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Prevalence and Severity of Periodontal Diseases and Their Association with Disease Severity and Quality of Life in COPD Patients: A Cross-sectional Study

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ABSTRACT

Introduction: Researchers have mentioned the possibility of an association between periodontal and respiratory diseases, especially chronic obstructive pulmonary diseases [COPD]. Moreover, previous research has shown that progress and exacerbation of COPD are related to the colonization of bacterial pathogens on oral and throat surfaces. We aimed to assess the prevalence and severity of periodontal diseases and their association with disease severity and quality of life in hospitalized Iranian COPD patients. **Methods:** This cross-sectional study was conducted on COPD patients between March 2020 and March 2021. Demographic information and data on Saint George's Respiratory Questionnaire [SGRQ] for quality of life were recorded. Dental examinations consisted of periodontal probing by Williams periodontal probe to determine the probing depth [PD], the cementoenamel junction [CEJ], bleeding index [BI], and clinical attachment level [CAL]. In addition, the dental plaque index [PLI] was scored from 0 to 3 by the dentist. **Results:** Eventually, 100 patients [69 female and 31 male] with a mean age of 60±11 years were analyzed. Dental examinations revealed that only 45[45%] patients had natural teeth and among the remaining, only 16[16%] were using dentures. Among those who had teeth, 13[13%] had only one, 17[17%] had two, 9[9%] patients had between 3 and 10 teeth and the remaining 20[20%] had more than 20 teeth. Results showed that there is a direct association between the severity of COPD and periodontal diseases [p< 0.001]. Also, the results revealed that patients with more severe COPD have a lower quality of life [p< 0.001]. **Conclusion:** We found that higher severity of periodontal diseases is associated with more severe COPD.

Keywords: Periodontitis; Gingivitis; Inflammation, Infectious disease, quality of life, Oral hygiene

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INTRODUCTION

Periodontal diseases are conditions involving the dental structure's supporting tissues, including the gingiva, cementum, periodontal ligament, and alveolar bone [1]. Periodontal diseases are categorized into two major categories; gingivitis and periodontitis [1]. In the United States, almost 15% of the general population suffers from periodontal diseases, and about 50% of the adult population has more than six teeth with gingivitis [2-4].

Gingivitis is the most common type of periodontal disease which is presented by redness, inflation, or bleeding of the gingiva during dental floss or brushing and is a predisposing factor for periodontitis [5]. Periodontitis is characterized by the loose cement of dental attachments or alveolar bone and is the cardcase for dental loss in adult patients [6, 7].

The incidence and severity of periodontal diseases are related to an oral condition, diabetes, smoking, AIDS, genetics, stress, ss, or osteoporosis and are preventable in most cases [8-12]. In addition, recent studies have revealed that periodontal diseases can be risk factors for cardiovascular or pulmonary diseases as well as low birth weight pregnancies [13-15].

In recent years, researchers have mentioned the possibility of an association between periodontal and respiratory diseases, especially chronic obstructive pulmonary diseases [COPD] [16, 17]. Moreover, previous research has shown that progress and exacerbation of COPD are relateth to the colonization of bacterial pathogens on oral and throat surfaces [18, 19]. Multiple reports have mentioned that respiratory pathogens that are a potential cause of COPD, have been colonized ed in the oral cavity of high-risk patients, such as ICU hospitalized patients [20, 21]. Previous results have revealed that improvement in oral health may decrease respiratory infections in hospitalized patients [16].

Clinical evidence shows that treatment of COPD and improvement of clinical conditions need not only symptom treatment but also identification and treatment of other underlying conditions. Several studies have addressed the association of oral health with COPD; however, they have also asked for further epidemiologic research to confirm this association [21]. Thus, we aimed to assess the prevalence and severity of periodontal diseases and their association with disease severity and quality of life in hospitalized Iranian COPD patients.

MATERIAL AND METHOD

This cross-sectional study was conducted between March 2020 and March 2021, on COPD patients who were admitted to the pulmonology ward of Afzalipour Hospital, Kerman, Iran. The protocol of the present study was registered at the ethics committee of Kerman University of Medical Sciences and we adhered to the provisions of the Helsinki declaration throughout the study.

