The profile of Oral Health Branch of Rafsanjan Cohort Study (OHBRCS) in Rafsanjan City, southeast of Iran

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ABSTRACT

Oral health status can be affected by some factors including drug abuse, systemic conditions and environmental pollutants. The present study was designed to investigate the most important and prevalent dental and oral conditions in adult population of Rafsanjan with the age of 35–70 years. Dental and oral health cohort center as part of the Rafsanjan Cohort Study (RCS) included in the prospective epidemiological research studies in IrAN was established in 2015. Of 9991 subjects enrolled in the RCS, 8682 people participated in the Oral Health Branch of Rafsanjan Cohort Study (OHBRCS).

The OHBRCS included 4021 men and 4661 women with the mean age of 49.94 ± 9.51. The most prevalent of oral lesion in total population was candidiasis and the least was aphthous lesion. The prevalence of candidiasis, white and red lesions, periodontal pocket, dental calculus, CAL and the mean of DMFT were higher in the male group than that of female group (p < 0.05). Candidiasis, herpes, oral cancer, white and red lesions were more prevalent in the older age groups (p < 0.05). The mean of DMFT index in total population was 21.30 and was higher among opium users, men and older age (p < 0.05). Also, the opium users had a higher rate of CAL, periodontal pocket, red and white lesions, and candidiasis but a lower rate of BOP (p < 0.05). Younger people had more decayed and filling teeth compared to other age groups, whereas older people had more missing teeth and a higher DMFT index (p < 0.001).

1. Introduction

Oral health problems are still counted as a crucial public health issue despite being preventable. Oral health status can be affected by some factors including; drug abuse, opioids, smoking alcohol (Kalbassi et al., 2018) and environmental pollutants such as pesticides and heavy metals (Shiue, 2015) and systemic conditions such as obesity, hypertension and diabetes (Chomkhakhai et al., 2009). Almost 3.5 billion people of all ages throughout the world are affected by oral diseases (Kassebaum et al., 2017). People at young ages are not the only group at risk for oral diseases. Untreated dental caries and also periodontal diseases are main causes of tooth loss among older adults with unfavorable impacts on chewing and communication (Benjamin, 2010; Naorungroj and Thitasomakul, 2020).

A national survey revealed an increased trend in periodontal and dental problems in comparison with previous studies (Khoshnevisan et al., 2018). The prevalence of periodontal diseases is estimated to be 20–50 % globally (Sanz et al., 2010); and the figures in Iran has been reported to be 30 % and 53 % in adolescents and adults, respectively which are relatively high (Nazir et al., 2020). There are studies indicating that 19.4 % of Iranian adult people have had oral mucosal lesions (Ghanaei et al., 2013).

Rafsanjan, located in the northwest of Kerman province, Iran, is the second biggest city of the province and its population is more than 160.000. Having the world's largest artificial pistachio jungle and the world's second largest copper mine has made it environmentally prominent (Hakimi et al., 2020). Furthermore, Kerman is located near opium trafficking rout and based on a study conducted in 2005, the frequency of opium abuse was reported 17.1 % (Ziaaddini and Ziaaddini, 2005). From the best of our knowledge, there are a limited number of studies in the field of oral health in Rafsanjan City and the present work is the first comprehensive study conducted in this city (covering a wide range of age group from new born to 70 years old) (Sadeghi and Roberts, 2016; Shakerian et al., 2016).

While most oral health studies have focused on dental caries and periodontal problems; oral mucosal lesions have not received a lot of attention. Moreover, no comprehensive study that prospectively examined the mutual relationship between oral diseases and systemic diseases was found by researchers. Therefore, considering the importance of the issue and existing several cohort studies of different aspects in Rafsanjan including adult's non-communicable diseases, birth (mother and child), youth, occupational and particularly Oral Health cohort studies, the present study was designed to investigate the most important and prevalent dental and oral conditions in adult population of Rafsanjan City with the age of 35–70 years old.

