The prevalence and related risk factors of oral mucosa diseases among residents in Baoshan District of Shanghai

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Background: Oral mucosal diseases (OMDs) refer to the various types of diseases. Our aim was to evaluate the prevalence and related risk factors of OMDs among residents in Baoshan District of Shanghai and provide a scientific basis for prevention and control strategies.

Methods: Oral Assessment Form, WHO and oral examinations were conducted in Baoshan District of Shanghai selected by cluster sampling, 653 residents aged from 17 to 92 years old were investigated. Four years later follow-up. X2 test was used to compare the rates. Logistic regression analysis was used to detect the risk factors.

Results: The prevalence rate of OMDs was 9.04-9.56% (2014-2018). The most common OMDs were atrophic glossitis (1.84%), recurrent aphthous ulcer (RAU, 1.68%), burning month syndrome (BMS, 1.38%), oral lichen planus (OLP, 1.23%), traumatic ulcers (1.23%). The prevalence of RAU and BMS in different age groups was significantly different. Tobacco and alcohol use and psychological factor in OMDs group were higher than the no-OMDs group. System disease including diabetes mellitus (DM) was relevant to OLP.

Conclusion: Age, tobacco and alcohol use, and psychological factor correlated with the occurrence and development of OMDs, and they should be the focus of primary prevention. General epidemiological studies suggested that OLP was closely related to DM.

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The Prevalence and Related Risk Factors of Oral Mucosa Diseases among Residents in Baoshan District of Shanghai

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Disclosure

The author reports no conflicts of interest in this work.

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34 were investigated. Four years later follow-up. X^2 test was used to compare the rates. Logistic

35 regression analysis was used to detect the risk factors.

36 **Results:**   The prevalence rate of OMDs was 9.04-9.56% (2014-2018). The most common

37 OMDs were atrophic glossitis (1.84%), recurrent aphthous ulcer (RAU, 1.68%), burning month

38 syndrome (BMS, 1.38%), oral lichen planus (OLP, 1.23%), traumatic ulcers (1.23%). The

39 prevalence of RAU and BMS in different age groups was significantly different. Tobacco and

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42 **Conclusion:**   Age, tobacco and alcohol use, and psychological factor correlated with the

43 occurrence and development of OMDs, and they should be the focus of primary prevention.

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45

46 **Keywords:**   Oral mucosal diseases, Epidemiology investigation, Prevalence rate, Risk

47 factors, Oral lichen planus, Diabetes mellitus

48

49

Introduction:

Oral mucosal diseases (OMDs) occur in the oral mucosa and soft tissues and are related to general health (Porter et al., 2017). The kinds of OMDs are various; The etiology is unknown, the course of disease is difficult to cure, easy to relapse, and is closely related to systemic diseases and physical and mental. Some diseases have potential malignancies that seriously affect quality of life and even are fatal. Oral Potentially Malignant Disorders (OPMDs) refers to diseases that may cause oral cancer (Wang et al., 2014; Dionne et al., 2015). OLP is the most common clinical OPMDs, with a cancerous rate of 0% to 12% (van der Meij et al., 2003). Oral leukoplakia (OLK) is the most important OPMDs, with a cancerous rate of 10-30% and an average cancerous time of 4-8.1 years (Petti, 2003; Warnakulasuriya et al., 2011). Oral erythroplakia (OE) is the most cancer-prone OPMDs, with a cancer rate as high as 50% (Villa et al., 2011).

Most of the causes of OPMDs are complex, and their pathogenesis and cancerous mechanism are unclear. Generally, there are no specific treatments and no effective chemical prophylaxis drugs for cancer (Ribeiro et al., 2010; van Monsjou et al., 2013). Poor prognosis of OPMDs and the condition of multiple and recurrent cancers can cause great physical and mental pain to patients. Early diagnosis of OPMDs with high risk of cancer is of great significance for the prevention of oral malignant tumors (McCullough et al., 2010; Amagasa et al., 2011).

As global megacity, Shanghai has a population of more than 24 million. Therefore, it is of great significance to understand the epidemiological characteristics of OMDs and analyze the risk factors associated with diseases. So as to early prevention and treatment of OMDs, early detection of high-risk groups of oral cancer, and improve people's quality of life.

The prevalence of OMDs was studied in a cross-sectional study using general epidemiology. The subjects were selected from the general population or oral outpatients. The former is a large sample survey of oral mucosal diseases in the population (current situation survey), and there are few data reports at present. In the recent 30 years, the epidemiological investigations of OMDs are mostly based on the investigation and analysis of clinical data of

77   patients, or case-control studies (Ikeda et al., 1995; Mumcu et al., 2005; Splieth et al., 2007;

78   Pentenero et al., 2008; Mansour Ghanaei et al., 2013; Do et al., 2014).

79   Because of the low incidence of OMDs and large sample size in the survey, it is

80   necessary to have professional theoretical knowledge and sufficient clinical experience in order

81   to make an accurate diagnosis. Little work has been done in the epidemiology of OMDs,

82   especially descriptive epidemiology. However, most are investigations of specific age groups or

83   special diseases (Xu et al., 1981; Qi, 2008). Work stress, mental stress, environmental changes,

84   dietary changes and accelerated life rhythms will inevitably lead to some changes in the

85   prevalence of OMDs.