Patients were selected using a non-randomized availability sampling method. We included adult patients with a confirmed diagnosis of COPD, FEV1/FVC ratio of lower than 0.7 in spirometry test, and an increase of no more than 12% or 200 ccs in FEV1 after inhaling 2 puffs of Salbutamol spray. We excluded patients with a history of other obstructive pulmonary diseases such as bronchiectasis and cystic fibrosis, active malignancy, nephrotic syndrome, malnutrition, Diabetes Mellitus, Osteoporosis, rheumatologic diseases, taking medications with known adverse effects on periodontal tissue such as Phenytoin and receiving any periodontal therapeutic care within the last 6 months. We also excluded those who were admitted to the intensive care units [ICU], pregnant, or non-inhaling opium abusers. The aim and process of the study were completely explained to the patients or their guardians and they signed an informed consent form before entering the study process.

Demographic information, as well as data on annual salary, level of education, smoking, method and amount of opium abuse, and Saint George's Respiratory Questionnaire [SGRQ] for quality of life, were recorded [22, 23]. Then, all the patients were examined by a well-educated dentist who was blind to the pulmonary condition of patients.

Study size According to [24]with a COPD mean prevalence of 38.9 ± 9.83 and considering sd = 10 and d = 2, the sample size was considered through G-power program as 100 participants.

All information was obtained using a spirometer [spirolab 3] made by MIR- Italy and available in Afzalipur Hospital by single trained expert person.

Dental examinations consisted of periodontal probing by Williams periodontal probe to determine the probing depth [PD], the cementoenamel junction [CEJ], bleeding index [BI], and clinical attachment level [CAL] "PD + CEJ = CAL". In addition, the dental plaque index [PLI] was scored from 0 to 3 by the dentist[19]. The BI criterion is also obtained from 0 to 5 points of the dentist's visual index. [19] In oral health situations, dental caries lost teeth, and alveolar bone loss was also evaluated using full-mouth series of intra-oral periapical imaging.

If the free margin of the gingiva is in apical contact with the

cementoenamel junction, it is considered a positive value, and if it is in coronal contact with the cementoenamel junction, it is considered a negative value. The amount of alveolar bone loss is also used by the full-mouth series of intra-oral periapical films. The amount of bone loss in each mesial and distal interproximal level is evaluated so that 1 = the amount of alveolar bone loss less than one-third of the root length, 2 = the amount of alveolar bone loss less is between one-third and two-thirds of the root length and 3 = amount of alveolar bone loss less than two-thirds of the root length. Also, the rate of tooth decay and oral mucosa is evaluated.

To measure the quality of life of COPD patients, the standard Persian SGRQ questionnaire was used, which has 76 items. This questionnaire has three subscales: 1] symptoms, 2] impact of the disease, and 3] activity. Also, this questionnaire obtains an overall score from the total of the mentioned scales by considering a coefficient for each subscale. Each of the subscales of the questionnaire and the overall score will have a score between 0 and 100, with a higher score indicating a more unfavorable quality of life in that one. This questionnaire has been used in various lung diseases such as asthma, COPD, etc.[23].

Data were analyzed using Statistical Package for Social Sciences [IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp]. Descriptive analysis was performed using mean and standard deviation as well as percentages and frequencies. Kolmogorov-Smirnov test was used to check the normal distribution of data. The Chi-square test was used to compare the categorical variables. Demographic information and SGRQ scores were compared using one-way ANOVA between different stages of COPD. Pearson's correlation was used to evaluate the relationship between SGRQ score and the severity of COPD or periodontal diseases. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Eventually, 100 patients [69 female and 31 male] with a mean age of 60±11 years were analyzed. The minimum age was 39 and the maximum age was 85 years old. The mean FEV1/FVC ratio was 10±53 with a minimum of 26 and a maximum of 69. In addition, the mean FEV1% was 16±36% with a minimum of 20% and a maximum of 94%. Regarding the severity of COPD, 55% of patients had severe and very severe COPD [Table 1]. The mean SGRQ score for quality of life was 44.63±12.3.

Farmers, workers, and drivers were among the most prevalent job titles in the study population. There was no significant relationship between the job and any of the study variables [p> 0.05]. Regarding the level of education, 96[96%] patients were illiterate or had education lower than a high school diploma. The level of education had no significant association with any of the study variables [p>0.05]. The monthly salary was less than 800 dollars in 88 [88%] patients and it had no significant association with severity of COPD or periodontal disease [p> 0.05].

