82 -15.0, $p < 0.004$).

Conclusion: according to highly prevalence of oral diseases routine oral examinations should be advised

Key words: •Diagnosis, Oral •Geriatric dentistry •Tooth diseases

Introduction

The population of the elderly people is growing rapidly without stoppage.⁽¹⁻³⁾ A major and growing health aspect of ageing is the presence of co-morbidity. There are different disorders occurring in dental and oral mucosa by rising age. Oral health is an integral component of general health. Oral health problems can have a profound impact on general health, whilst problems with general health can, and frequently do manifest in the mouth. As people age, they remain susceptible to new and repeated episodes of oral diseases⁽⁴⁾ With increasing age cumulative effects of oral disease frequently result in tooth loss to a level that affects the function, diet and quality of life for older people.^(5,6) The retention of natural teeth in old age makes a major positive contribution to maintaining good oral health related quality of life.^(4,7) There are relationships between the severity of periodontal inflammation and glycemic control in diabetic patients, atherosclerotic disease affecting the heart and/or brain. The retention of natural teeth has potential benefits, but it is clearly important to ensure that these teeth are well maintained and, above all, clean.^(5,6) Salivary dysfunction due to different systemic diseases may have a profound negative impact on dental and oral disorders. Altered oral condition may change nutrition and pleasure of eating with specific effect on oral health related quality of life.

Oral health conditions in elderly are largely based on the data obtained from surveys conducted in different countries. Oral health is related to oral health promotion, training and service provision and economics, as well. Further research should address the issues that will inform planning for future dental services by considering the population structure and the changing epidemiology of oral diseases and disorders.^(1,5,6,8)

Different countries on account of their developing status provided various dental

services with and without social insurance or welfare trying to support their population.^(1,7,8) In developing countries, there are still needs for improving health care. Likewise, many investigations on underlying causes of elderly oral and dental problems suggested age, socio-economic status and education as having inevitable impact on oral health.^(9,10)

Few studies have been run in Iran as a developing country regarding the oral health and dental disease in geriatrics. Iran is a country with a lifestyle different from the prevalent lifestyles of populations in western countries where most observational studies have been carried out in. In addition, in terms of per capita gross national product and life expectancy at birth, Iran is positioned in the middle of the second quartile. Therefore, it cannot yet be classified as a highly developed country like most Western countries.⁽¹¹⁾

Guilan is one of Iran's three Northern provinces adjacent to the Caspian Sea. Talash, covering almost a quarter of Guilan, is an area situated in the north-west of the province. There are 191,408 inhabitants including 73,209 urban and 118,199 rural inhabitants. The total number of inhabitants aged 65 years and older in Talash is 9,567, with 6,561 and 3,006 for rural and urban areas respectively. To the aim of this study, the oral health and the related oral health behaviour among the independent elder (non institutionalized) 65 years of age and older in Talash, North of Iran, and their relation with systemic conditions is going to be assessed.

Materials and Methods

Subject: A convenience sample of 203 functionally independent elders, 65 years and over (non-institutionalized), was chosen for the study from September 2009 to October 2010.

This sample consisted of elder outpatients attending the public dental health services in

Talash and who had responded to the dental hygiene census conducted in the area. There are 13 public dental health services in Talash, 9 urban and 4 rural situated centres. All rural centres and a random sample of 4 urban centres were included.

All selected patients were informed about the research in which they were going to participate and were asked to fill in the consent form. There was no one to refuse taking part in this study.

This study was approved by Guilan University Research Centre Committee.

Study design: this is a cross-sectional observational study. Data was recorded by means of guided anamnestic interviews and oral examinations.

-**Anamnesis:** Data on age, sex and place of residence, urban and rural were extracted from patient files.

-Oral health behavior was assessed by asking fixed formal questions based on an existing check-list on frequency and timing of tooth brushing, using dental floss and dental services. The level of education was classified into primary school, secondary school and the illiterate ones.

-Dry mouth was assessed by using 4 standard questions:

1-Does the amount of saliva in your mouth seems too little?