2. Methods

2.1. Study design and main objectives

Rafsanjan Cohort Study (RCS), as one of the 19 geographically district areas of Iran included in the Prospective Epidemiological Research Studies in IrAN (PERSIAN) (Poustchi et al., 2018) was launched in 2015; and is comprised of five parallel prospective studies: Adult, Youth, Birth, Occupational and Oral Health Branch of Rafsanjan Cohort Study (OHBRCS). Adult RCS was designed to recruit a total of 10,000 participants of both genders aged 35–70 years. Individuals were randomly selected by systematic clustering based on household number until the target sample size was reached. A total number of 9991 individuals willingly participated in the baseline phase of RCS. The details of the RCS profile have been published previously (Hakimi et al., 2020). Adult RCS was followed by youth (3000 individuals, aged 15–35), Birth (870 pregnant women and their infants) and Occupational (2000 participants, aged 25–65). As part of the RCS, dental and oral health cohort center was also established aiming to investigate the most important aspects of dental and oral health of the participants. This is a unique characteristic of the RCS as none of the other areas of the PERSIAN are involved in this study. The main objectives of the present prospective study were as follows:

- To investigate the prevalence, incidence and progression of oral diseases
- To determine the pattern and rate of progression of periodontal disease after a 5-year follow-up
- To investigate the risk factors associated with oral disease and complications
- To determine the value of the DMFT (Decay, Missing and filled teeth) index in the study population
- To establish the association between oral health status and systemic diseases

2.2. Recruitment and data collection

The recruitment procedure of RCS has been described in detail previously (Hakimi et al., 2020); The recruitment phase of the adult, youth and occupational cohorts is already completed and the follow-up phase is undergoing, whereas birth cohort recruitment is in progress. All recruited individuals of the RCS were also invited to participate in the OHBRCS. Finally, a total of 8682 participants of the RCS were included in the OHBRCS.

The interview and dental and oral examinations were undertaken by trained oral health professionals at the main center of the RCS where other cohort studies are conducted. Table 1 represents the main categories and subcategories of data collected via questionnaires. The general questionnaire was contained sociodemographic data, medical history, and personal habits. Oral health questionnaire was included factors related to oral health, oral hygiene, oral diseases and dental examination (Table 1).

The clinical oral examination via visual and dental probes included determination of the following items:

1- DMFT using WHO two-side Probe (dental sound).
2- Periodontal status by Michigan-O Probe.

All RCS stages were performed in accordance with the PERSIAN protocols (Poustchi et al., 2018). The quality control and quality assurance measures taken by RCS have been previously published (Hakimi et al., 2020). Additionally, quality control procedures in dental cohort were conducted. Several pre- designed training workshops were

Table 1
Categories of topics in the dental and oral questionnaire in the baseline phase of the Oral Health Branch of Rafsanjan Cohort Study (OHBRCS) launched in 2015 (n = 8682).

General questionnaire	Personal information, socioeconomic information, marital status, educational level, occupation status, lifestyle, personal habits, past medical history.
Oral health determinants	
Factors related to oral health	Oral hygiene, problems related to oral health, reason for dental extraction, last dental visit and access to oral health services, teeth cleaning method, frequency and duration, smoking
Dental examination	Caries, need for dental caries treatment, periodontal index, periodontal attachment loss, use of dental prosthesis, calculus, gingival recession, fissured tongue, geographic tongue, DMFT (Decayed teeth, Missing teeth, Filled permanent teeth)
Diseases of oral cavity	Gingivitis and periodontitis based on clinical examination including (bleeding on probing, clinical attachment loss, and pocket depth), malignant tumor (oral cancer), leukoplakia, wounds, herpes, Acute necrotizing ulcerative gingivitis (ANUG), candidiasis, aphthous stomatitis, abscess, white lesions, red lesions, exophytic lesions, pigmentation lesions

held to improve the intra-examiner functional reliability in diagnosis of oral health status. Three oral medicine specialists, one periodontist and one general dentist were trained and calibrated with each other and everyone with himself/herself during 2 training sessions.

