

Periodontal diseases in military aviation crew: A pilot study in armed forces

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ABSTRACT

Background: Recent literature suggests psychosomatic and occupational stresses have a bearing on the etiology of periodontitis. The aviation field is a high-risk environment and rich in potential stresses which can be potent environmental factors. The purpose of this pilot study was to clinically evaluate the incidence of periodontitis amongst military aviators and its management on the health-related quality of life recovery.

Materials and Methods: A total of 252 individuals were examined, equally divided into ground duty and flying groups. In addition to standard parameters, the clinical attachment loss (CAL) was estimated according to a three-point scale. Stress factor was evaluated as per short form of Minnesota Job Satisfaction Questionnaire (MSQ). Numbers of visits after diagnosis, limitation from flying tasks due to the acute phase of disease and during treatment were recorded. The subjects who presented with active phases of disease were taken up for surgical mode of treatment. **Results:** Out of 252 individuals examined in this study, active periodontitis was found in 7.9% of the total population. Group 1 and 2 subjects presented an incidence rate of 5.6 and 10.3%, respectively. Among the aviators, 12.2% of the helicopter crews, 10.3% of fighter pilots, and 8.9% of the transport crews showed active form of periodontal diseases during routine annual medical examination. Ten cases presented limitation from flying due to acute phase of disease. **Conclusions:** Periodontitis causes early teeth loss and compromises the quality of life. It is mandatory for quick recovery and return to professional activities in the aviators. The annual medical checkup must include a thorough check up by a dental officer/periodontist and assessment with an appropriate radiograph once in every 3 years advised. The screening examination used is suggested for use as part of each aviator's annual dental examination.

Key words: Aviators, clinical attachment loss, periodontitis

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INTRODUCTION

Periodontal diseases are infections that are caused by microorganisms that colonize the tooth surface at or below the gingival margin. Periodontitis can manifest itself with polymorph clinical presentation which can be chronic, aggressive, or necrotizing form of periodontitis.^[1]

Periodontal diseases are currently considered to be multifactorial diseases developing as a result of complex interaction between the host response and the environment.^[2] The etiopathogenesis of periodontitis can be described under bacteriologic, immunologic, and genetic reasons. Inheritance of periodontitis susceptibility is probably insufficient for the development of the disease, the environmental exposure to potential pathogen

endowed with specific virulence factor is also a necessary step.^[3] The aviation field is a high-risk environment and rich in potential stresses which can be potent environmental factors. The combination of stress, other environmental factors, lack of good oral hygiene, and even less motivation can lead to increase the incidence of periodontal diseases.

The prognosis for the patients with periodontal diseases depends on whether the disease is generalized or localized and the degree of destruction present at the time of examination. Patients who are diagnosed as having periodontal diseases in the initial stage may respond faster to standard periodontal therapy in combination with systemic use of antibiotics. Similarly, earlier the diagnosis of this disease is made in aviators; the therapy can be more successful with predictable outcome.

When a pilot sits in the cockpit, he or she methodically goes through a checklist of all systems and equipment before the

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aircraft is fired up. Even if the pilot has flown that plane and route many times, the items on the checklist are reviewed one by one and no one would think of flying the plane without completing the checklist. The same holds good for the medical evaluation which include a careful periodontal examination for an individual who is actively involved in flying.

Clinical observations and data from the literature indicate a high incident rate of functional disturbances of the tooth supporting structure and periodontitis. Clinical observations indicate that these disturbances are caused mainly by the loss of supporting alveolar bone and subsequent tooth loss. There are various studies in literature which have related the various intrinsic and extrinsic factors for periodontal disease and flying, mainly the stress. But, such a study has not being undertaken exclusively amongst military flying crew and very limited studies are available with us.^[2]

This is a pure pilot study in the armed forces which makes an attempt to correlate increase in incidence of periodontal diseases and aviators. The officers and air warriors (flying and nonflying branches) who came for medical examination were selected for the study. The scope of the study dwells into the symptomology of presentation and the recommendation of periodontal examination and relevant treatment amongst the flying pilots reporting for annual medical examination if needed.