86   In this study, the epidemiological characteristics of oral mucosal diseases in Baoshan

87   district of Shanghai were studied, and the risk factors of the diseases were analyzed, so as to

88   understand the incidence rate and epidemic characteristics of oral mucosal diseases in Baoshan

89   district of Shanghai, and provide scientific basis for the prevention and treatment of oral mucosal

90   diseases.

91

92   **Materials and Methods:**

93   *Research Objectives*

94   We used the ways of multistage stratified random sampling and field survey to investigate the

95   samples at the year of 2014 in Baoshan district of Shanghai. The long-term effects of persistent

96   risk factors on the disease of the same patient were analyzed by longitudinal observation of the

97   same group of community residents during a follow-up period of 4 years.

98   *Questionnaire design and Oral mucosa examination*

99   Informed consent was obtained prior to the initiation of the examination. Prior to the study,

100 inspectors were trained and calibrated to ensure uniform interpretation of the guidelines for

101 observation and documentation of various mucosal diseases.

102 Our survey form was prepared according to the oral health assessment form of WHO (2013)

103 (World Health Organization, 2013). It was used in this study to evaluate oral mucosa. The

104 questionnaire includes demographics (name, gender, age, nationality, place of birth, length of

105 residence in Shanghai, education level, marital status, occupation, etc.), smoking, drinking

106 habits, eating habits, health status (systemic disease, heredity), and mental status (stress,

107 anxiety).

108 According to WHO, when performing oral mucosa examination, the intraoral and perioral

109 mucosa and soft tissue should be examined for each subject. The examination should be

110 comprehensive and systematic, in order of lip, corner of mouth, cheek, tongue, bottom of mouth,

111 hard and soft palate, alveolar ridge and gingiva.

112 ***Statistical methods:***

113 All data were statistically analyzed using SPSS 25.0 software package (Chicago, IL, USA). The

114 data were input computer by two persons (two copies) to describe and analyze the data of the

115 general population, gender and age stratification. X^2 test was used to compare the rates. Logistic

116 regression analysis was used to detect the correlation between disease and risk factors when

117 making statistics of binary variables such as risk factors related to OMDs. Results were

118 considered significant if $P < 0.05$.

119

120 **Results:**

121 ***Information of investigative patients***

122 The residents were 653 samples (male 337, female 316). The investigative patients' education

123 condition was the level of middle-high school. Most of them were retiring and white-collar

124 person. The average age was 66.05 (17-92) years old.

125   The community surveyed in this survey is relatively mature, with an ageing population

126 composition, which is representative of the local community to a certain extent. A total of 653

127 permanent residents were surveyed in 2014, including 337 males and 316 females. The 2018

128 follow-up population was 607, including 311 men and 296 women.

129   The education levels of the test subjects were mainly middle school (and below) level,

130   mostly retired people. The average age of the respondents in 2014 was 66.05 years old (17-92

131   years old), and the average age in 2018 was 67.38 years old (18-91 years old).

132   ***Prevalence of OMDs***

133   In the first survey in 2014, a total of 59 people (9.04%) had OMDs, which contained 12 cases of

134   atrophic glossitis (1.84%), 11 cases of recurrent aphthous ulcer (RAU) (1.68%), 9 cases of

135   Burning Mouth Syndrome (BMS) (1.38%), 8 cases of OLP (1.23%), 8 cases of traumatic ulcer

136   (1.23%), 6 cases of furrowed tongue (0.92%), 3 cases of geographic tongue (0.46%), 1 case of

137   cheilitis (0.15%), 1 case of angular cheilitis (0.15%), and 1 case of leukoplakia (0.15%). The

138   result showed that OMDs were easily local in tongue back, buccal mucosa, labial mucosa and

139   gingival.

140   In 2018, 46 people lost to follow-up (41 normal residents lost to follow-up, 5 mucous

141   membrane patients lost to follow-up, 10 cases of decrease and 9 cases of new). In 2018, 58 cases

142   (9.56%) had mucous membrane disease, as follows: 11 cases of atrophic glossitis (1 case lost,

143   without new), 9 cases of RAU (2 cases lost, without new), 7 cases with furrowed tongue (no loss

144   of follow-up, 1 case of new), 9 cases of OLP (no loss of follow-up, 1 case with DM of new), 7

145   cases of traumatic ulcer (no loss of follow-up, 8 cases of decrease, 7 cases of new), 1 case of

146   geographic tongue (1 case of loss of follow-up, 1 case of reduction). One case each of cheilitis,

147   angular cheilitis and leukoplakia (no loss, no increase, no decrease).