2.3. Definition of terms

Diagnosis of gingival and periodontal status were done by; 1) bleeding on probing (BOP) which was defined as gingival bleeding upon probing, 2) probing depth was measured from gingival margin to packet base, 3) Clinical attachment loss (CAL) which is loss of attachment measured from Cemento-enamel junction (CEJ) to the probing depth. BOP, Periodontal pocket and CAL were determined in a population with at least 1 tooth, after excluding subjects who used both maxillary and mandibular removable dentures. The thresholds for Pocket and CAL were > 3 mm and ≥ 1 mm respectively (Lang and Lindhe, 2015).

Opium consumption was self-reported. A participant was considered as an opium user if he/she reported consumption of opium at least once per week for 6 months. To assess opium use, a structured questionnaire contained detailed questions such as age at the time of first opium use, opium dose, duration and frequency of use, administration routes, opium types and age at the time of quitting was used (Khalili et al., 2021). Wealth score index (WSI) was used to measure Socio-Economic Status (SES) of participants.

2.4. Follow-up phase

Participants of the OHBORCS will be followed for at least 5 years, and a re-evaluation in a subsample will be conducted every 5 years. During this phase, participants will be also invited to attend the dental cohort center, and undergo interviews and oral examinations for a reassessment of the oral outcomes and oral health status. In addition, people with oral mucosal lesions such as lichen planus, leukoplakia, various types of candidiasis and other critical lesions are annually recalled.

2.5. Ethical considerations

Ethical approval for the study was obtained from the Ethical Committee of RUMS (ID: IR.RUMS.REC.1399.096). Informed written consent was obtained from all participants for the interview, oral examinations, bio-specimen collection and future research using the collected data. All necessary measures were taken to ensure confidentiality of the personal information. In addition, this study was performed in accordance with the guidelines for the report of observational studies in epidemiology (STROBE).

2.6. Statistical analyses

Demographic and lifestyle characteristics and major diseases of the oral cavity were compared across the groups of the present study using chi-square (χ^2) for the categorical variables and a *t*-test and one-way ANOVA test for the continuous variables. Frequency (%) for categorical variables and mean and standard deviation (SD) for the quantitative variables were reported. All analyses were performed through Stata V.14. All p-values are two-sided. P-value < 0.05 was considered the significance level.

3. Results

The results of the baseline phase of the present study were reported as follows:

3.1. Demographic details and lifestyle characteristics of the participants of OHBRCS

Of 9991 men and women enrolled in the RCS, 8682 people (86.91 %) participated in the OHBRCS. The OHBRCS included 4021 men (46 %) and 4661 women (54 %) with the mean age of 50.23 ± 9.72 and 49.68 ± 9.32 years respectively. The prevalence of hookah smoking, cigarette smoking and alcohol consumption were 10.33 %, 24.89 %, 9.93 % respectively. Notably, the rate of opium use was 22.65 % among the OHBRCS participants. The details of gender-related demographic and lifestyle characteristics of the OHBRCS participants is presented in Table 2.

3.2. Oral health and dental findings in OHBRCS

Table 3 shows the oral characteristics of the OHBRCS in men and women separately. Men had more decayed and missing teeth,

Table 2

Gender-related demographic details and lifestyle characteristics of the participants in the baseline phase of the Oral Health Branch of Rafsanjan Cohort Study (OHBRCS) launched in 2015 (n = 8682).