Rate of smoking and opium use among the participants in our study, 69% of the patients had a history of smoking or were currently smoking, and 75% of the patients had a history of or were using inhaled opium. Our study patients' average FEV1/FVC ratio was 53.0±10.0, the lowest ratio was 26 and the highest ratio was 69. Similarly, the average FEV1% of the patients in our study was 36.0±16.0%, which was the lowest at 20% and the highest at 94%.

In examining the severity of COPD, among the participants in our study, 55% of participants in our study had severe and very severe diseases according to the GOLD criteria, the information of which is shown in table number seven.

Dental examinations revealed that only 45[45%] patients had natural teeth and among the remaining, only 16[16%] were using dentures. Among those who had teeth, 13[13%] had only one, 17[17%] had two, 9[9%] patients had between 3 and 10 teeth and the remaining 20 [20%] had more than 20 teeth. Table 1 summarizes the outcome of periodontal probing examinations.

Table 1. The Demographic and Baseline Characteristics of Study Individuals and Their Association with COPD

Characteristic	COPD Stage				
	I: Mild [n = 19]	II: Moderate [n = 26]	III: Severe [n= 26]	IV: Very severe [n = 29]	p-value*
Distribution of subject [%]					
Gender					0.25
Men	12 [63.1]	16 [61.5]	17 [65.3]	24 [82.7]	
Women	7 [36.8]	10 [38.5]	9 [34.7]	5 [17.3]	
Smoking status					0.01
Non-smoker	9 [47.3]	4 [15.3]	5[19.2]	7 [24.1]	
Former smoker	8 [42.1]	13 [50.0]	6 [23.0]	9 [31.0]	
Current smoker	2 [10.6]	9 [34.7]	15 [57.8]	13 [44.9]	
Opium addiction status					0.03
Non- Opium addiction	6 [31.5]	9 [34.7]	8 [30.7]	3 [10.3]	
Former Opium addiction	1 [5.2]	3 [11.5]	1 [3.8]	1 [3.4]	
Current Opium addiction	12 [63.3]	14 [53.8]	17 [65.3]	26 [86.3]	
Dentures status					0.001
Dentures Users	16 [84.2]	18 [69.2]	2 [7.7]	3 [10.4]	
No teeth & No Dentures	1 [5.2]	4 [15.4]	6 [23.7]	5 [17.2]	
Natural teeth	2 [10.6]	4 [15.4]	18 [69.2]	21 [72.4]	
Mean±standard deviation [SD]					**
Periodontal status					<0.0001
Gingival index[GI]	1.26±0.36	2.38±1.13	2.60±0.78	3.25±1.11	
plaque index [PI]	1.82±0.69	2.38±1.27	2.60±1.48	3.25±1.76	
Oral hygiene index [OHI]	4.44±0.63	3.76±1.35	2.21±0.94	0.85±1.23	
Clinical attachment level [CAL]	4.13±0.53	3.41±1.65	2.60±1.84	1.25±1.11	
Probing depth [PD]	2.22±0.60	2.38±1.49	3.81±1.23	4.25±2.13	
Missing Teeth	3.42±1.36	6.37±3.49	26.12±11.8	30.12±10.3	
SGRQ scores	32.8±7.03	39.1±9.68	47.3±11.9	59.3±16.4	<0.0001

*: p-value obtained from Chi^2 **: p-value obtained from one-way ANOVA for continuous variables and c2 test for categorical variables.
SGRQ: St George's Respiratory Questionnaire.

Results showed that there is a direct association between the severity of COPD and periodontal diseases [p< 0.001, Table 1]. Also, the results revealed that patients with more severe COPD have a lower quality of life [p< 0.001, Table 1].

DISCUSSION

Since periodontal examinations are expensive and time-consuming, and as the majority of patients are from lower socioeconomic situations, no clinical trial or cohort studies have been yet conducted to assess the effect of treating periodontal diseases on the improvement of COPD patients. Such health conditions impose a remarkable amount of expenses on the healthcare system and also one of the priorities of health policymakers is to include dental and periodontal examinations under insurance cover; however, the high expenses and lack of sufficient clinical evidence for treatment efficacy, have made the politicians hesitant.

