IN-FLIGHT BARODONTALGIA AMONG COMMERCIAL AND MILITARY PILOTS OF PAKISTANI ORIGIN.

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Abstract

Background: Barodontalgia is defined as oral pain occurring due to changes in ambient pressure. It can be severe enough to cause in-flight incapacitation and has a tendency to go undiagnosed in regular sickbays. There is a large variation in incidence of Barodontalgia in the literature and major fraction of epidemiological data on Barodontalgia has been compiled from military flight simulations. The aim of this study was to document the frequency of in-flight Barodontalgia in Pakistani military and civilian aircrew.

Methods: A cross-sectional study was conducted on (non-patient) civilian as well as military pilots. Subjects were given standardized and anonymous questionnaires to complete regarding demographic and professional characteristics, occurrence of oral pain during flying, character of pain, treatment seeking and recurrence of the pain.

Results: Out of the 100 subjects, 51 responded (response rate of 51%), with mean age 30.31 ± 5.634 Years; 17.6% (09) of these participants (All Civilian) reported at least one event of barodontalgia during their career. A total of 88% (8/9) of pilots visited their dentists after they had oral pain. The diagnosis rendered by their dental surgeons was always dental pain. None of the patients reported recurrence of the disease or premature mission termination due to dental pain. None of the military Pilots reported any event of Barodontalgia.

Conclusion: Barodontalgia was reported exclusively by commercial pilots, which was of a minor non-recurrent nature and did not disrupt their health or flight routines.

Keywords: Aviation dentistry, human performance barodontalgia, flight safety
Introduction

Ever since the Wright brothers invented the aero plane, flying has only become safer. Aviation sector has expanded with increasing numbers of aircraft, air passengers, pilots and air crew. Dental surgeons encounter Barodontalgia as an emergency (1). Barodontalgia is a dental pain evoked by changes in barometric pressure in an otherwise asymptomatic tooth. Inhospitable flying environment along with ambient pressure changes affects oral & maxillofacial region which might cause pain or trauma affecting air crew, aircraft passengers as well as aviators. It has been shown to adversely affect personnel’s operational capability and performance. In some instances, Barodontalgia has been identified as the only cause of an aircrew member suddenly becoming incapacitated, thus hazardously compromising the safety of the affected person as well as others (2).

The incidence of barodontalgia in aircrew has been reported to vary from 0.26% to 49.6% (3,4). It is ranked fifth in the physiological complaints of the trainees, and third as a causative factor of premature retirement (5). Literature search did not reveal any published studies on this topic from Pakistan, thereby resulting in a total gap of knowledge related to this phenomenon (6).

Despite the rarity of phenomenon, Barodontalgia has been known to occur across a broad range of altitudes (1). It has no predilection to any age group. Several factors have been hypothesized that make teeth susceptible to barodontalgia such as circulatory disturbances in an abnormal pulp, expansion of trapped air bubbles under a root canal filling or against dentin that activates nociceptors; stimulation of nociceptors in the maxillary sinuses, with pain referred to the teeth; and stimulation of nerve endings in a chronically infected pulp. Kollman has reported histologic evidence of chronic pulpitis in an amputated pulp. Kollman has reported histologic evidence of chronic pulpitis in an amputated pulp (7).

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The objectives of this study were to estimate the current in-flight incidence of Barodontalgia among Pakistani military aircrew members and commercial crew at selected bases and centers recurrence of Barodontalgia after treatment and Accidents secondary to Barodontalgia.

Methodology

The present survey was conducted at a pre authorized air base and airport in Pakistan on healthy Military and Commercial pilots based on data collected from March 2016 to April 2017. An exclusive questionnaire was administered to 100 subjects with incorporated questions regarding Age, Gender, Type of Flying (Commercial/Fighter), In Flight Pain, Type of Pain, Treatment seeking, Performance limitation and recurrence. Informed consent was obtained from subjects through an information sheet which explained the nature and reason of study. Anonymity was maintained by excluding the names or any other identification. No subjects fewer than 18 years and above 60 years were included. A total of 100 questionnaires were distributed 50 among each category. The collected data were analyzed for descriptive data using the IBM Statistical Package for Social Sciences (SPSS) program version 22.

Results

The response rate was 51%, out of which 31(60.8%) subjects were engaged in civilian commercial flights and 20(39.2%) in military flying (Table 1).