Characteristics	Total (n = 8682)	Men (n = 4021)	Women (n = 4661)	P-Value
Age at baseline, No. (%)				0.002
35–44 years	2982(34.35)	1369(34.05)	1613(34.61)	
45–54 years	2671(30.77)	1191(29.63)	1480(31.75)	
55–64 years	2421(27.89)	1138(28.31)	1283(27.53)	
≥65 years	607(6.99)	322(8.01)	285(6.11)	
Age- Mean ± SD	49.94 ± 9.51	50.23 ± 9.72	49.68 ± 9.32	0.007
Marriage, No. (%)				<0.001
Single	117(1.35)	52(1.29)	65(1.40)	
Married	8022(92.44)	3927(97.71)	4095(87.89)	
Widow	441(5.08)	19(0.47)	422(9.06)	
Divorce	98(1.13)	21(0.52)	77(1.65)	
Education Level, No. (%)				<0.001
No schooling	773(8.91)	232(5.77)	541(11.62)	
1–5 years of school	2195(25.31)	728(18.11)	1467(31.51)	
6–12 years of school	4234(48.81)	2182(54.29)	2052(44.08)	
University/college	1472(16.97)	877(21.82)	595(12.78)	
Employment status, No. (%)				<0.001
Unemployed	124(1.43)	108(2.69)	16(0.34)	
Employed	4077(47.05)	3164(78.80)	913(19.63)	
Retired	979(11.30)	742(18.48)	237(5.10)	
Homemaker	3486(40.23)	1(0.02)	3485(74.93)	
Wealth score index- No. (%)				<0.001
Very low income	2262(26.09)	909(22.63)	1353(29.07)	
Low income	2144(24.73)	955(23.77)	1189(25.56)	
Middle	2475(28.55)	1142(28.43)	1333(28.65)	
High income	1788(20.63)	1011(25.17)	777(16.70)	
Wealth score index. Meane ± SD	0.037 ± 0.981	0.180 ± 0.950	−0.087 ± 0.990	<0.001
Tobacco use [a]- No. (%)	891(10.33)	691(17.32)	200(4.31)	<0.001
Smoking [b], No. (%)	2147(24.89)	2039(51.12)	108(2.33)	<0.001
Opium use [c], No. (%)	1954(22.65)	1781(44.65)	173(3.73)	<0.001
Alcohol consumption [d], No. (%)	857(9.93)	852(21.36)	5(0.11)	<0.001
Participation rate [e], No. (%)	8682/9991 (86.90)	4021/4655 (86.38)	4661/5336 (87.35)	

[a] Tobacco use defined as using Naas, Hookah, Pipe, or Chopogh once per week for at least six months.

[b] Smoking was defined as having smoked more than 100 cigarettes in lifetime.

[c] Opium use was defined as having used opium at least once per week for 6 months.

[d] Alcohol consumption defined as drinking approximately 200 ml of beer or 45 ml of liquor, once per week for at least six months.

[e] Participation rate was defined as OHBRCS participants divided by RCS participants.

Table 3

Gender-related major diseases of the oral cavity and periodontal health indices in the baseline phase of the Oral Health Branch of Rafsanjan Cohort Study (OHBRCS) launched in 2015 (n = 8682).

Oral and periodontal condition	Total (n = 8682)	Men (n = 4021)	Women (n = 4661)	P-Value
Candidiasis. No (%)	689(7.94)	443(11.02)	246(5.28)	<0.001
White lesions. No (%)	616(7.10)	345(8.58)	271(5.81)	<0.001
Red lesions. No (%)	77(0.89)	48(1.19)	29(0.62)	0.005
Herpes. No (%)	380(4.38)	163(4.05)	217(4.66)	0.172
ANUG. No (%)	49(0.56)	17(0.42)	32(0.69)	0.102
Aphthous stomatitis. No (%)	0(0.00)	0(0.00)	0(0.00)	NA
Malignant tumor (oral cancer). No (%)	5(0.06)	2(0.05)	3(0.06)	0.777
Abscess. No (%)	125(1.44)	57(1.42)	68(1.46)	0.872
Decayed teeth. Mean ± SD	3.08 ± 3.65	3.24 ± 4.03	2.95 ± 3.29	<0.001
Missing teeth. Mean ± SD	14.85 ± 11.00	15.63 ± 11.59	14.18 ± 10.42	<0.001
Filled permanent teeth. Mean ± SD	3.37 ± 4.66	2.74 ± 4.26	3.91 ± 4.91	<0.001
DMFT. Mean ± SD	21.30 ± 8.54	22.61 ± 9.07	21.04 ± 8.04	0.002
	Total (n = 6754) *	Men (n = 2997)*	Women (n = 3757)*	
BOP (gingivitis). No (%)	4928 (74.05)	2168 (74.09)	2760 (74.01)	0.941
Dental calculus. No (%)	5474 (82.27)	2462 (84.17)	3012(80.77)	<0.001
Periodontal pocket. No (%)	922(13.86)	492(16.82)	430(11.53)	<0.001
CAL. No (%)	4006 (60.20)	1958 (66.94)	2048 (54.92)	<0.001

Abbreviations: ANUG (Acute necrotizing ulcerative gingivitis); DMFT (Decayed teeth, Missing teeth, Filled permanent teeth); BOP (bleeding on probing); CAL (Clinical attachment loss).

