

Examination of Periodontal Health Status in Sulfur Mustard Gas Intoxicated Warfare Veterans: A Cross-Sectional Study

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Abstract

Introduction: A great number of Iranian military forces have sustained sulfur mustard gas exposure during the Iran-Iraq war of 1980-1988 and have survived with dental care needs. Accordingly, this study aimed to discover the prevalence of intraoral lesions and periodontal diseases associated with the percentage of being chemical veterans. **Methods:** This cross-sectional study was conducted in the summer of 2009 on 40 chemical veterans. The patients were examined using dental mirrors under dental unit light, as well as a periodontal probe, to evaluate soft tissue attachment. The clinical results were then documented on medical records. Data were analyzed using the Chi-square test and two independent sample t-tests in SPSS software (version 19). A p-value less than 0.05 was considered statistically significant. **Results:** The study population was composed of 40 patients with a mean age of 50.7 ± 9.32 years, mean pocket depth of 1.47 ± 0.31 mm, and mean bleeding on probing of 0.35 ± 0.24 mm. Furthermore, 55% and 27.5% of the patients had xerostomia and temporomandibular joint dysfunction, respectively. However, no significant association was found between these factors and the percentage of being veterans. **Conclusion:** The study findings showed that 96.7% of the patients had bleeding on probing problem. The mean score of plaque index that is a practical measurement on evaluating oral hygiene was 2.06 ± 0.99 . Therefore, informing chemical veterans about their periodontal health by performing regular dental assessments by dental specialists and instructing oral hygiene seem to be this group's need.

Keywords: Dental care, Mustard gas, Oral hygiene, Periodontal diseases, Veterans

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Introduction

During the Iran-Iraq war of 1980-1988, about 34,000 Iranians were exposed to sulfur mustard (SM) gas, an alkylating chemical warfare substance, which can cause numerous systemic diseases, such as leukopenia, increased bleeding time, decreased T helper cells, and hematuria (1-4). The most common complaints amongst this group were pulmonary diseases with a prevalence of 42.5%, including cough and dyspnea, eye disorders (39.3%), and skin conditions (24.5%). It should be noted that the gas effect on different organs depends on the amount and duration of the exposure (1, 2, 5, 6).

Clinical manifestations of SM-poisoned veterans were eye poisoning with a sensation of grittiness and ulceration of the cornea, skin lesions (e.g., hyperpigmentation and bullous narcotization), chronic pruritus as one of the most-observed negative impacts of this agent, respiratory effects (e.g., chronic obstructive pulmonary disease), asthma, large airway narrowing and pulmonary fibrosis, dysphonia, post-nasal discharge laryngitis, and bronchiolitis (2, 7-10).

Regarding the results of a study, more than 60% of intoxicated veterans suffered from oral lesions, such as white patches, mucosal pigmentations, intraoral ulcers mostly detected on the tongue, and gingival hyperplasia (8). Furthermore, the assessment of metal concentration in saliva showed that the amount of Cu, salivary alpha 1 antitrypsin, and secretory IgA was significantly higher in veterans (11, 12). Previous studies suggest that an impaired immune system probably increases the risk of infections in SM-poisoned patients (12). However, others found no correlation between the severity of SM poisoning and immunological complications (13). Studies over past decades concluded that the major complaints of these patients are mild interstitial fibrosis and bronchiolitis (7), and others established photophobia as the most significant symptom in the cases (14). A few studies show that due to xerostomia in veterans, the risk for tooth decay and periodontal disorders increases (15, 16). Nevertheless, other investigations revealed that decreased saliva secretion does not increase coronal caries or periodontal index measured by community periodontal index of treatment needs (CPITN) among patients (16).

According to the literature, few documents assessed the periodontal health of chemical veterans in the dental office in North East of Iran, Mashhad. As a result, further research is required to find out underlying factors associated with poor dental/oral health that leads to periodontal diseases in chemical warfare victims (15). Given the fact that many patients were not informed of their mouth lesions which emphasizes the need for oral examinations by specialists to enhance their quality of lives (6, 17); this study aimed to carry out a periodontal assessment using dental probes to examine probable bleeding surfaces and also pocket depth (PD) measuring in chemical veterans in Mashhad, Iran, in 2009.

Materials and Methods

Study design

This cross-sectional study was carried out in the summer of 2009, Mashhad, Iran. The study protocol was approved by the Ethics and Research Committee of Mashhad University of Medical Sciences, Mashhad, Iran (IR.mums.sd.REC.1388.211). The instructions of "Strengthening the Reporting of Observational Studies in Epidemiology" were followed in this study. Based on the Helsinki Declaration principles, informed written consent was collected from all participants before enrollment. The study population consisted of sulfur gas intoxicated veterans from Imam Reza toxicology Centre in accordance with the veterans' foundation. All of these 40 veterans were referred to the clinic of Mashhad Dental School and were examined precisely. Inclusion criteria

were having a medical record of being infected by at least one time with a high dose of SM gas. On the other hand, those who did not submit a written consent and complete questionnaires, and the patients who underwent dental examinations were excluded from the study.