MATERIALS AND METHODS

The design is a clinical pilot study with subjects included being the officers and air warriors of flying and nonflying branches. The age group of the individual varies from 22 to 54 years with a mean value of 38 years. All subjects selected in this study were males. The period of study was from June 2008 to December 2011. All these individuals were examined by the author and included both primary reporting as well as secondary referrals for symptoms related to periodontal diseases at tertiary care dental centers of an armed forces clinic. A total of 252 individuals were examined in this study. They were equally divided into Group 1 (ground duty branches) and Group 2 (actively involved in flying). Group 1 subjects are individuals who do not sit and fly the aircraft in a cockpit (all supporting branches); whereas, Group 2 individuals are pilots, navigators, and gunners who are actively involved in flying an aircraft.

The study was approved by the institutional ethics committee. Informed consent was taken prior to the study from each subject.

A detailed history was recorded regarding the nature of clinical presentations and chronicity of the disease and

a thorough clinical examination was carried out. The subjects also completed the short form of Minnesota Job Satisfaction Questionnaire (MSQ). The MSQ is designed to measure an employee's satisfaction and stress level with their particular job. It measures job satisfaction across 20 different dimensions, with five questions on each dimension. The short-form MSQ consists of 20 items from the long form MSQ that best represent each of the 20 scales.^[4]

The individuals who were diagnosed with periodontitis were taken for nonsurgical or surgical management. The treatment was grossly carried out broadly under two categories.^[5]

- Surgical management: These cases were treated by flap surgeries with regenerative or respective approaches.
- Conservative management: These cases were managed by Phase 1 therapy including local drug delivery.

Periodontal assessment: One periodontist/dental officer using set criteria examined each subject and clinical attachment loss (CAL) using a standard Williams probe as needed. The CAL was estimated according to a three-point scale^[6] [Tables 1 and 2]:

Scale 1: CAL 0-2 mm

Scale 2: CAL 3-5 mm

Scale 3: CAL > 5 mm

The treatment plan was charted as per the scale of assessments. Scale 1 subjects were identified as healthy cases. Scale 2 patients were kept under observation and periodic checkup. These individuals were educated regarding the disease progression, susceptibility, and importance of periodontal care protocol. Scale 3 subjects were taken up

Table 1: Clinical attachment loss (CAL) of different groups

Stream	N	Scale 1	Scale 2	Scale 3	% of subjects detected with active periodontitis
Nonflying branch (Group 1)	126	96	23	7	5.6
Flying branch (Group 2)	126	77	36	13	10.3
Sum total	252	173	59	20	7.9

N = Total subjected examined in a group, Scale 1 = CAL 0-3 mm (no treatment), Scale 2 = CAL 3-5 mm (nonsurgical therapy/periodic checkup), Scale 3 = CAL > 5 mm (require active periodontal treatment)

Table 2: Clinical attachment loss (CAL) among flying groups

Stream	N	Scale 1	Scale 2	Scale 3	% of subjects detected with active periodontitis
Fighter	29	20	6	3	10.3
Helicopter	41	24	12	5	12.2
Transport	56	33	18	5	8.9
Sum total	126	77	36	13	10.4

N = Total subjected examined in a group, Scale 1 = CAL 0-3 mm (no treatment), Scale 2 = CAL 3-5 mm (nonsurgical therapy/periodic checkup), Scale 3 = CAL > 5 mm (require active periodontal treatment)

for different type of surgical periodontal therapy as per the severity of the case.

After the completion of the study, appropriate statistical analysis was carried out. After the phase I therapy, subjects who scored “5 mm” of CAL or above were defined as periodontitis cases and were taken up for surgical mode of therapy. All measurements were taken by the same examiner using a Williams graduated periodontal probe (Hu-Friedy Co., Chicago, USA) and the measurements were recorded to the nearest 0.5 mm. The examiner used a Williams graduated periodontal probe (with markings of 1, 2, 3, 5, 7, 8, 9, and 10mm) which was introduced into the interior of the gingival sulcus following the length of the tooth until resistance was felt by the penetrating probe.^[7] Ten individuals were presenting with pain, difficulty in mastication, and severe bleeding from gums. They also felt discomfort at high altitude in nonpressurized aircraft. Since it was a pilot study, no attempt was made to measure the CAL using a radiograph.

Even though the treatment part was not carrying much role to this study, it would be more meaningful to mention how the cases were treated with. The surgical management was done for cases with more than 5 mm CAL. Standard periodontal flap surgery with or without bone graft substitute material was performed. The patient was reviewed for a period of 12 months postoperatively at regular intervals. These nonsurgical cases were managed by standard phase 1 therapy as per the clinical severity of the conditions. The radiographs were taken for surgical cases with Dental RVG Systems Kodak 5100 system.