148   ***Distribution condition of various diseases in male and female in 2014***

149   The prevalence rate of female was higher than male's in case of OLP, but there was no statistical

150   significance between male and female in different OMDs (P＞0.05), as could be observed in

151   Figure 1.

152   ***Distribution condition of various diseases in different ages of residents in 2014***

153   The cases of RAU and BMS were statistical significance in different ages of residents. The

154   prevalence of RAU in the 15-29 years old group and the 30-39 years old group was significantly

155   higher than that in other high age groups (50-59, 60-69, 70-79) (P<0.01), but there was no

156   significant difference between the two groups (P>0.05). BMS was detected more frequently in

157   people over 40 years old, and the prevalence increased with age and was significantly higher in

158   the 70-79 group than in the 40-49 group (P<0.01). OLP was detected in the population over 40

159   years old, and there was no significant difference among age groups (Figure 2).

160   ***Effect of living habits on OMDs in 2014***

161   Respondents generally were light diet. There were 107 (16.39%) people who persisted smoking

162   for over three years. There were 93 (14.24%) people who persisted drinking (millet wine and

163   beer). The rate of smoking (p=0.01) and drink (p=0.00003) in OMDs persons were higher

164   compared with no OMDs persons (Figure 3).

165   ***Effect of mental state on OMDs in 2014***

166   Our survey showed that 87 people were mental anxiety and 24 people felt higher stress in life

167   (p=0. 0002). The OMDs person were a higher rate of anxious emotion compared with no OMDs

168   person (p=0. 903) (Figure 4), and it included 97.5% nice family relationship, 28.1% no friends.

169   36.8% low frequency on interpersonal communication. The 96.2% of respondents didn't have

170   any unfortunate life events in past 12 months.

171   ***Analysis of risk factors related to OMDs in 2014***

172   This survey found that there was no significant difference in the prevalence of OMDs between

173   men and women in the population of Baoshan, Shanghai. Meanwhile, it showed that the

174   occurrence of OMDs was positively correlated with the increase of age, and the prevalence of

175   OMDs increased with the increase of age among residents. The incidence of atrophic glossitis,

176   RAU, BMS and OLP were higher.

177   The study also found that smoking, drinking and mental anxiety in OMDs population

178   were significantly higher than the healthy population, but there were no statistical differences.

179   Systemic diseases such as cardiovascular and cerebrovascular hypertension (P=0.025), metabolic

180   diseases diabetes (P=0.028) were closely related to OMDs. Due to a large number of subjects in

181   the elderly, the investigation group considered that the proportion of dental caries and removable

182   denture in this group was high, and the prevalence of traumatic ulcer would increase

183   correspondingly (table 1).

184   ***Analysis of risk factors related to OLP in 2014***

185   OLP was more common in the elderly aged 40-60 years, with more females than males. In this

186   study, OLP mostly occurred in the buccal region. The cause of OLP is complex, and the exact

187   cause is still unknown. The world health organization defines OLP as a potentially malignant

188   disease of the oral mucosa.

189   Currently, there is no specific treatment for OLP in clinical practice, and the condition is

190   often recited, delayed and cured, and the course of the disease is long. OLP has the risk of

191   cancer, which has a vital impact on patients' life and psychology. The results of the general

192   epidemiological investigation showed that there were 8 community residents (1.23%) with OLP,

193   2 males and 6 females. The male to female ratio was 1:3. OLP was significantly associated with

194   age, smoking, and diabetes mellitus ($p<0.01$) (table 2).

195

196   **Discussion:**

197   In this survey, we discovered that the prevalence rate was 9.04% (2014) - 9.56% (2018). The

198   incidence of atrophic glossitis, RAU, BMS and OLP were higher. The survey of Guoqi Xu (Xu

199   et al., 1981) showed that the prevalence rate was 14.93% on OMDs at 1978 in Shanghai. The

200   Hongkang Cao (Cao et al., 1988) discovered that the prevalence rate of OMDs condition was

201   29.3% on over 60 age elderly in Shanghai. A large-scale epidemiological investigation of

202   Zengtong Zhou (Feng et al., 2015) found that the prevalence of OMDs was 10.8%, which was

203   conducted among 11,054 people in Shanghai in 2012.The work pressure, mental pressure,

204   environmental changes, changes in diet structure, and accelerated the pace of life is bound to

205   lead to increasing OMDs condition.

206   In our study, OMDs were positively correlated with age, and the prevalence increased

207   with age. Therefore, preventive measures of different ages should be taken. Atrophic glossitis

208   occurred mainly in the elderly over 60 years of age in our study, which was consistent with its

209 etiology: chronic anemia, lack of nicotinic acid, Sjogren's syndrome and Candida infection.