Table 1. Demographic data of military and commercial pilots (n=51).

| Variables               | Military (n=20) | Commercial (n=31) | Total | P value |
|-------------------------|----------------|-------------------|-------|---------|
| Gender                  | Male           | Female            |       |         |
|                         | 20             | 23                | 43    | 0.013   |
|                         | Female         |                   | 08    |         |
| Age Groups              |                |                   |       |         |
| 20-30                   | 16             | 16                | 36    | 0.255   |
| 31-40                   | 06             | 12                | 18    |         |
| 41-50                   | 0              | 03                | 03    |         |
| History of Past Dental Treatment|                |                   |       |         |
| Yes                     | 09             | 20                | 29    | 0.139   |
| No                      | 11             | 11                | 22    |         |
| Barodontalgia           |                |                   |       |         |
| Yes                     | 0              | 09                | 09    | 0.007   |
| No                      | 20             | 22                | 42    |         |
| Recurrence of Pain      |                |                   |       |         |
| Yes                     | 00             | 00                | 00    | No Statistics are Compared |
| No                      | 20             | 31                | 51    |         |

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Methodology

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![Figure 1: Pie chart showing distribution of cases of barodontalgia among commercial personnel (n=32).](image-url)
Discussion
This pioneer study was conducted to document the incidence of barodontalgia among civilian and military pilots in Pakistan at selected air base and airport. Considering the size of population in other studies such as that of Fleury et al (7), Kollmann et al (4), and Gonzalez Santiago (8) the present sample may seem small, but this is because it was conducted in one single airbase and airport. A positive aspect of the study is that the obtained results are from real flights whereas most of the other studies have results obtained from flight simulations.

The proportion of pilots (Civilian and Military) at selected bases that have already experienced barodontalgia was 17.64% collectively. However, the data showed that there was a higher incidence of barodontalgia in commercial pilots (29.03%) as compared to military pilots (0%). The results are consistent with some previous studies such as Rai et al (9) who determined prevalence rate of 20.6% in Indian origin commercial pilots, whereas Laval Meunier et al (10) estimated barodontalgia in 59.5% of French commercial pilots. The reason for increased prevalence of phenomenon among commercial pilots might be that it is assumed that commercial pilots are usually subjected to less rapid maneuvers and extreme situations than their military counterparts; it is assumed that they are less vulnerable to the pathologic consequences of rapid pressure (13).

In this study, no case of barodontalgia was reported among military pilots, which is in accordance with some past studies. In a study Kollmann et al (4) recorded incidence of 0.26% in German air force crew whereas in a research conducted by Gonzalez et al (8) among Spanish in-flight personnel who underwent the obligatory official examination at the Stratis Air Command Hospital estimated 0.3-2.6% prevalence of barodontalgia. Cumhar Sipahi and colleagues has reported 0.003% prevalence among four air base pilots of the Turkish air force (12). The results were divergent from other studies done by Wadha Al-Hajri and Ebtissam Al-Mad (3) who recorded incidence of 0.26% in German air force crew and 0.3-2.6% prevalence of barodontalgia at the Straits Air Command Hospital estimated 0.3-2.6% prevalence of barodontalgia.

Khawalde MA et al recorded prevalence among four air base pilots of the Turkish air force (12). The results were divergent from other studies done by Wadha Al-Hajri and Ebtissam Al-Mad (3) and 10.2% by Rai(9)and colleagues; this difference points to optimal standards of care in both military and commercial industry. It could also reflect the underlying cause as being tooth disease rather than atmospheric or flying conditions. This would also agree with the fact that military pilots have more stringent and regular dental checkups and a strict fitness criteria thereby having healthier oral health.

Conclusion
Barodontalgia was reported exclusively by commercial pilots, which was of a minor non-recurrent nature and did not disrupt their health or flight routines.

Recommendations
Dental Surgeons should be well informed of barodontalgia and use of preventive measures (check-ups, prophylactic scaling and oral hygiene education). It is recommended that more studies specific to air flight centers be performed to estimate the full extent of the problem. The factors affecting the incidence and translate the preventive measures into practice; furthermore to improve the understanding of barodontalgia, its pathogenesis, prevention and treatment.

The implementation of large prospective cohorts is necessary for long-term follow-up of the patients. Finally, before researchers can provide tools to predict barodontalgia, thorough periodic clinical and radiographic oral and dental examinations are necessary to reduce the occurrence of barodontalgia in pilots and crewmembers.

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