2-Does your mouth feel dry when eating?

3-Do you have difficulty in swallowing any kind of food?

4-Do you sip liquids to aid in swallowing any kind of food?

Individuals who complained regarding all questions were liable to xerostomia. Dry mouth was confirmed by estimating salivary flow rate.

- Health and medication statuses were enquired by anamnesis and verified by the physicians in the health care centre.^(12,13)

- **Oral examination:** Oral and dental examinations were conducted during routine activities in regular dental offices in Talash

during 2009- 2010. All oral examinations were carried out by one researcher (RM) specialist in oral medicine and the head of the department of community dentistry who was trained in recognizing oral and dental disorders. Diagnostic criteria for caries and soft tissue anomalies were based on WHO classification and Axell.⁽¹⁴⁾ Caries were diagnosed visually without radiography. The intra-examiner agreement was 90%.

Denture stomatitis was recorded using Newton's classification:

Type I: pin-point hyperaemia, or localized simple type of inflammation; Type II: more diffuse erythema, confined to the mucosa in contact with the acrylic plate; Type III (Granular type): granular inflammation or "Inflammatory papillary hyperplasia".

Statistical analysis: The basic statistical data was subjected to analysis by chi-square tests (categorical variables), Fisher test to test differences between sub-groups. Multiple stepwise logistic regression analysis was employed to analyze the association of various independent variables with oral lesions. The effect of each independent variable was assessed adjusting for that of all others in the forward model. Hosmer Lemeshow goodness of fit was considered for model fitness. The level of significance was set at 0.05.

Results

A total of 203 elderly individuals were examined. The majority of subjects belonged to ≥ 65 -74 year's age group. Age ranged from 65 to 79 years with the mean age of 72(6.44) years. There was also unequal gender distribution with males comprising 125(61.6%) and 78(38.4%) females. Half of the subjects 102 (50.2%), were from urban, and the other half 101(49.8%) were from rural areas. One percent of the subjects had secondary schooling, 10.3% had primary schooling while 88.7% were illiterate. Table 1 displays the oral health behavior of the study population based on residency.

Only 5.4% of the study population brushed their teeth more than once a day. Most of the participants (84.7%) never used dental floss and 45.3% never used fluoridated tooth paste. Seventy percent of the study population seldom visited a dentist (≥ 4 years).

Frequency of tooth brushing, inter dental cleaning and use of fluoridated tooth paste in urban residents were significantly more than rural areas ($p < 0.001$).

More than three out of four (78.8%) were edentulous and 93.8% of them wore dentures. The mean number of remaining teeth among dentate subjects was 7.34 ± 4 , 33 (range: 2-22); 6.83 ± 3.68 in urban and 8.11 ± 5.17 in rural area. Almost all dentate subjects (41/43) suffered from root caries (95.3%). Those who suffered from coronal caries constituted (18.6%) of the population (table 2).

The vast majority of subjects (86.77%) had oral soft lesions. Table 3 shows oral soft tissue conditions by residency. Denture stomatitis ($p < 0.05$) and pseudomembrane candidiasis ($p < 0.005$) were significantly higher among the rural than the urban area. Denture stomatitis (OR: 2.48, 95%CI 1.28- 4.78) ($p < 0.006$), Dry mouth (OR: 2.4, 95% CI: 1.35- 4.32) ($p < 0.002$), Burning mouth (OR:1.96, 95%CI: 1.05-3.67) ($p < 0.03$), fissure tongue (OR:2 95%, CI: 1.08- 3.7) ($p < 0.02$) geographic tongue ($p < 0.03$) were significantly higher in females than in males while nicotinic stomatitis was significantly higher in males ($p < 0.013$). Altogether oral conditions were more prevalent in females than in males (OR:2.42, 95%CI: 0.93-6.28). Otherwise, nicotinic stomatitis was more prevalent in males (OR: 5.57, 95%CI: 1.2-24.9). Overall, oral conditions were more prevalent in uneducated (OR:2.67, 95%CI: 0.948-7.5); Denture stomatitis (OR:8, 95% CI: 1.05-60.9) ($p \leq 0.02$), Burning mouth ($p < 0.08$) were more prevalent in uneducated elderlies.