We found abnormal periodontal findings such as gingival bleeding, plaque index, oral hygiene index clinical attachment level, and Probing depth associated with an increase in COPD severity, and a decrease in quality of life. A notable number of studies have addressed the relation between periodontal diseases and the severity of COPD [25];

in addition to confirming the previous findings, we have also found that there is a direct association between periodontal diseases and the severity of COPD. firstly, It seems that bacterial colonization of the oral cavity in periodontal diseases and consequent inflammatory processes may lead to pulmonary diseases through various mechanisms such as aspiration [18, 19, 26, 27]. Secondly, these people are usually innately and genetically prone to conflict and destruction of different parts of the Body's soft tissue due to inflammatory factors. Or a mixture of both conditions. So, we expect a more direct association between Periodontal disease and COPD severity. Previous studies mostly focused on the colonization and release of blood mediators [18, 19, 27]. Also, It has been shown that improving oral and dental hygiene and eliminating predisposing factors such as smoking reduces lung infections [28, 29]. However, in none of the studies conducted, there has been no research on the possibility of inherent and hereditary talent.

COPD patients suffer from different degrees of disability during their daily life. Pulmonary function parameters through spirometry have been used in the past decades to measure the severity or evaluate the treatment results in COPD patients [30]. The results of the studies have shown that the quality of life cannot be compared with the pulmonary function of patients, so a clear picture of the quality of life in different degrees of COPD severity is not clear [31]. But the findings of our study proved that the increase in the severity of COPD caused decreases in the level of quality of life among the patients in our study.

The dimensions of physical health, mental health, and the whole quality of life is related to the health of COPD patients. Kheirabadi et al, mentioned that the average score of the total quality of life in people with chronic obstructive pulmonary disease was significantly lower than the control group [p<001], which indicates the negative effect of this disease on the quality of life of patients. Also, the results of Spencer et al showed that the health impairment of chronic obstructive pulmonary disease patients compared to normal people was observed more in physical health than in mental health [32]. Martín et al also reported that 61% of patients have a normal health-related quality of life and 39% of them have a low quality of life. However, a high percentage of them had lower physical health in comparison to mental health, among which the subscales of general health and physical performance had the lowest score and role performance and social performance had the highest score [33]. Considering that most patients with chronic obstructive pulmonary disease are elderly, they may adapt themselves to the limitations caused by the disease and consider it as a natural consequence of their aging process, so their mental health is less affected by COPD complications.

We also realized that patients with dentures have a higher quality of life and less severe disease in comparison with those who had natural teeth. Which confirm previous studies [34, 35]. In addition, our results revealed that patients with a lower number of natural teeth had a higher chance for more severe COPD. As a result, it is suggested that physicians consider the prescription of dentures for patients with less than 10 natural teeth and prescribe treatment of periodontal diseases for patients with more than 25 natural teeth.

Smokers as well as those with a history of smoking had a higher severity of COPD and periodontal disease in our study. Hyman et al. have confirmed the risk factor role of smoking for periodontal diseases and COPD which is in line with the findings of our study [36]. The association between opium abuse and COPD has remained controversial, as most of the opium abusers are cigarette smokers too and this is a confounding factor [23, 24, 37]. In the present study, we found that there is no significant difference between opium abusers and other patients in terms of the severity of COPD or periodontal diseases. Also, the method of opium abuse, inhalation or oral, was not a risk factor for the severity of COPD or periodontal diseases.

Carrasco-Garrido et al also showed that there is no significant difference between the physical health score in women and men, while in the field of mental health, this relationship is significant and men are better than women [P<05] [38]. Martín et al also reported that the mean score of the mental health dimension of health-related quality of life was higher in men than in women [p<001] and no significant difference was observed between the two genders in the physical health dimension [33]. In our study, there was no significant finding between gender and health level, which confirms the findings of Carrasco-Garrido et al results. Also, the findings of our study showed that there is no significant relationship between the quality of life and the level of education, and this lack of relationship can be caused by the fact that about 96% of the people in our study had illiterate or had education lower than a high school diploma