Study variables and data collection

The periodontal assessment was performed by specialists using probes and dental mirrors under dental unit light by examining oral, buccal, gingival, palatal, and tongue mucosa, as well as vestibule depth and sublingual space. At first, chemical veterans completed the first series of the questions of a standard WHO-designed questionnaire consisting of first name and surname, age, gender, residence, and occupation. The second series of questions was about recording any existing oral lesions based on their types, conditions, and locations in addition to testing xerostomia subjectively. In examining Temporomandibular joint (TMJ), the patients were classified based on symptoms, such as jaw-dropping and clinical signs. In order to note their systematic diseases, previous medical (12) records were used, and drug consumptions were classified based on the type of disease; moreover, for dental needs, clinical findings and radiographic examination were also employed.

To examine the periodontal status of patients, four dental indices were evaluated. Firstly, PD was measured using the Williams probe (Hufriedy-USA) at four points, including mesiobuccal, distobuccal, mid buccal, and mid lingual. Subsequently, the average number of these variables was noted. The periodontal probing depth, which is the space from the free gingival margin to the most apical location of the periodontal pocket, was estimated by placing a dental probe under the gingival margin, and the deepest distance was recorded. In cases of teeth decay, the number of caries was added to the space. The clinical attachment loss was evaluated by the means of a graduated probe and expressed as the distance from the cemento-enamel junction to the bottom of the periodontal pocket. Moreover, bleeding sites were positive around each probed tooth using the Walking technique, and after 30 sec, the number of teeth with bleeding on probing (BOP) to all teeth was estimated to note sulcus bleeding index (15). The plaque index based on the Olerly index was evaluated based on the percentage of surfaces that were colored using detector pills or disclosing agents (18). Furthermore, the number of missed teeth was also noted in clinical evaluation.

Data analyses

Periodontal conditions of chemical veterans were examined precisely under dental unit light the same as previous studies (6) using dental probes. The statistical

analysis was carried out in SPSS software (version 19, SPSS Inc., Chicago, IL). Quantitative variables were described as mean±SD, and general information of veterans, such as their drug consumption, was listed as percentages. Data analysis was conducted using the Chi-square test, as well as two independent sample t-tests. A P-value less than 0.05 was considered statistically significant.

Results

Patient characteristics

This study examined 40 chemical veterans with a mean age of 50.7±9.32 years (age range: 39-71 years) and a mean percentage of being veterans of 56%±12% in Mashhad, Iran. In this study, nine veterans were among the group with less than 50% of being veterans, and the remaining were more than 50%. The majority of their drug consumption was composed of heart medications (45.9%), and the minority were digestive medicines (8.1%). Regarding the systematic diseases, 94.9% of the veterans suffered from respiratory problems, and neurological diseases comprised only 10.3% of their complications. With reference to drug abuse, only one person had drug addiction (2.9%). More than half of the patients (55%) had xerostomia, and 27.2% of the patients suffered from TMJ dysfunction. Approximately, 60% of patients with more than 50% of being veterans suffered from xerostomia, and 48% of them had TMJ problems. However, no significant correlation was found between these two variables and the percentage of being veterans (P=0.897 and P=0.850, respectively). BOP was observed among 96.7% of the patients. The mean score of missed teeth was 6.5±10. In other words, 35.9% of the cases had missed 1 to 5 of their teeth, and 25.6% of the patients had lost more than 20 teeth. Statistically, there was no significant relationship between this factor and the percentage of being veterans (P=0.182). These results are obtained from the Chi-square statistical test.

Periodontal parameters

In the current study, the maximum figure for PD was described as 2.25 mm, and the minimum figure was estimated at 1.04 mm. Regarding the attachment level (AL), the maximum record was 5.38 mm, and the minimum was 1.04 mm. The plaque index was 1.00 in the highest level and 0.50 in the lowest one. The results demonstrated that 25% of patients with more than 50% of being veterans had more than 1.5 mm PD, and totally, in 37.5% of veterans, the PD was noted more than 1.5 mm; however, no meaningful relationship was found between the percentage of being veteran and PD. Moreover, 35% of the patients had more than 1.7 mm mean loss of AL, and 22.5% of the patients who were

more than 50% of being veteran had more than 1.7 mm of AL; however, there was no significant relation between AL and percentage of being intoxicated. In 32.5% of the patients with more than 50% of being veterans, plaque index was less than one surface colored up to grade three in the coloring process, and only 2.5% of them had more than one colored surface. It should be mentioned that no significant correlation was found between this factor and the percentage of being veterans. The result of sulcus bleeding index measured by POB in the group of more than 50% of being veterans in less than 0.3 mm was positive among 25% of them, and 10% of less than 50% of being veterans had less than 0.3 mm BOP; nonetheless, no meaningful relationship was found between this index and the percentage of being intoxicated. Table 1 demonstrates the scores of these quantitative variables, as well as the relationship between these factors and the percentage of being veterans considering the amount of P-value.