210 Among young people aged around 30 and in middle age, there has been a significant increase in

211 the incidence of RAU, with more female patients than male patients. OLP and BMS occurred in

212 older people aged 40-60, and more women than men were ill.

213   In 2014, 8 residents with traumatic ulcers were informed of the treatment at the time of

214 the first transfer. During the 2018 follow-up, all 8 patients dealt with trauma factors and their

215 ulcers had disappeared. It indicated that the community epidemiological survey had diagnostic

216 and popular science functions that contribute to early treatment of residents and reduce cancer

217 risk to the limits of the possibility that ulcers might occur for a long period of time without

218 treatment. It indicated that early prevention and control of mucosal diseases was of great

219 significance. In addition, 7 new cases of traumatic ulcer found in the current investigation were

220 informed of the hazards and treatments one by one, which was considered to be a good

221 demonstration. Many of the interviewees were elderly people with high rates of dental caries and

222 periodontitis. The elderly lacked the awareness to treat dental caries and keep dentures. As a

223 result, the detection rate of traumatic ulcers increased accordingly. In particular, most of the

224 cases occurred in the denture base covering the gums and palate areas. Glossy traumatic ulcers

225 were associated with residual roots and crowns. With the continuous improvement of living

226 standards, the rate of visits to traumatic ulcers gradually increased.

227   Our study showed that OMDs patients who smoke, drink and anxiety were higher than

228 those who were healthy. Plenty of studies have confirmed that tobacco and alcohol are closely

229 related to OMDs and are risk factors for OMDs (Shulman et al., 2004; Dundar & Ilhan Kal,

230 2007; Pentenero et al., 2008; Mohamed & Janakiram, 2014). In past surveys, the incidence of

231 BMS was extremely low and rarely detected. However, the survey found that the incidence of

232 BMS increased, middle-aged and old women in perimenopausal and postmenopausal occurrence,

233 accompanied by obvious changes in psychological and mental state. Might be due to the gradual

234 acceleration of the pace of life in recent years, psychological problems increased year by year.

235 The causes of many diseases, especially chronic diseases, are no longer a simple biological

236 factor, but also include many social, environmental and psychological factors. Alcohol, tobacco,

237 stimulation and mental factors associated with the occurrence and development of oral mucosal

238 diseases should be the focus of primary prevention (O'Sullivan, 2011; Mendes et al., 2012).

239   It is noteworthy that the follow-up observations of community residents after 4 years with

240 OMDs suggested that systemic metabolic diseases such as DM were closely related to OPMDs

241 such as OLP, which is consistent with the results of large-scale oral health epidemiological

242 investigation which we participated in the 2012 in shanghai (Feng et al., 2015). OMDs are vital

243 components of oral diseases, many types and complexities, the prevention and control of OMDs

244 was difficult. At present, the prevention and treatment of OMDs is still the main body of three-

245 level prevention of disease.

246

Conclusion:

248 Therefore, it is imperative to transfer the prevention nodes of OMDs to primary level and level

249 two prevention. Early prevention and control of mucosal disease is of great significance. It is

250 necessary to understand the prevalence of OMDs among Shanghai residents, to carry out

251 effective intervention activities from the aspects of health education, policy formulation and the

252 creation of supportive environment, to reduce the related risk factors, to promote the health of

253 oral mucosa and to improve the quality of life of the masses.

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270

271   **References:**

272   Amagasa T, Yamashiro M, Uzawa N. 2011. Oral premalignant lesions: from a clinical

273   perspective. *International Journal of Clinical Oncology* 16:5-14 DOI: 10.1007/s10147-

274   010-0157-3.

275   Cao HK, Le FY, Chen JH, Lu H, Shi HB, Shen ZY, Hu HF, Jin WC, Hu LY, Tang GY, Chen

276   YP. 1988. Epidemiological study on oral mucosal diseases of 3,091 elderly people in

277   Shanghai. *Oral Medicine* 8:169-171.

278   Dionne KR, Warnakulasuriya S, Zain RB, Cheong SC. 2015. Potentially malignant disorders of

279   the oral cavity: current practice and future directions in the clinic and laboratory.

280   *International Journal of Cancer* 136:503-515 DOI: 10.1002/ijc.28754.

281   Do LG, Spencer AJ, Dost F, Farah CS. 2014. Oral mucosal lesions: findings from the Australian

282   National Survey of Adult Oral Health. *Australian Dental Journal* 59:114-120 DOI:

283   10.1111/adj.12143.