By adding the different oral health behavior variables (number of tooth brushing, use of tooth paste, dental flossing, and using dental services), we developed new compound variable categorized into two groups: poor and proper habits. Poor oral health habits deteriorated Dental conditions (OR: 46.8, 95% CI: 10.1- 215.2). In the same way, the number of remaining teeth were lower in former groups (1.05 ± 3.1) than individuals with better oral behaviors (6.66 ± 3.74) $P < 0.0001$.

Regarding to the systemic condition, unexpectedly hypertension in rural areas was significantly higher than in urban ones (Table 4). Diabetes (OR: 6.22, 95%CI: 0.816-47.49) and hypertension (OR: 2.59, 95%CI: 0.834-8.07) were the risk factors for change and aggravated the oral conditions. Elders without systemic diseases had more maintained teeth (OR: 3.43, 95%CI: 1.71-6.89) ($p < 0.0001$).

Stepwise multivariate logistic regression analysis was undertaken to estimate the relationship between the variables that were statistically significant with oral lesions in an unadjusted analysis. The results of the regression analysis (table 5) revealed that diabetes (OR: 7.29, 95% CI: 2.96-17.92, P value < 0.0001) and hypertension (OR: 2.20, 95% CI: 1.18-4.08) increased the risk of dry mouth. Elderlies with diabetes mellitus also perceived more burning sensation (OR: 5.31 95%, CI: 2.4-11.45) (table 6). The ultimate significant predictors for denture stomatitis were age and sex (table 7).

Table 1. Oral health behaviour of the study population by residency

	Number(%)	Urban N=102	Rural N=101	P value
Frequency of tooth brush				
≥ 1 a day	11(5.4)	3(0.02)	8(0.07)	0.0001
Once a day	56(27.6)	40(0.39)	16(0.15)	
Less frequently	136(67)	58(0.56)	78(0.77)	
Use of fluoridated tooth paste				
Almost	36(17.7)	13(0.12)	23(0.20)	0.008
Sometimes	75(36.9)	48(0.47)	27(0.26)	
Never	92(45.3)	41(0.40)	51(0.50)	
Inter dental flossig				
Daily	8(3.9)	2(0.01)	6(0.05)	0.008
Seldom	23(11.3)	18(0.17)	5(0.04)	
never	172(84.7)	82(0.80)	90(0.89)	
Time since last dental visit				
Within 1 year	20(9.9)	13(0.12)	7(0.06)	0.1
2 years	40(19.7)	24(0.23)	16(0.15)	
≥ 4 years	143(70.5)	65(0.63)	78(0.77)	

Table 2. Dental profile of elder people by their age and life style

Dentition	Total N(%)
- Edentulousness	160(78.8%)
-With denture	150 (93.8%)
-Without denture	10 (6.3%)
Root caries	41 (95.3%)
Coronal Caries	8 (18.6%)
Without caries	2 (4.7%)
Mean number of remaining teeth among dentate subjects	7.34±4.33

Table 3. Prevalence of oral soft tissue conditions by residency

Oral conditions	Total N(%)
1-Denture induced-stomatitis	57 (28.1)
-Denture Hyperplasia (Newton 1)	36 (17.73)
-Denture stomatitis (Newton 2,3)	49 (24.1%)
2-Dry Mouth	85 (41.9%)
3-Burning Mouth	58 (28.6%)
4-Fissure Tongue	62 (30.5)
5-Geographic Tongue	34 (16.7%)
6-Pseudo membrane Candidacies	14 (6.9%)
7-Angular cheilitis	20 (9.9%)
8-Nicotinic stomatitis	18 (8.9)
9-Sublingual Varicosities	32 (15.8%)
10-Epulis Fissuratum	8 (3.9%)
11-Traumatic ulcer	18 (8.9%)
12-Atrophy of Tongue	4 (2%)
13-Fordyce's Granule	5 (2.5%)
14-Leukoedema	2 (1%)
15-Diffuse pigmentation	2 (1%)
16-focal Melanosis	3 (1.5%)