*These indices have been determined in a population with at least 1 tooth.

candidiasis and white and red lesions compared to women (p < 0.005), whereas women had more filled permanent teeth than men (p < 0.001).

The mean of DMFT was 21.30, decayed surfaces (coronal and root), missing teeth (coronal and root), and filled surfaces (coronal and root) were 3.08, 14.85, and 3.37 respectively (Table 3). The mean of decayed surfaces, filled surfaces and missing teeth for coronal and root surfaces were separately shown in Table S1.

Among the population with at least 1 tooth, the rate of BOP, periodontal pocket, dental calculus and CAL were 74.05 % 13.86 %, 82.27 % and 60.20 % respectively. The prevalence of periodontal pocket, dental calculus and CAL was higher in the male group than that of female group (p < 0.001, Table 3).

Table 4 shows the oral characteristics of the OHBRCS according to age groups. Candidiasis, herpes and oral cancer were more prevalent in the age group of ≥ 65 years (p < 0.05) and white and red lesions were more prevalence in the age range of 55–64 years (p < 0.05). Younger people had more decayed and filling teeth compared to other age groups (p < 0.001), whereas older people had more missing teeth and a higher DMFT index (p < 0.001).

The rate of BOP and dental calculus was higher in the age groups of 35–44 and 45–54 respectively (p < 0.001), whereas the rate of periodontal pocket and CAL was higher in the age group of 55–64 and ≥ 65 respectively (p < 0.05).

Table 5 shows the comparison of major diseases of the oral cavity among opium users and non-opium users participated in the OHBRCS. The prevalence of candidiasis, white and red lesions, the mean of DMFT and missing teeth in opium users were significantly more than non–opium users (p < 0.001). Regarding the periodontal health indices, periodontal pocket depth, and CAL were higher in opium users than those in non– opium users (p < 0.001), although no significant

Table 4

Comparison of major diseases of the oral cavity and periodontal health indices according to age groups in the baseline phase of the Oral Health Branch of Rafsanjan Cohort Study (OHBRCS) launched in 2015 (n = 8682).

Oral and periodontal condition	35–44 years(n = 2982)	45–54 years (n = 2671)	55–64 years (n = 2421)	≥65 years (n = 607)	P value
Candidiasis. No (%)	76(2.55)	192(7.19)	315 (13.01)	106 (17.46)	<0.001
White lesions. No (%)	186(6.24)	188(7.04)	203(8.38)	39(6.43)	0.020
Red lesions. No (%)	12(0.40)	25(0.94)	33(1.36)	7(1.15)	0.002
Herpes. No (%)	97(3.25)	117(4.38)	132(5.45)	34(5.60)	<0.001
ANUG. No (%)	15(0.50)	14(0.52)	15(0.62)	5(0.82)	0.769
Aphthous stomatitis. No (%)	0	0	0	0	NA
Malignant tumor (oral cancer). No (%)	1(0.03)	1(0.04)	1(0.04)	2(0.33)	0.039
Abscess. No (%)	50(1.68)	38(1.42)	29(1.20)	8(1.32)	0.523
Decayed teeth. Mean ± SD	3.84 ± 3.80	3.40 ± 3.72	2.22 ± 3.22	1.40 ± 2.92	<0.001
Missing teeth. Mean ± SD	8.18 ± 7.10	14.23 ± 10.09	20.94 ± 10.66	26.06 ± 9.39	<0.001
Filled permanent teeth. Mean ± SD	4.43 ± 4.78	3.68 ± 4.88	2.31 ± 4.15	1.21 ± 3.10	<0.001
DMFT. Mean ± SD	16.44 ± 7.38	21.30 ± 7.88	25.46 ± 7.52	28.66 ± 6.03	<0.001
Total (n = 6754) *					
	35–44 years (n = 2861)*	45–54 years (n = 2210)*	55–64 years (n = 1464)*	≥ 65 years (n = 219)*	P value
BOP (gingivitis). No (%)	2184 (76.55)	1613 (73.92)	1000 (70.52)	132 (65.35)	<0.001
Dental calculus. No (%)	2318 (81.25)	1851 (84.83)	1151 (81.23)	153 (75.74)	<0.001
Periodontal pocket. No (%)	345 (12.09)	330 (15.12)	223 (15.74)	24 (11.88)	0.002
CAL. No (%)	1332 (46.69)	1478 (67.74)	1046 (73.82)	150 (74.26)	<0.001