284   Dundar N, Ilhan Kal B. 2007. Oral mucosal conditions and risk factors among elderly in a

285   Turkish school of dentistry. *Gerontology* 53:165-172 DOI: 10.1159/000098415.

286   Feng J, Zhou Z, Shen X, Wang Y, Shi L, Hu Y, Sun H, Liu W. 2015. Prevalence and distribution

287   of oral mucosal lesions: a cross-sectional study in Shanghai, China. *Journal of Oral*

288   *Pathology & Medicine* 44:490-494 DOI: 10.1111/jop.12264.

289   Ikeda N, Handa Y, Khim SP, Durward C, Axell T, Mizuno T, Fukano H, Kawai T. 1995.

290   Prevalence study of oral mucosal lesions in a selected Cambodian population. *Community*

291   *Dentistry and Oral Epidemiology* 23:49-54.

292   Mansour Ghanaei F, Joukar F, Rabiei M, Dadashzadeh A, Kord Valeshabad A. 2013. Prevalence

293   of oral mucosal lesions in an adult Iranian population. *Iranian Red Crescent Medical*

294   *Journal* 15:600-604 DOI: 10.5812/ircmj.4608.

295   McCullough MJ, Prasad G, Farah CS. 2010. Oral mucosal malignancy and potentially malignant

296   lesions: an update on the epidemiology, risk factors, diagnosis and management.

297   *Australian Dental Journal* 55 Suppl 1:61-65 DOI: 10.1111/j.1834-7819.2010.01200.x.

298   Mendes DC, Poswar Fde O, de Oliveira MV, Haikal DS, da Silveira MF, Martins AM, De Paula

299   AM. 2012. Analysis of socio-demographic and systemic health factors and the normative

300   conditions of oral health care in a population of the Brazilian elderly. *Gerodontology*

301   29:e206-214 DOI: 10.1111/j.1741-2358.2010.00446.x.

302   Mohamed S, Janakiram C. 2014. Recurrent aphthous ulcers among tobacco users- hospital based

303   study. *Journal of Clinical & Diagnostic Research* 8:ZC64-LC66 DOI:

304   10.7860/JCDR/2014/10368.5145.

305   Mumcu G, Cimilli H, Sur H, Hayran O, Atalay T. 2005. Prevalence and distribution of oral

306   lesions: a cross-sectional study in Turkey. *Oral Diseases* 11:81-87 DOI: 10.1111/j.1601-

307   0825.2004.01062.x.

308   O'Sullivan EM. 2011. Prevalence of oral mucosal abnormalities in addiction treatment centre

309   residents in Southern Ireland. *Oral Oncology* 47:395-399 DOI:

310   10.1016/j.oraloncology.2011.03.003.

311 Pentenero M, Broccoletti R, Carbone M, Conrotto D, Gandolfo S. 2008. The prevalence of oral
312   mucosal lesions in adults from the Turin area. *Oral Diseases* 14:356-366 DOI:
313   10.1111/j.1601-0825.2007.01391.x.

314 Petti S. 2003. Pooled estimate of world leukoplakia prevalence: a systematic review. *Oral*
315   *Oncology* 39:770-780.

316 Porter SR, Mercadante V, Fedele S. 2017. Oral manifestations of systemic disease. *British*
317   *Dental Journal* 223:683-691 DOI: 10.1038/sj.bdj.2017.884.

318 Qi XQ. 2008. *Report of Third National Survey of Oral Health Status in China*. Beijing: People's
319   Medical Publishing House.

320 Ribeiro AS, Salles PR, da Silva TA, Mesquita RA. 2010. A review of the nonsurgical treatment
321   of oral leukoplakia. *International Journal of Dentistry* 2010:186018 DOI:
322   10.1155/2010/186018.

323 Shulman JD, Beach MM, Rivera-Hidalgo F. 2004. The prevalence of oral mucosal lesions in
324   U.S. adults: data from the Third National Health and Nutrition Examination Survey,
325   1988-1994. *Journal of the American Dental Association* 135:1279-1286.

326 Splieth CH, Sumnig W, Bessel F, John U, Kocher T. 2007. Prevalence of oral mucosal lesions in
327   a representative population. *Quintessence International* 38:23-29.

328 van der Meij EH, Schepman KP, van der Waal I. 2003. The possible premalignant character of
329   oral lichen planus and oral lichenoid lesions: a prospective study. *Oral Surgery, Oral*
330   *Medicine, Oral Pathology, Oral Radiology and Endodontics* 96:164-171 DOI:
331   10.1016/S1079210403003056.

332 van Monsjou HS, Wreesmann VB, van den Brekel MW, Balm AJ. 2013. Head and neck
333   squamous cell carcinoma in young patients. *Oral Oncology* 49:1097-1102 DOI:
334   10.1016/j.oraloncology.2013.09.001.

335 Villa A, Villa C, Abati S. 2011. Oral cancer and oral erythroplakia: an update and implication for
336   clinicians. *Australian Dental Journal* 56:253-256 DOI: 10.1111/j.1834-
337   7819.2011.01337.x.