Many studies have been conducted regarding the relationship between periodontal diseases and COPD. In this study, the findings of other studies have been proved [13, 15, 28, 29, 31, 36, 39], in addition, it was shown that the severity of these diseases is directly related to the severity of COPD,

unfortunately, considering that Periodontal examinations are costly and time-consuming, and many people with these two diseases have a low social level. So far, no study has been able to relate the treatment of periodontal diseases to the improvement of the disease through clinical trial study or even cohort sizes severity of COPD with acceptable sample size, on the other hand, Iran is one of the countries involved in this disease, and in addition to lung diseases, its relationship with heart diseases has also been proven [40] and these diseases impose enormous burdens on the health system of our country, according to the health reform plans and also one of the concerns of health policymakers is to include dental health services in the preventive and treatment health package services

As mention before, Our study has shown people with Denture [Dental prosthesis] had a better quality of life and also had less COPD severity than people with teeth, based on our findings, it was also shown that people who have fewer teeth in their mouths have a higher chance of severe COPD compared to those who have more teeth in their mouths. Based on this, it is suggested that policymakers and clinical experts control the severity of COPD in patients. With less than ten teeth, one could recommend the use of Denture, and in patients with more than 25 teeth, periodontal treatment could be recommended.

The issue of the association of COPD with other environmental factors such as smoking and opium is widely discussed in our country and our region today. In the present study, it was shown that people who had more severity of COPD used opium and cigarettes or had a history of using it before, and at the same time, the severity of periodontal disease was also observed in them. In a study conducted by Hyman et al in 2004 on the relationship between smoking, periodontal diseases, and COPD, they stated that smoking is an auxiliary factor and plays a key role in contracting both diseases, and patients who smoke have a high chance of contracting each. They have two diseases [29], which confirmed the findings of our study

In a study published by Leuckfeld and his colleagues in 2007, they stated that chronic marginal periodontitis is more prevalent in patients with severe COPD, which seems to be the reason for the association of these two diseases with the presence of common risk factors for the two diseases, such as age, consumption smoking, BMI, use of corticosteroids, and tooth mineral loss [30] Unfortunately, due to the history of hospitalization, it was not possible to fully investigate these factors in our study, which was one of the limitations of our study. So, to avoid the occurrence of sampling bias and heterogenous samples such as in terms of economic and educational issues. we attempted to do sampling from a general hospital which was the main referral center for pulmonary diseases in the Iran southeast region,

The discussion of opium use and its relationship with lung diseases, especially asthma and COPD, has always been a controversy between clinical specialists and experts [41-43]. One of the reasons why the relationship between opium and these diseases is still unclear is the simultaneous use of opium and cigarettes among the majority of opium users, and smoking has always been mentioned as an important confounding variable in these studies in the findings of our study, it was shown that there is no difference between opium consumption and non-opium consumption among the participants in the severity of COPD disease and periodontal disease. Also, in the investigation of how to use opium by inhalation or orally, no difference was observed between the severity of COPD disease and the severity of the periodontal disease. The total number of people who used opium was significantly higher than the number of people who used cigarettes, which could be concluded that the use of opium Inhalation can be effective in the short term in improving the pulmonary symptoms of patients with COPD, but it seems that in the long term, it may be due to an unknown mechanism, along with other risk factors such as alpha 1 antitrypsin, genetic diseases, periodontal diseases, and other inflammatory factors. cause an increase in chronic inflammation in the airways, and besides that, it can probably cause temporary or permanent paralysis of the air cilia, and probably with the synergistic presence of smoking, it can aggravate the development of chronic inflammatory pulmonary diseases [COPD], to confirm this theory multi-phase trials should be done.

Another finding of our study was the discussion of the level of education and income of the patients participating in our study. About 96% had an income level of fewer than 800 dollars/month and 97% had illiterate or had education lower than a high school diploma. In addition, all the people with severe and very severe diseases are in this group. That indicates the lack of knowledge regarding oral and dental health and its consequences, as well as the lack of ability to treat and cure oral diseases. It's proved that oral health education and insurance coverage play an important role to control the severity of COPD disease [44]. It is also suggested for health policymakers, considering oral health or even Dentures, also It should be defined as a priority to enter

public health packages over other dental services in patients with severe and very severe COPD and other associated periodontal conditions.

In conclusion, we found that higher severity of periodontal diseases is associated with more severe COPD and this also affects the quality of life. We suggest further studies for developing a clinical grading system to diagnose periodontal diseases and determine their prognosis in COPD patients to make physicians able for referring their patients to dentists at the appropriate time.