RESULTS AND STATISTICAL ANALYSIS

The present study is purely a pilot study which was undertaken to assess the incidence of periodontitis in aviation field of armed forces. Since there were no similar kind of study attempted in armed forces in the past, this study was selected for a pilot study. Total of 252 individuals were included in this study. Irrespective of any grouping, all the subjects were recalled postoperatively at 1, 6, and 12 months for checkup and various data recording. Various clinical recordings so obtained were presented in tabular form. Out of 252 individuals examined in this study, active forms of periodontitis (CAL was more than 5 mm) were found in 7.9% of the total population. Group 1 (ground duty branches) showed an incidence rate of 5.6% and Group 2 (actively involved in flying) with 10.3% [Figures 1 and 2]. Among Group 2 subjects, 12.2% were helicoptercrews, 10.3% from fighter streams, and 8.9% were the transport crews [Figure 3]. The average flying hours was more than 2,000 h per individuals.

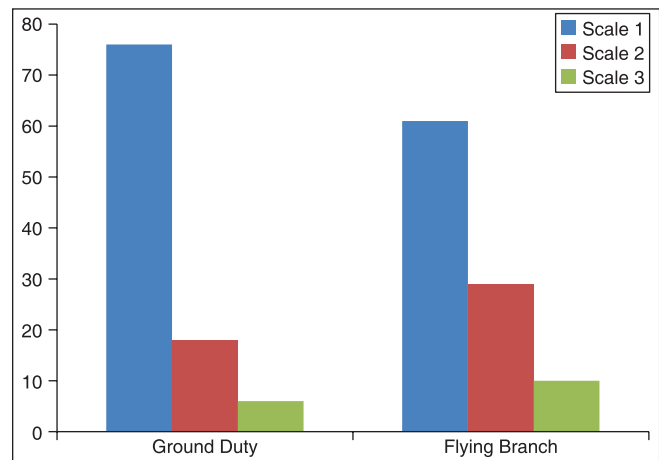


Figure 1: Percentage of scales - flying and non flying groups

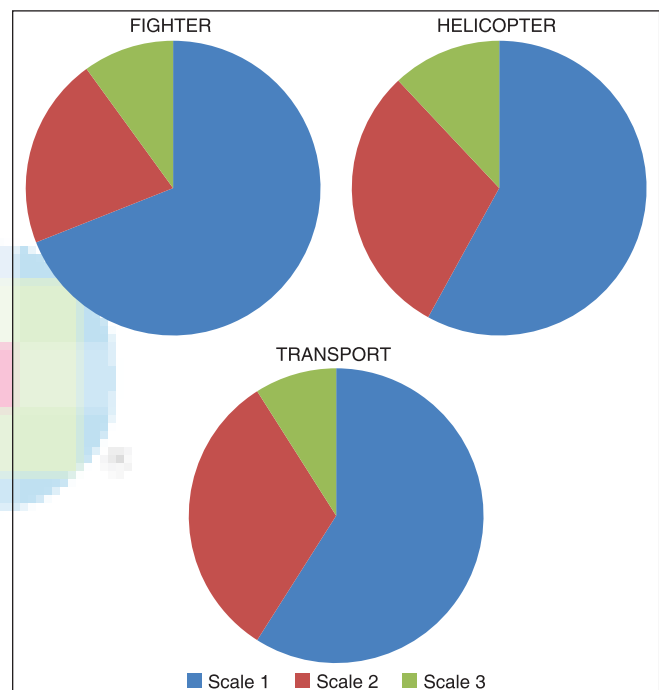


Figure 2: Pie diagram showing percentage of scales

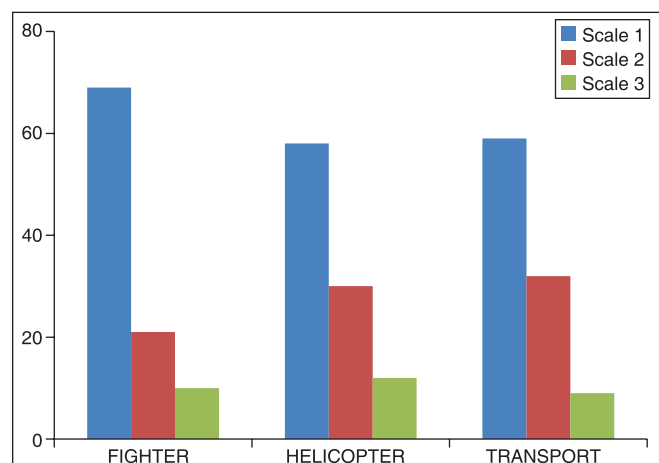


Figure 3: Percentage of scales - among flying groups

The stress and job satisfaction level were analyzed clinically by questionnaires given to all subjects listed in the study. The survey was completed with the help of short form of MSQ and collected the data promptly with maintaining confidentiality and anonymity of the respondents. The result shows that Scale 3 individuals were exposed to more occupational stress than the others.

Of the total subjects selected for this study, 20 subjects were diagnosed as active periodontal diseases cases (Scale 3) who reported more than 5 mm CAL. They were taken up for periodontal surgical modalities. Fifty-nine subjects were diagnosed as Scale 2 and were managed nonsurgically. The rest of 173 cases (Scale 1) did not show any clinical parameters of periodontal disease and diagnosed as healthy. The difference in the prevalence of periodontal diseases among Group 1 was analyzed by means of chi-square for independence tests with *P*-value of 0.05, thus being statistically significant denoting a positive relationship between aviation as occupational stress and the presence of periodontal diseases.

DISCUSSION

While stress has long been linked to many health problems, researchers studied the effects of stress on dental health, especially in periodontal tissues at the State University of New York at Buffalo and University of North Carolina. But no similar kinds of studies were attempted to find out any correlation between stress and periodontitis in the field of military aviation filed.

Rapid attachment loss and bone destruction in otherwise healthy individuals are the main feature of aggressive periodontitis which leads to an early teeth loss.^[8] It is important to recognize the objectives of the management of periodontitis to increase the longevity of the teeth and associated periodontal structures. A functionally adequate periodontal support is mandatory to maintain the masticatory function of the individual.