338   Wang YY, Tail YH, Wang WC, Chen CY, Kao YH, Chen YK, Chen CH. 2014. Malignant

339   transformation in 5071 southern Taiwanese patients with potentially malignant oral

340   mucosal disorders. *BMC Oral Health* 14:99 DOI: 10.1186/1472-6831-14-99.

341   Warnakulasuriya S, Kovacevic T, Madden P, Coupland VH, Sperandio M, Odell E, Moller H.

342   2011. Factors predicting malignant transformation in oral potentially malignant disorders

343   among patients accrued over a 10-year period in South East England. *Journal of Oral*

344   *Pathology & Medicine* 40:677-683 DOI: 10.1111/j.1600-0714.2011.01054.x.

345   World Health Organization. 2013. *Oral health surveys: basic methods*. Geneva: WHO Press.

346   Xu GQ, Shi HB, Qiu XY, Tang H. 1981. A report on oral mucosal diseases in 18,769 Shanghai

347   residents. *Stomatology* 1:26-29.

348

349   **Figure Legends**

350   **Figure 1.** Prevalence distribution of different types of OMDs among residents of different

351   genders.

352   **Figure 2.** Prevalence of different types of OMDs in residents of different age groups (disease

353   prevalence trend of residents of different ages.

354   **Figure 3.** Risk factors of oral mucosal disease in community residents - smoking and drinking

355   habits.

356   **Figure 4.** Influence of mental state on OMDs of community residents.

357   **Table 1.** Analysis of risk factors for OMDs

358   **Table 2.** Analysis of risk factors for OLP

359

Table 1. Analysis of risk factors for OMDs

* univariate logistic regression

** multivariate logistic regression

1 **Table 1.** Analysis of risk factors for OMDs

☐	variable	case	control	Unadjusted OR* (OR 95%CI)	p value*	Unadjusted OR** (OR 95%CI)	p value**
age	≥60	34(6.4)	495(93.6)	0.893(0.113-7.03)	0.914		
	40-59	5(7.4)	63(92.6)	1.032(0.111-9.581)	0,978		
	＜40	1(7.1)	13(92.9)	1			
smoking	yes	5(7.0)	66(93.0)	1.107(0.417-2.934)	0.839		
	ex	2(8.0)	23(92.0)	1.27(0.287-5.62)	0.753		
	no	33(6.40)	482(93.6)	1			
drink	yes	3(4.7)	61(95.3)	0.666(0.199-2.225)	0.509		
	ex	0(0.0)	9(100.0)	0(0)	0.999		
	no	37(6.9)	501(93.1)	1			
hypertension	yes	14(4.7)	287(95.3)	0.533(0.273-1.041)	0.066	0.45(0.224-0.906)	0.025
	no	26(8.4)	284(91.6)	1			
diabetes	yes	10(10.5)	85(89.5)	1.906(0.899-4.042)	0.093	2.41(1.098-5.294)	0.028
mellitus	no	30(5.8)	486(94.2)	1			
coronary heart	yes	4(5.2)	73(94.8)	0.758(0.262-2.192)	0.609		
disease	no	36(6.7)	498(93.3)	1			
cerebrovascular	yes	3(8.8)	31(91.2)	1.412(0.412-4.837)	0.582		
disease	no	37(6.4)	540(93.6)	1			

2 * univariate logistic regression

3 ** multivariate logistic regression

Table 2. Analysis of risk factors for OLP

*□□□□□□□

**□□□□□□□

1 **Table 2.** Analysis of risk factors for OLP

	variable	case	control	Unadjusted OR* (OR 95%CI)	p value*	Unadjusted OR** (OR 95%CI)	p value**
age	≥60	5(0.9)	524(99.1)	0.124(0.014-1.138)	0.065	0.030(0.002-0.396)	0.008
	40-59	3(4.4)	65(95.6)	0.6(0.058-6.230)	0.669	0.286(0.022-3.717)	0.339
	＜40	1(7.1)	13(92.9)	1			
smoking	yes	3(4.2)	68(95.8)	4.5(1.052-19.252)	0.043	8.732(1.773-43.013)	0.008
	ex	1(4)	24(96)	4.25(0.478-37.812)	0.194	4.497(0.368-55.002)	0.239
	no	5(1)	510(99)	1			
drink	yes	2(3.1)	62(96.9)	2.447(0.497-12.04)	0.271		
	ex	0(0)	9(100)	0(0)	0		
	no	7(1.3)	531(98.7)	1			
hypertension	yes	6(1.9)	304(98.1)	0.51(0.126-2.058)	0.344		
	no	3(1)	298(99)	1			
diabetes	yes	5(5.3)	90(94.7)	7.111(1.874-26.988)	0.004	14.083(2.958-67.05)	0.001
mellitus	no	4(0.8)	512(99.2)	1		1	
coronary heart	yes	1(1.3)	76(98.7)	0.865(0.107-7.014)	0.892		
disease	no	8(1.5)	526(98.5)	1			
cerebrovascular	yes	1(2.9)	33(97.1)	2.155(0.262-17.747)	0.475		
disease	no	8(1.4)	526(98.6)	1	□	□	□