REFERENCES

1. R C Williams. (1990). Periodontal disease. N. Engl J Med. 322(6):373-383.
2. Oliver RC, Brown LJ, Löe H. (1998). Periodontal diseases in the United States population. J Periodontol. 69[2]:269-278.
3. Oliver RC, Brown LJ, Loe H. (1991). Variations in the prevalence and extent of periodontitis. The Journal of the American Dental Association. 122(6):43-48.
4. Albandar JM, Kingman A. (1999). Gingival recession, gingival bleeding, and dental calculus in adults 30 years of age and older in the United States, 1988-1994. Journal of periodontology. 70(1): 30-43.
5. Ronderos M, Michalowicz B. (2004). Epidemiology of periodontal diseases and risk factors. Periodontics: Medicine, Surgery and Implants. 39.
6. Burt B. (2005). Position paper: epidemiology of periodontal diseases. J Periodontol. 76(8):1406-1419.
7. Theilade E, Wright W, Jensen SB, Löe H. (1966). Experimental gingivitis in man: II. A longitudinal clinical and bacteriological investigation. J Periodontal Res. 1(1):1-13.
8. Haffajee AD. (1994). Microbial etiological agents of destructive periodontal diseases. Periodontol 2000. 5:78-111.
9. Sznajder N, Carraro JJ, Rugna S, Sereday M. (1978). Periodontal findings in diabetic and nondiabetic patients. J Periodontol. 49(9):445-448.
10. Sheiham A. (1971). Periodontal disease and oral cleanliness in tobacco smokers. J Periodontol. 42(5):259-263.
11. Bastiaan R, Waite I. (1978). Effects of tobacco smoking on plaque development and gingivitis. J Periodontol. 49(9):480-482.
12. Grossi SG, Genco R, Machtet E, Ho A, Koch G, et al. (1995). Assessment of risk for periodontal disease. II. Risk indicators for alveolar bone loss. J Periodontol. 66(1):23-29.
13. Beck JD, Offenbacher S. (2001). The association between periodontal diseases and cardiovascular diseases: a state-of-the-science review. Ann Periodontol. 6(1):9-15.
14. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, et al. (1996). Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol. 67:1103-1113.
15. Hayes C, Sparrow D, Cohen M, Vokonas PS, Garcia RI. (1998).The association between alveolar bone loss and pulmonary function: the VA Dental Longitudinal Study. Ann Periodontol. 3(1):257-261.
16. Scannapieco FA, Wang B, Shiau HJ. (2001). Oral bacteria and respiratory infection: effects on respiratory pathogen adhesion and epithelial cell proinflammatory cytokine production. Ann Periodontol. 6(1):78-86.
17. Scannapieco FA, Ho AW. (2001). Potential associations between chronic respiratory disease and periodontal disease: analysis of National Health and Nutrition Examination Survey III. J Periodontol. 72(1):50-56.
18. Scannapieco F, Papandonatos G, Dunford R. (1998). Associations between oral conditions and respiratory disease in a national sample survey population. Ann Periodontol. 3(1):251-256.
19. Scannapieco FA, Mylotte JM. (1996). Relationships between periodontal disease and bacterial pneumonia. J Periodontol. 67:1114-1122.
20. Scannapieco FA, Stewart EM, Mylotte JM. (1992). Colonization of dental plaque by respiratory pathogens in medical intensive care patients. Crit Care Med. 20(6):740-745.
21. Scannapieco FA, Bush RB, Paju S. (2003). Associations between periodontal disease and risk for atherosclerosis, cardiovascular disease, and stroke. A systematic review. Ann Periodontol. 8(1):38-53.
22. Attaran D, Lari SM, Khajehdaluee M, Ayatollahi H, Towhidi M, et al. (2009). Highly sensitive C-reactive protein levels in Iranian patients with pulmonary complication of sulfur mustard poisoning and its correlation with severity of airway diseases. Hum Exp Toxicol. 28(12):739-745.

23. Assari S, Lankarani MM, Montazeri A, Soroush MR, Mousavi B. (2009). Are generic and disease-specific health related quality of life correlated? The case of chronic lung disease due to sulfur mustard. J Res Med Sci. 14(5):285-290.

24. Kheir Abadi GH AS, Amanat S, Nemati M. (2008). Quality of life of patients with COPD compared with controls. Hormozgan Med J.12(4):255-260.