Table 4. Systemic condition

Systemic Diseases	Total N(%)
Hypertension	76 (37.4%)
Chronic pulmonary disease	44 (21.7%)
Heart disease	66 (32.5%)
Cerebra vascular disease	6 (3%)
Dementia	8 (3.9%)
Diabetes Mellitus	35 (17.2%)
Nervous disease	24 (11.8%)

Table 5. Stepwise wald multiple regression by dry mouth

							95% C.I for EXP(B)	
		β	S.E.	wald	sig	Exp(B)	Lower	Upper
Step 3	diabetes	1.987	.459	18.761	.000	7.291	2.967	17.915
	hypertension	.787	.316	6.211	.013	2.198	1.183	4.083
	constant	-.959	.207	21.365	.000	.383		

Variables entered on steps: Hypertension, Diabetes, systemic disease

Table 6. Stepwise wald multiple regression by burning mouth syndrome

							95% C.I for EXP(B)	
		β	S.E.	wald	sig	Exp(B)	Lower	Upper
Step 2	diabetes	1.670	.392	18.139	.000	5.311	2.463	11.452
	constant	-1.264	.186	46.116	.000	.282		

Variable entered on steps: gender, diabetes and hypertensio

Table 7. Stepwise wald multiple regression by denture stomatitis

							95% C.I for EXP(B)	
		β	S.E.	wald	sig	Exp(B)	Lower	Upper
Step 3	Sex	.929	.342	7.399	.007	2.533	1.297	4.948
	Age	.064	.025	6.633	.010	1.066	1.015	1.119
	Constant	-7.121	1.919	13.764	.000	.001		

Variables entered: gender, age, hypertension, diabetes and literacy

Discussion

This is a multidimensional study identifying different aspects including oral diseases, systemic condition, capability of self-care and oral hygiene practice in elder population groups who are functionally independent.

The oldest population group in the present study had inadequate oral health behav-

our; therefore we can expect more frequent oral health problems, dental and oral diseases in this group. The study revealed that three out of four of participants were edentulous, dentate individuals widely had root and/or coronal caries. Nevertheless, the underlying factors which attributed to tooth loss among our subjects were ambiguous. The mean number of remaining teeth in dentate

subjects $7.34(\pm 4.33)$ was higher than the one in another study including elderly residents in a nursing home (3.22) (15) but edentulous was prominent, 78.8% versus 56% in the previous study. (15) By 2025, figures are expected to reduce by only one in five, aged 65 years and over will have no natural edentulous.⁽⁶⁾ Equally, the definition of a functional dentition differs from one country to another (e.g. 21 in Australia, 16 in the UK.⁽⁴⁾ It is postulated that elders with a functional dentition could enjoy a healthy diet without needing to use partial dentures.⁽⁶⁾ Despite the fact that the mean number of remaining teeth is less than what can be expected as functional, there is a concern about oral health related quality of life and satisfactions which need to be investigated. Raising the number of public health services in rural area, with an attempt to improve the oral health care may contribute to change elders attitude toward natural tooth retention, contributing to an increased oral health related quality of life.

Shah et al. reported that 15% of residents in urban and rural Indian areas were completely edentulous, however 64.2% of dentate suffered from caries: 66.7% had root caries and 33.3% coronal caries. Furthermore, caries pattern was slightly higher among the old urban than rural residents (66.1% vs. 61.4%).⁽¹²⁾ A comparable pattern has been seen in our study (58.55% in urban vs. 41.5% in rural). Coronal caries were less prevalent (18.6%), while the prevalence of root caries was rather similar, 58.3% in urban and 38.1% in rural areas.

Luan et al. showed that 24% of the elders were edentulous in China and tooth loss was prominent in rural residents in comparison with urban ones ($p < 0.001$). Gender differences were considerable with females being more edentulous ($p < 0.001$). In contrast, in this study there was no difference regarding the health condition of the remaining teeth.