2 * univariate logistic regression
3 ** multivariate logistic regression

Figure 1

Figure 1. Prevalence distribution of different types of OMDs among residents of different genders.
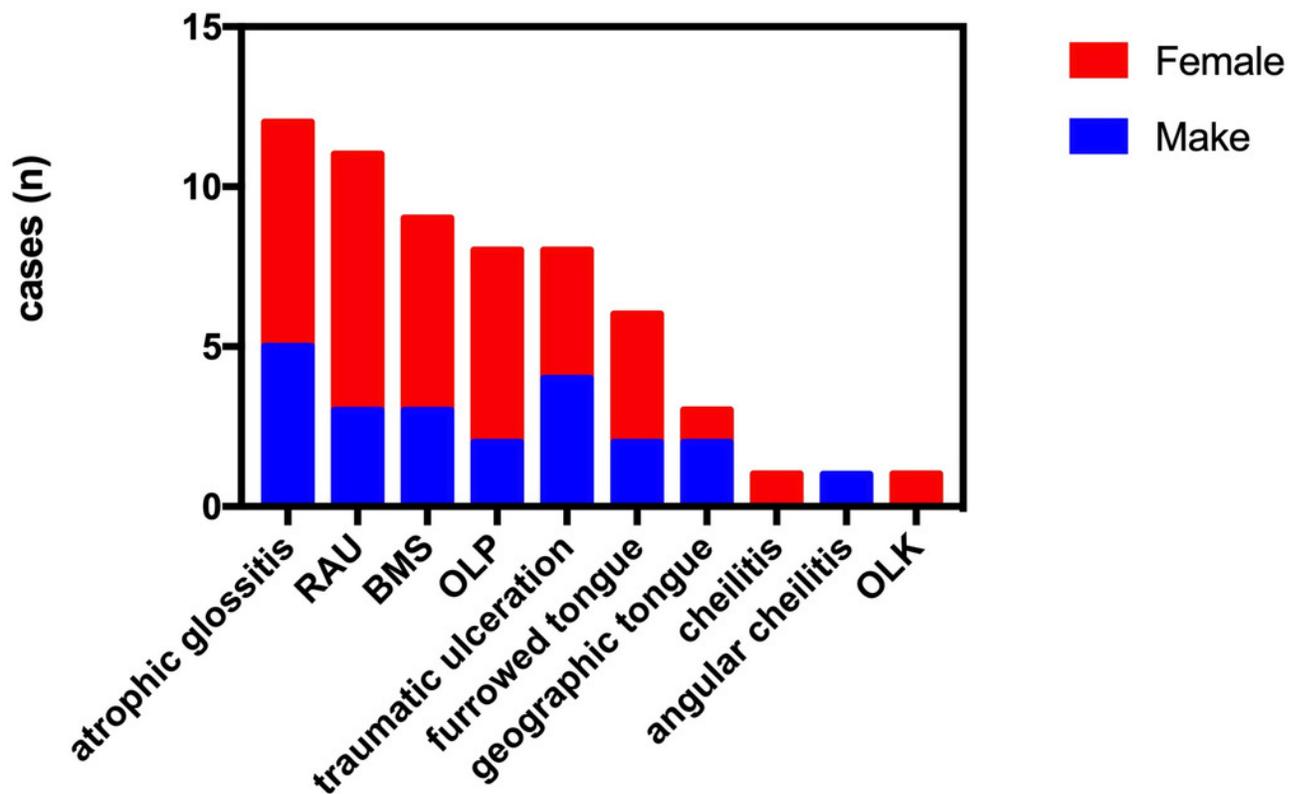
Figure 2