Recent studies show that besides genetic influences, environmental factors may affect the clinical expression of periodontitis. Stress and smoking are two major environmental factors which can influence the extent of destruction seen in affected individuals. Patients with generalized aggressive periodontitis who smoke have more affected teeth and more loss of CAL.^[9]

The association between psychosocial stress and periodontal disease had been addressed by various authors in the past. The impact of stress on the immune system has been well-established and possible influences on a chronic inflammatory disease like periodontitis. Multiple variables affecting the severity of periodontal disease and the uncertainty about the individual onset of periodontal disease

complicate the issue further. Nevertheless, more recent studies indicate that psychosocial stress represents a risk indicator for periodontal disease and should be addressed before and during treatment.^[10]

One of the few human studies in Indian population by Mannem and Chava^[11] to evaluate the important role of psychological stress and hyperactivation of the hypothalamus-pituitary-adrenal axis on chronic periodontitis. The result shows psychological stress was associated with chronic periodontitis in the age group of 40 years and above, establishing a risk profile. The authors recommended more periodontal care to patients who are under stress to avoid initiation of periodontal disease along with the treatment to reduce the stress. A longitudinal study by Linden *et al.*,^[12] evaluated the association between occupational stress and the progression of periodontitis in employed adults. Clinical measurements of periodontal status including clinical attachment level were made at four proximal sites on all teeth. A questionnaire, the occupational stress indicator, was used at the second examination to assess stress retrospectively. The results suggest that occupational stress may have a relationship to the progression of periodontitis.

Due to the nature of duty, armed forces personnel are under occupational stress compared to the civilian counterpart. Aviation crew members, in particular, represent a population that is constantly exposed to occupational stress, even during peacetime. Stress, the unique bond between the environmental demands toward the individual and his ability to cope with them, is associated with undesirable physical consequences. The relationship between stress and the periodontal disease is established, but not yet well-documented in relation with military personnel.

A total of 252 flying related individuals were examined during the study period. The subjects were equally divided into ground duty personnel (*n* = 126) and flying-related personnel (*n* = 126). It was concluded that 5.6% of Group 1 members and 10.3% of the Group 2 subjects were having active form of periodontitis. Among Group 2 individuals, 12.2% were helicopter crews, 10.3% fighter pilots, and 8.9% from transport stream. The increase in the incidence of periodontitis among aircrew members may be due to environmental stress which acts as a contributing factor. At the end of the study period, the result revealed a high incidence of periodontitis in individuals who were involved in flying.