The mean number of decayed or filled teeth was 6.2 (± 5.5) among $70 \pm$ year olds.⁽¹⁶⁾

Dry mouth was the prominent oral condition encountered in this investigation. As our findings revealed, dry mouth was a subsequent symptom of diabetes and hypertension, consequently it could be aggravated by medications. Pharmacologic agents can mimic or antagonize numerous regulatory aspects of salivation, thus affecting both salivary flow rate and composition.^(8,16) Dry mouth can adversely affect oral health by raising the number of microorganisms and can have an impact on the quality of life.⁽¹⁷⁾ Likewise, prevalence of dry mouth in Guilan, Iran was 42.1% (13), in Finland 57% in independent old people and 63% in hospitalized patients (17); Greece 14% (18), Brazil 37% (19) and 35% of Scottish elder people suffer from dry mouth.⁽²⁹⁾ Dry mouth was the underlying factor for raising caries and tooth loss, and a predisposing factor for candidiasis among the vulnerable elder individuals. In this study, systemic diseases such as hypertension and diabetes were the major risk factors for dry mouth and could seriously affect the oral conditions.

In almost all studies, dentures display an important role in implementing oral lesions in geriatric populations: Greece 25.6%, Brazil 20%, 19% in China, 11% in Chinese Hong Kong, 45% in Scotland, 31.7% in Chile and 45% in Rasht, Iran. Denture-induced pathology was reported and assumed as an age related problem.^(15,16) Different investigations showed mucosal pathology occurred in more than one third of their elderly population.^(20,21) Oral lesions had higher prevalence among denture wearers compared to subjects who had no dentures. Complete denture wearers encountered lesions more than partial denture wearers. The most common lesions were Newton type one.^(22,23) Age, gender, literacy, diabetes and hypertension had a profound influence on denture stomatitis in this study. Dry

mouth and poor oral hygiene are major contributors and underlying factors in denture related stomatitis.

The most common systemic disease was hypertension which could influence the oral condition, in particular xerostomia. Apart from frequency diabetes which could cause and aggravate entire oral conditions; it enhances the perception of burning and dry mouth sensation. Compared to other systemic diseases, diabetes had more negative influences on the oral conditions.

Despite the lower number of female participants in this study, the present findings confirm the gender influence on oral health condition. Elderly female subjects are more vulnerable to oral lesions.⁽¹⁵⁾

The limitation of present study follows the restrictions of target population. The sample is not representative for the important number of functionally dependent elderly groups who cannot seek for dental care. National –wide surveys should be conducted to have a more reliable picture of oral health in this country. The most important findings in this study revealed a high prevalence of oral conditions, both dental and soft tissues, systemic problems which elderlies suffer and as it was mentioned, their influence on each other.

References

1. Harford J. Population ageing and dental care. *Community Dent Oral Epidemiol.* 2009; 37(2):97-103.
2. Ship I. Clinician's guide oral health in Geriatric patients. 2nd ed. BC Decker Inc; 2005. PP. 1-5.
3. Bedi R. National Health Services. Setting the Science. *Gerodontology.*2005; 22 (suppl.1): 2-48.
4. Steele JG, Sanders AE, Slade GD, et al. How do age and tooth loss affect oral health impacts and quality of life? *Community Dent Oral Epidemiol.* 2004; 32(2): 107-14.
5. Bedi R, National Health service. Oral health related to general health in older people. Chapter 2. *Gerodontology* 2005; 22(suppl.1):2-48.
6. Bedi R, National Health Service Oral health and older people. *Gerodontology* 2005; 22(suppl.1):2-48.
7. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, Walls AW. The prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. *Community Dent Oral Epidemiol.* 2001; 29(3):195-203.