Discussion

SM has various genotoxic effects on the skin and immune system which increases the risk of infections that include dermal and ocular injury, respiratory system damage, and cancer (11-14, 19). At present, this agent can provoke noxious reactions with mucosal cells of the gastrointestinal tract and oral cavity among others (20-22). In the light of probable threats arising from SM and the need for dental treatments among victims, dentists should undertake regular periodic oral examinations (6, 20, 23, 24).

Therefore, this study focused on performing periodontal assessments by precise methods to help dentists to offer certain dental services. It was found that 96.7% of chemical war veterans and 25% of the patients with more than 50% of being veterans had POB; however, there was no meaningful relationship between this index and the percentage of being veterans. In line with this finding, in a study conducted by Salari Seddigh S et al., 34.2% of the most observed common oral lesions were bleeding and gingival enlargement (6). Consistent with this finding, Kakoei S et al. (24) and Shirinbak I et al. (18) found no difference between the prevalence of oral lesions and being veterans. The similar results could be due to the limited sample sizes.

The present study demonstrated that the number of patients with more than 1.5 mm in PD measurement is higher amongst the group of with more than 50% of being veterans; nevertheless, no significant relationship was found between these factors and the percentage of being veterans. Regarding AL, the authors concluded that patients with more than 1.7 mm of sulcus depth are more among the group of being more than 50% chemical

veteran with no significant difference between these variables and being veteran.

Contrastingly, Mottaghi A et al. (15) suggested that veterans had significantly higher scores than the control group for CPITN, and this might be due to a decrease in saliva secretion. The possible reason for this disparity could be different mean ages of these studies.

In this study, chemically injured veterans with dental plaque were 89%, and the results showed the number of patients with plaque index less than one colored surface is higher among the group of more than 50% of being chemical veterans. However, no significant relationship was found between this factor and being veterans. Nevertheless, the plaque index scores were high among chemical veterans which highlights the need for maintaining oral hygiene. This result is consistent with the findings of a study by Mottaghi A et al. (15) in which they concluded that chemical warfare victims have fairly poor dental or oral health. This might be due to the fact that veterans are not enough informed about their oral health or even because of their physical or mental complications.

Another remarkable finding was that patients with more than 10 missed teeth were more in less than 50% of being veterans. Similarly, Muhvić-Urek M et al. (19) indicated that exposure to SM does not increase the risk of tooth decay and tooth loss. However, Mottaghi A et al. revealed that victims had significantly higher scores than the control group for missing teeth (15). The difference could be the result of non-similar percentages of being veterans in the study populations.

In the present study, 55% of patients had xerostomia; however, there was no meaningful relationship between the percentage of being veterans and dry mouth. Consistent with this, Janket SJ et al. (16) concluded that xerostomia did not appear to increase periodontal index measured by CPITN among veterans. However, Mottaghi A et al. (15) had the opposite opinion and declared that chemical injury led to dysfunction in saliva secretion results in increasing the risk of periodontal disorders. The possible reason for this contrast could be some missed medical records of our study population.

Strength and limitation

Regarding the limitations of this study, one can refer to missed medical information of our patients due to unfilled forms; therefore, it is recommended that future studies provide complete medical history. Secondly, due to the limitations of descriptive design in our study, such as being incapable of analyzing the relationship between periodontal health status and dental treatment needs,

more analytical studies are recommended to be conducted on this subject.

Conclusion

SM that is a harmful chemical warfare agent can have toxic effects on the mucosal surface, including the oral cavity. Our study focused on assessing periodontal indices and the prevalence of soft oral lesions in intoxicated veterans. The findings showed that a great number of patients were not enough informed about their periodontal health; accordingly, regular dental examinations are necessary, and it is recommended that specialists treat veterans on their own foundation. Moreover, the importance of dental hygiene is emphasized that can be promoted by instructing patients to promote their dental and oral health.

Ethical issues

All procedures performed in this study involving the human participant were in accordance with the ethical standards of our institutional research committee and the 1964 Helsinki declaration. This study was approved by the Ethics and Research Committee of Mashhad University of Medical Sciences, Mashhad, Iran (IR.mums.sd.REC.1388.211). The authors certify that all data collected during the study are as stated in the manuscript, and no data from the study has been or will be published separately elsewhere.

Conflict of interest to

The authors have no conflict of interest to declare.

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