Figure 2. Prevalence of different types of OMDs in residents of different age groups (disease prevalence trend of residents of different ages.
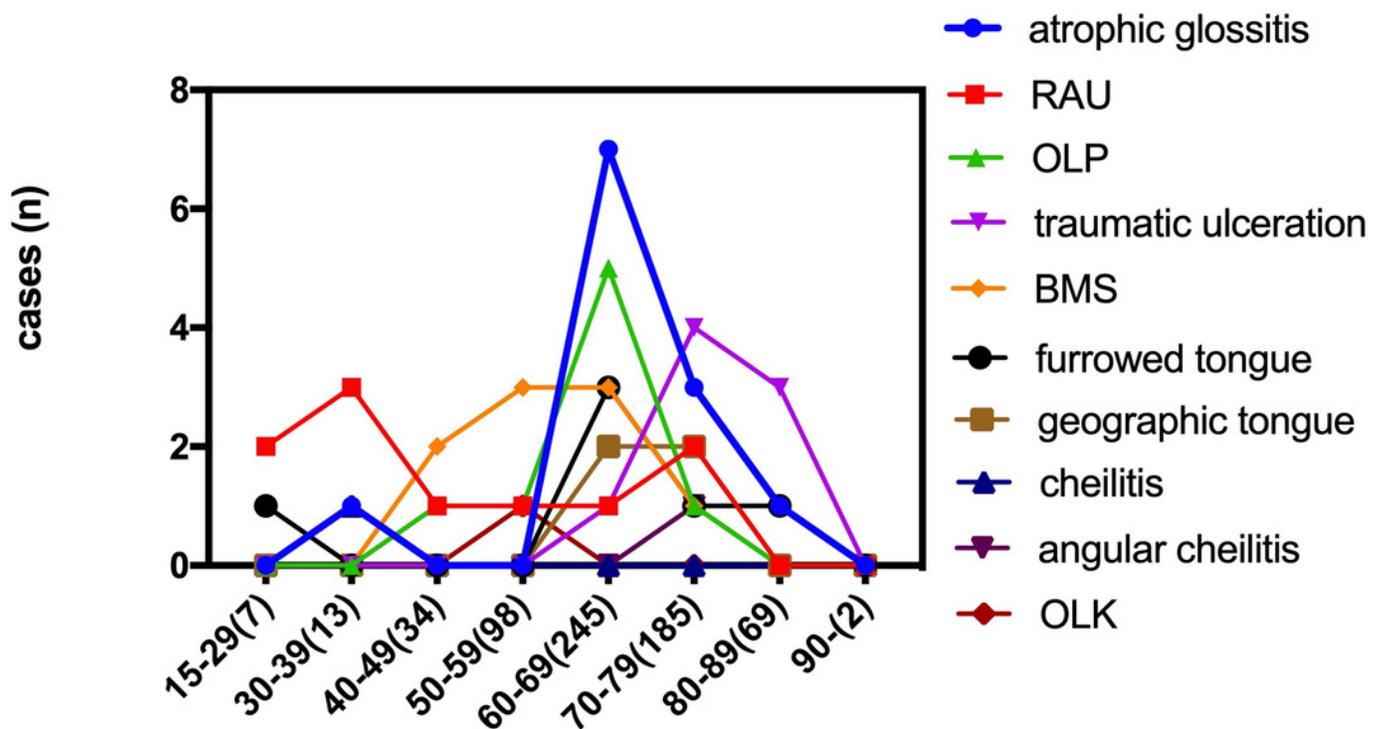
Figure 3

Figure 3. Risk factors of oral mucosal disease in community residents - smoking and drinking habits.
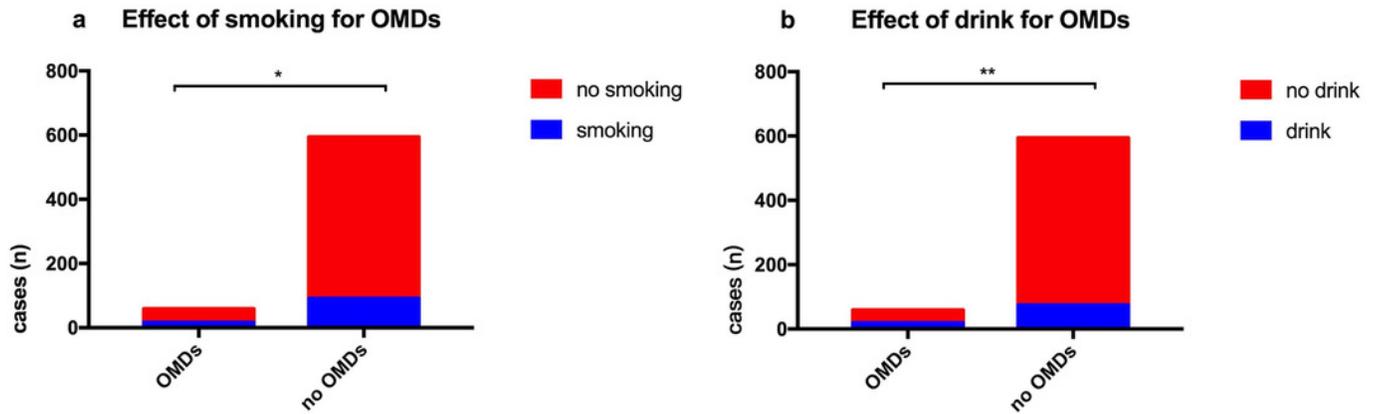
Figure 4

Figure 4. Influence of mental state on OMDs of community residents.