Abbreviations: ANUG (Acute necrotizing ulcerative gingivitis); DMFT (Decayed teeth, Missing teeth, Filled permanent teeth); BOP (bleeding on probing); CAL (Clinical attachment loss).

*These indices have been determined in a population with at least 1 tooth.

difference was observed in dental calculus between the two groups (p > 0.05). Also, BOP was lower in opium users than that of non– opium users (p < 0.05).

4. Discussion

To the best of our knowledge, this is the first prospective population-based cohort study on oral and dental health in adults in Iran. Oral Health cohort study as a branch of the RCS known as OHBRCS aims to investigate the prevalence, incidence and progression of oral diseases and their risk factors. The value of the DMFT index in the study population was also determined. Furthermore, a 5-year follow-up enables us and other investigators to have a valuable assessment of many risk factors and exposures affecting oral and dental health outcomes. We anticipate that the findings of this study will offer beneficial information about different aspects of oral and dental health in adult population.

A thorough and planned examination of the oral cavity enhances the probability of detection of any undiagnosed pathologic conditions. While the membrane of oral cavity is normally coral pink, it's color may be affected by some pathologic processes including ulcers with or without fibrino leukocytic membrane or presence of white or red plaques. Although, in many cases biopsy is indispensable for definitive diagnosis of the oral lesions, an oral comprehensive clinical examination

Table 5

Comparison of major diseases of the oral cavity and periodontal health indices among opium users and non-opium users participated in the baseline phase of the Oral Health Branch of Rafsanjan Cohort Study (OHBRCS) launched in 2015 (n = 8682).

Oral diseases	Opium use (n = 1954)	Non-opium use (n = 6673)	P-Value
Candidiasis. No (%)	317(16.22)	365(5.47)	<0.001
White lesions. No (%)	181(9.26)	430(6.44)	<0.001
Red lesions. No (%)	31(1.59)	45(0.67)	<0.001
Herpes. No (%)	92(4.71)	285(4.27)	0.406
ANUG. No (%)	12(0.61)	35(0.52)	0.635
Aphthous stomatitis. No (%)	0(0.00)	0(0.00)	NA
Malignant tumor (oral cancer). No (%)	3(0.15)	2(0.03)	0.046
Abscess. No (%)	25(1.28)	99(1.48)	0.505
Decayed teeth. Mean ± SD	3.19 ± 4.38	3.04 ± 3.39	0.130
Missing teeth. Mean ± SD	20.49 ± 11.31	13.21 ± 10.34	<0.001
Filled permanent teeth. Mean ± SD	1.55 ± 3.46	3.91 ± 4.82	<0.001
DMFT. Mean ± SD	25.22 ± 8.18	20.16 ± 8.29	<0.001
	Opium use (n = 1179) *	Non-Opium use (n = 5531) *	
BOP (gingivitis). N (%)	800(70.80)	4094(74.67)	0.007
Dental calculus. N (%)	942(83.36)	4495(82.00)	0.274
Periodontal pocket. N (%)	222(19.65)	689(12.57)	<0.001
CAL. N (%)	772(68.32)	3205(58.46)	<0.001

Abbreviations: ANUG (Acute necrotizing ulcerative gingivitis); DMFT (Decayed teeth, Missing teeth, Filled permanent teeth); BOP (bleeding on probing); CAL (Clinical attachment loss).