25. Russell SL, Boylan RJ, Kaslick RS, Scannapieco FA, Katz RV. (1999). Respiratory pathogen colonization of the dental plaque of institutionalized elders. Spec Care Dentist.19(3):128-34.

26. Hedges SR, Agace WW, Svanborg C. (1995). Epithelial cytokine responses and mucosal cytokine networks. Trends Microbiol. 3(7):266-270.

27. Svanborg C, Hedlund M, Connellp H, Agace W, DUAN RD, et al. (1996). Bacterial adherence and mucosal cytokine responses. Ann N Y Acad Sci. 797(1):177-190.

28. Deo V, Bhongade ML, Ansari S, Chavan RS. (2009). Periodontitis as a potential risk factor for chronic obstructive pulmonary disease: a retrospective study. Indian J Dent Res. 20(4):466-470.

29. Sharma N, Shamsuddin H. (2011). Association between respiratory disease in hospitalized patients and periodontal disease: A cross-sectional study. J Periodontol. 82(8):1155-1160.

30. Hoesterey D, Das N, Janssens W, Buhr RG, Martinez FJ, et al. (2019). Spirometric indices of early airflow impairment in individuals at risk of developing COPD: spirometry beyond FEV1/FVC. Respir Med. 156:58-68.

31. Zhou X, Wang Z, Song Y, Zhang J, Wang C. (2011). Periodontal health and quality of life in patients with chronic obstructive pulmonary disease. Respir Med. 105(1):67-73.

32. Spencer S, Calverley PM, Sherwood Burge P, Jones PW. (2001). Health status deterioration in patients with chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 163(1):122-128.

33. Martín A, Moro JMR-G, Izquierdo JL, Gobartt E, de Lucas P. (2008). Health-related quality of life in outpatients with COPD in daily practice: the VICE Spanish Study. International journal of chronic obstructive pulmonary disease. 3(4):683- 692.

34. Przybyłowska D, Mierzwińska-Nastalska E, Swoboda-Kopeć E, Rubinsztajn R, Chazan R. (2016). Potential respiratory pathogens colonisation of the denture plaque of patients with chronic obstructive pulmonary disease. Gerodontology. 33(3):322-327.

35. Przybyłowska D, Rubinsztajn R, Chazan R, Swoboda-Kopeć E, Kostrzewa-Janicka J, et al. (2015). The prevalence of oral inflammation among denture wearing patients with chronic obstructive pulmonary disease. Pulmonary Function: Springer. 858:87-91.

36. Hyman JJ, Reid BC. (2004) Cigarette smoking, periodontal disease, and chronic obstructive pulmonary disease. J Periodontol. 75(1):9-15.

37. Scannapieco FA. (1999). Role of oral bacteria in respiratory infection. J Periodontol. 70(7):793-802.

38. Carrasco-Garrido P, de Miguel-Díez J, Rejas-Gutierrez J, Martín-Centeno A, Gobartt-Vázquez E, et al. (2009). Characteristics of chronic obstructive pulmonary disease in Spain from a gender perspective. BMC Pulm Med. 9:2.

39. Leuckfeld I, Obregon-Whittle M, Lund M, Geiran O, Bjørtuft Ø, et al. (2008). Severe chronic obstructive pulmonary disease: association with marginal bone loss in periodontitis. Respiratory medicine. 102(4):488-494.

40. Güder G, Störk S. (2019). COPD and heart failure: differential diagnosis and comorbidity. Herz. 44(6):502-508.

41. Javad Mousavi S, Yadollah Zadeh M, Hossein Nejad Yazdi M, Adeli S. (2005). Spirometric assessment of patients having opium smoking addiction and pulmonary complications. Razi Journal of Medical Sciences. 12(46):267-274.

42. Rahmati A, Shakeri R, Khademi H, Poutschi H, Pourshams A, et al. (2017). Mortality from respiratory diseases associated with opium use: a population-based cohort study. Thorax. 72(11):1028-1034.

43. Sanzharovskaya M, Budankova E, Fisenko A, Kuzin E, Ustyuzhanina E, et al. (2013). Bullous emphysema and severe COPD in acetylated opium users. Eur Respiratory Soc.

44. Blackstock F, Webster K. (2007). Disease-specific health education for COPD: a systematic review of changes in health outcomes. Health Educ Res. 22(5):703-717.