A study by Horning *et al.*,^[13] involving 1,984 males and females (age range 13-84) at a military dental clinic were given oral examinations with full-mouth circumferential periodontal probing. Diagnoses were made both for individual quadrants and for the entire mouth using clearly defined diagnostic

criteria. The results showed 37% of the subjects had gingivitis only, 33% had early periodontitis, 14% had moderate periodontitis, 15% had advanced periodontitis, 0.5% had juvenile periodontitis, and 0.5% had necrotizing gingivitis. The prevalence of periodontitis increased with age to a peak in the 45- to 50-year age group.

Various treatment modalities have been tried for the treatment of periodontitis in the past; which are:^[8]

Extraction of the affected hopeless teeth: Usually first molar extraction was carried out to facilitate an uneventful healing. Transplantation of developing third molar to the sockets of previously extracted first molars has also been attempted.

Standard surgical therapy

Such therapy included curettage; various flap surgery with and without bone grafts enhancing regeneration of periodontium, periodontal resective therapy, use of barrier membranes, root amputation, and hemisection along with strict plaque control [Figures 4-7].



Figure 4: Flap with Osseograft

Nonsurgical therapy

Use of local drug delivery has been suggested as a rational complement to mechanical debridement. Also systemic antimicrobial therapy with the appropriate agent is usually initiated immediately upon completion of the surgical intervention. These can be described as the nonsurgical type of management for periodontitis.

The presence of symptomatic periodontitis compromises the quality of life of aircrew and result in an early removal of teeth. It is recommended that an immediate intervention by periodontist for quick recovery and return to professional activities in the aircrew is highly mandatory. In the absence of guidelines on the issue of periodontitis, it is proposed that as a rule of thumb, a specialist exam for use as part of each soldier's annual dental examination is mandatory with individual case variations based on clinical finding. This kind of annual medical examination is part of a soldier's routine examination which is done once in a year.

The limitations of this study were the presence of various confounding factors and biases such as age, diet, built, genetic factors, smoking, oral hygiene, etc. However, the high incidence of periodontitis amongst the subject as a preliminary random study without any other parameters definitely raises the thought for a more extensive probing into the occurrence on a larger population and a more exhaustive

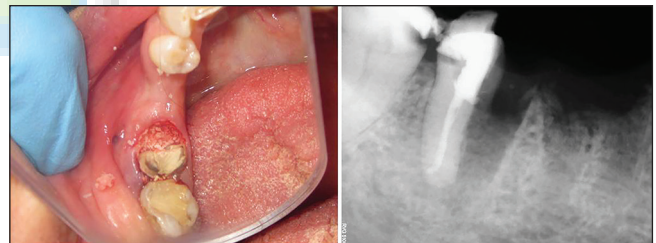


Figure 5: Hemisection with bone graft



Figure 6: Flap with osseoplasty



Figure 7: Flap with Osseograft and guided tissue regeneration (GTR)

definition of study parameters to exclude the mentioned biases and confounding factors. Radiograph was not used for assessing the loss of clinical attachment because it was an initial kind of pilot study.

CONCLUSION

Periodontal diseases are one of the divesting conditions which lead to early loss of teeth and compromise the quality of life. While stress has long been linked to many health problems, researchers studied the effects of stress on dental health, especially in periodontal tissues. The military flying is a typical field where the individual undergoes a lot of stress while performing the flying duty. It is mandatory for the quick recovery from this disease and return to professional activities in the aircrew. The present study was undertaken to assess the incidence of periodontitis in aviation scenario. Out of 252 aviators examined in this study, periodontitis was found in 7.9% of the total population. Among the aviators, the helicopter crews, fighter pilots, and the transport crews showed different percentages of active periodontal diseases. The results suggest that the tremendous amount of stress can affect the periodontal health of flying crew when the individual perform the duty. It is recommended to diagnose the diseases in an early stage to facilitate better response to standard periodontal therapy and the more predictable outcome. The annual medical checkup must include a thorough check up by a dental officer/periodontist and an appropriate radiological examination once in 3 years. The screening exam used is suggested for use as part of each aviator's annual dental examination. However, the authors suggest a more detailed study with larger sample size, long follow-up period and use of radiographs can be considered in future.

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