Conclusion

The present study provides data on the prevalence of oral mucosal lesions, oral habits and dental conditions observed among an Iranian adult population, northern city in Iran. Although there are difficulties of comparing prevalence rates from different studies, these results were considerably in agreement with the data reported by previous studies. Moreover, the importance of risk factors, oral hygiene, medical conditions and dentures in the pathogenesis of oral mucosal conditions were evident and/or inevitable. The fact that almost four out of five adult subjects may be susceptible to oral lesions and three out of four were edentulous or had caries emphasized that the subjects needed more caring and it is better to set up routine dental and oral visits as a common program to maintain appropriate oral health and good quality of life.

Acknowledgement

Authors wish to acknowledge Dr Akef Javadinia for managing the patients for both urban and rural fields and also Professor Ehsan Kazemnezhad Leili who provided statistical advice.

8. Vargas CM, Kramarow EA, Yellowitz JA. The Oral Health of Older Americans, Centers for disease control and National Center for Health Statistics. *Aging Trends*. 2001; (3):1-8.
9. Hamasha AH, Sasa I, Al Qudah M. Risk indicators associated tooth loss in Jordanian adults.. *Community Dent Oral Epidemiol*. 2000; 28(1):67-72.
10. Holst D. Oral health equality during 30 years in Norway. *Community Dent Oral Epidemiol*. 2008; 36(4):326-34.
11. World Health Organization. *World Health Statistics 2008*. Geneva: World Health Organization; 2008.
12. Shah N, Sundaram K R. Impact of socio-demographic variables, oral hygiene practices, oral habits and diet on dental caries experience of Indian elderly: a community-based study. *Gerodontology*. 2004; 21(1):43-50.
13. Vyšniauskaitė S, Kammona N, Vehkalahti M M. Number of teeth in relation to oral health behavior in dentate elderly in Lithuania. *Gerodontology*. 2005; 22(1): 44-51.
14. Axell TA. Prevalence study of oral mucosal lesions in an adult Swedish population. *Odontol Revy Suppl*. 1976; 36:1-103.
15. Rabiei M, Kasemnezhad E, Massoudi rad H, et al. Prevalence of oral and dental disorders in institutionalized elderly people in Rasht, Iran. *Gerodontology*. 2010; 27(3):174-7.
16. Luan WM, Baelum V, Chen X Fejerskov O. Dental Caries in Adult and Elderly Chinese. *J Dent Res* 1989; 68(12): 1771-6.
17. Pajukoski H, Meurman JH, Halonen P, Sulkava R. Prevalence of subjective dry mouth and burning mouth in hospitalized elderly patients and outpatients in relation to saliva, medication ,and systemic disease. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2001; 92(6):641-9.
18. Triantos D. Intra oral findings and general health conditions among institutionalized and non institutionalized elderly in Greece. *J Oral Pathol Med*. 2005; 34(10):577-82.
19. dos Santos PJ, Bessa CF, de Aguiar MC, do Carmo MA. Benevides dos Santos PJ, Navarro Bessa CF, Ferreira de Aguiar MC, Vieira do Carmo MA. Cross-sectional study of oral mucosal conditions among a central Amazonian Indian community, Brazil. *J Oral Pathol Med* 2004; 33:7-12.
20. Espinoza I, Rojas R, Aranda W, Gamonal J. Espinosa I, Rojas R, Aranda W, Gamonal J. Prevalence of oral mucosal lesions in elderly people in Santiago ,Chile. *J Oral Pathol Med* 2003; 32:571-5.
21. Kuc IM, Samaranayake LP, van Heyst EN. Kuc IM, Samaranayaka LP, Heyst EN. Oral health and microflora in an institutionalized elderly population in Canada. *Int Dent J* 1999; 49:33-40.
22. Jainkittivong A, Aneksuk V, Langlais RP. Jainkittivong A, Aneksuk V, Langlais, R P. Oral mucosal conditions in elderly dental patients. *Oral Diseases* 2002; 8(4):218-223.
23. Pentenero M, Broccoletti R, Carbone M, Conrotto D, Gandolfo S. Pentenero M, Broccoletti R, Carbone M, et al. The prevalence of oral mucosal lesions in adults from the Turin area .*Oral Diseases* 2008; 14, 356–36.