* These indices have been determined in a population with at least 1 tooth.

associated with other related criteria also can be conclusive (Glick, 2015). Accordingly, in the present study, the diagnosis of some important and prevalent oral lesions such as herpes, aphthous, ANUG and other precancerous lesions was based on the clinical examination, history and appearance. Oral ulcers are among the most frequent complaints with a prevalence of about 4 % throughout the world (Shulman et al., 2004). Based on previous reports, recurrent aphthous stomatitis affects 20 % of the population at any time (Patil et al., 2014). However, the prevalence of aphthous ulcer has reported 0.3–55 %, in studies conducted in different societies and age groups (Davatchi, et al., 2008; Faraz et al., 2019; Muhaidat and Rodan, 2013; Kansky et al., 2018; Al-Mobeeriek and AlDosari, 2009). The annual prevalence of aphtha was found to be 10.84 % in Turkey on 2325 subjects 20–87 years in 2016 with higher levels in women and young adults (Baş et al., 2016). In a retrospective study in Brazil in 2018, for a period of 11 years, among 4895 patients 3.3 % had complaints of oral aphthous ulcerations (Queiroz et al., 2018). In the study of Davatchi et al in 2008 on 10,291 subjects in Iran, 25.2 % had aphthosis ulcers at some time in the present or past with a higher prevalence in women (Davatchi, et al., 2008). Interestingly, the results of our study indicated no case of aphthous which may be explained by differences in method of study, genetic predisposition, level of stress, lifestyle and dietary habits and particularly the age of participant.

Herpes, as another oral lesion with an equal gender distribution but a higher prevalence in countries with a low to moderate income, involved 37.9 million people aged 0–49 years old throughout the world (Sukik et al., 2019). The frequency of this lesion in the present study was 4.38 % with a higher rate in the older ages and an equal gender distribution that was higher than those reported by other studies in India and Slovenia (3.25 % and 0.62 % respectively) (Faraz et al., 2019; Kansky et al., 2018).

ANUG was found to have a prevalence of 0.56 % in our population. Also similar findings has reported among 1200 patients aged 35–44 years in India in 2019 (0.17 %) (Faraz et al., 2019).

Oral candidiasis may be presented as red or sometimes white lesion. Occasionally, oral candidiasis may also be appeared as denture

stomatitis and can be diagnosed only by a clinical examination (Glick, 2015). Our results showed greater prevalence of oral candidiasis in males (males, 11.02 %; females, 5.28 %) and older subjects, which was in contrast to the study by Meira et al. who found that oral candidiasis was more prevalence among women and the age group of 31–40 years (Meira et al., 2017). Using a *meta*-analysis in 2016 on 2271 individuals aged 32.7 to 87.5 years in Iran, the prevalence of denture stomatitis using the *meta*-analysis was estimated 28.9 %. Also the overall prevalence of candida albicans in patients with denture stomatitis was 60.6 % (Moosazadeh et al., 2016). We also realized that oral candidiasis was more common among opium users than non-users (16.22 Vs 5.47 respectively), which was consistent with results from the study by Navabi et al in Kerman city in southeast of Iran (Navabi et al., 2021).

In the present study, the prevalence of leukoplakia as a risk factor for oral cancer was also investigated by clinical examination, although the definitive diagnosis of leukoplakia and other white lesions including oral lichenoid reaction, irritated and frictional keratosis is based on biopsy (Ghaleyani et al., 2012). The prevalence of leukoplakia in our study was 7.1 % which was similar to the findings of Faraz and associates (Faraz et al., 2019). Also in agreement with their study (Faraz et al., 2019) we found that the prevalence of leukoplakia was higher among men and older age subjects. The prevalence of leukoplakia in present study was considerably higher than those reported by other investigators (Ghanaei et al., 2013; Kansky et al., 2018; Meira et al., 2017).

In the present study, leukoplakia was more common among opium users than that of non-users. In contrast with our study, in one study in north of Iran on 1581 people aged > 30 years, no statistically significant difference was confirmed between the two groups regarding opium consumption (Ghanaei et al., 2013). In the study of epidemiology of oral mucosal lesions on 2395 patients in Slovenia, a significant association was found between oral cancer and tobacco smoking (Kansky et al., 2018). Regression analysis in a cross-sectional study in general population age range 1–96 years from China revealed that the elderly age, smoking, and alcohol were statistically significant risk factors of oral mucosal lesions (Meira et al., 2017).

DMFT the sum of the number of Decayed, missing due to caries, and filled teeth in the permanent teeth is of basic importance and is a valuable index used for determining and monitoring the oral health status in a population. The findings of the present study showed that among 8682 participants aged 35–70 years, the mean of DMFT was 21.30 ± 8.54. Study of Najafi and his colleagues reported that the mean of this index was 18 ± 9.5 among approximately 13,000 adults with similar ages from 14 provinces in IRAN although with significant variation across provinces (Najafi et al., 2020). Similar studies were conducted in other countries in different age groups (Carvalho and Schiffner, 2019; Kamberi et al., 2016). This score was also determined among opium users and non-opium users in the present study that was higher in opium users than those in non– opium users (25.22 ± 8.18 vs. 20.16 ± 8.29).

In the present study, 82.27 %, 74.05 % and 13.86 % had dental calculus, BOP and periodontal pocket respectively. In general, 60.20 % were diagnosed to have CAL. In a national survey on the oral health status of 8,301 subjects 35 to 44 years across 28 provinces of Iran, the mean of DMFT was 11.0 ± 6.4 and 6 % exhibited bleeding, 40 % had calculus, 43 % shallow and 10 % deep pockets (Hessari et al., 2007). In the present study, dental calculus and periodontal health indices were also determined among opium users and non-opium users showing that periodontal pocket depth, and CAL were higher in opium users than those in non– opium users. In their study on 217 opiate dependents (98 % men), with a mean age of 43.6 years, Shekarchizadeh et al. reported that the mean DMFT score of patients was 20.3 (SD 7.8). None of the dentate patients had a healthy periodontium. 66 %, 11 %, 15 %, and 8 % of opiate dependents had shallow pockets, deep pockets, calculus, and bleeding respectively (Shekarchizadeh et al., 2019).

In similar articles, the prevalence of CAL was shown to be more than 90 % in some populations such as Chilean adult (93.45 %) (Gamonal

et al., 2010) and South India (96.4 %) population (Rao et al., 2014). Nazir and colleagues reported that the global prevalence of BOP and calculus in 27 countries with low to high income in adults aged 35–74 years were 5–8.9 % and 31.9–44.6 % respectively (Nazir et al., 2020). It was shown that the periodontal diseases have involved 20–50 % of the population worldwide (Nazir, 2017). The discrepancy in results reported in the above-mentioned studies might be ascribed to some reasons including; different definitions of periodontal diseases, measurement differences, health habits, use of dental services, demographic and socioeconomic characteristics.

5. Conclusion

Based on our findings the most prevalent of oral lesion in total population was candidiasis and the least was aphthous lesion. The prevalence of candidiasis, white and red lesions, periodontal pocket, dental calculus, CAL and the mean of DMFT were higher in the male group than that of female group. Candidiasis, herpes, oral cancer, white and red lesions were more prevalent in the older age groups. The mean of DMFT index in total population was 21.30 and was higher among opium users, men and older age. Also, the opium users had a higher rate of CAL, periodontal pocket, red and white lesions, and candidiasis but a lower rate of BOP. Younger people had more decayed and filling teeth compared to other age groups, whereas older people had more missing teeth and a higher DMFT index.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Author contribution

Sardari F, Hakimi H, Vakilian A, Ahmadi J, Abbasifard M and Esmaeili–nadimi A contributed to the study conception and design. Khalili P performed the statistical analysis and interpretation of the data. Jamali Z, Ayoobi F, Sadeghi T, Jalali Z and Shamsizadeh A contributed to the interpretation of the data, drafting the manuscript and critical revision of the manuscript. Sharifi Z, salari Sedigh S, Mohammadi Kamalabadi Y,Vosoughi E, Movagharipoor A, Tavakolinejad Z, Kamyab N, Mollaie N and Salehi N contributed to the collection of the data. All authors read and approved the final manuscript.

Ethics approval

Ethical approval for the study was obtained from the Ethical Committee of RUMS (ID: IR.RUMS.REC.1399.096).

Consent to participate

Informed consent was obtained from all subjects.

Consent for publication

NA.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2023.102513.

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