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SM Journal of Clinical Medicine

Review Article

# Prevalence of Backache in Aircraft Pilots

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**Article Information**

Received date: Nov 21, 2015
Accepted date: Dec 10, 2015
Published date: Dec 15, 2015

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**Keywords** Backache; Aircraft Pilots; Prevalence

## Abstract

**Aim:** We sought to determine the prevalence of Backache (BA) among pilots and the influence of the aircraft type, and factors that may be associated with it.

**Methods:** Pilots who had experienced BA underwent radiographic + MRI imaging. Demographics, flight experience (years), daily physical exercise, flight hours, type of aircraft as well as associated Neck Pain (NP) were assessed; data were analyzed via the Kolmogorov-Smirnov test, Student's t-test Mann-Whitney U-test and the chi-square test.

**Results:** The pilots (133) had a mean age of 37.21±8.01 years. The mean ± SD of professional experience was 17.67±7.63 years; daily Physical Exercise (PE) duration in pilots with BA was 22.57±12.56 minutes and in pilots without BA was 30.20±18.38 minutes (P=0.03). A significant difference was noted in work experience, daily PE duration and flight hours among pilots with BA (P=0.002, 0.034, and 0.029 respectively). Also, there was a significant relationship of BA and NP (P=0.004).

**Conclusion:** Our study showed BA more common among helicopter pilots HPs but was not significant. The relationship between daily PE and flight hours among pilots with BA suggests physical exercise as an important mode of early prevention.

## Introduction

General medical practitioners in the air force often find Backache (BA) an occupational sequel in pilots. BA is often due to prolonged sitting, ineffective lumbar support, poor posture, having to lean forward to reach for navigational buttons and vibrations that can produce disc damage via micro-trauma [1]. It is difficult to make a clear association between the type of aircraft and BA [2]. However, the higher incidence of BA in Helicopter Pilots (HP) has been attributed to vibrations (of around 5 Hz) as well as in-flight posture [1,3,4]. Andersen assessed the occurrence of spinal pain, i.e., low back and neck pain, among commercial helicopter pilots, along with possible associations between pain and anthropometric and demographic factors and flying exposure. He found Spinal pain to be a frequent problem [5]. BP in fighter pilots remains a serious occupational problem and found that recent advances such as the Joint Helmet Mounted Cueing System (JHMCS) in modern air combat can contribute to the development of spinal complaints in F-16 pilots [6]. Nagai found Low Back Pain (LBP) to be one of the most common musculoskeletal issues facing military helicopter pilots and stated that it is clinically important to identify differences in musculoskeletal characteristics between pilots with and without a LBP history for formulating effective interventions [7]. He found specific exercises targeted to improve trunk strength, ROM, and side-to-side symmetries may be beneficial to reduce LBP in helicopter pilots [7]. Herein, we sought to determine the prevalence of vertebral problems among 133 pilots, seeking the presence of Backache (BA), the type of aircraft and other factors associated with it.

## Methods

We assessed all pilots of one air force base in eastern Tehran. BA, the type of aircraft and factors associated with it were sought. Pilots who had experienced BA underwent radiographic + MRI imaging. Demographics, flight experience (in years), daily physical exercise, flight hours as well as associated Neck Pain (NP) were assessed; data were analyzed via the Kolmogorov-Smirnov test, Student's t-test Mann-Whitney U-test and the chi-square test.

## Results

There were 133 pilots with a mean age of 37.21±8.01 years, [pilots with BA were aged 39.62±7.98 years and pilots without were 35.36±7.69 years (P=0.079)]. Tables 1-3 depicts demographic, descriptive data and aircraft data. The Mean±SD of flight hours in pilot with NP was 1795.32±1849.98 hours. There was no association between flight hours and NP (P=0.119) (Table 1). But a significant difference was noted in work experience, daily PE duration and flight hours among pilots with BA (P=0.04, 0.034, and 0.029 respectively, Table 1). Also, there was a significant relationship between BA and NP (P=0.004) (Table 2). Pilots from 47 transport planes (Antonov), 16 fighter

planes (Sukhoi) and 59 helicopters (MI17) were assessed; 56/133 pilots (43.1%) had BA (Table 3). However, here was no significant association between BA and aircraft type (P=0.358, Table 3). The mean±SD of professional experience was 17.67±7.63 years and daily Physical Exercise (PE) duration in pilots with BA was 22.57±12.56 minutes; PE in pilots without BA was 30.20±18.38 minutes (P=0.03) (Table 1). There was significant association between flight hours and BA (P=0.002) (Table 1).

**Table 1:** Study variables and data.

| VARIABLES | MEAN | P value |
|---|---|---|
| Age average<br>Age With BA<br>Age Without BA | 37.21±8.01 years<br>39.62±7.98 years<br>35.36±7.69 years | <br>P=0.079<br>- |
| Flight experience among pilots with BA<br>Flight experience among pilots without BA | 21..4±7.21 years<br>16.05±7.48 years | 0.04<br>- |
| Daily physical exercise among pilots with BA<br>Daily physical exercise among pilots without BA | 22.57±12.56 minutes<br>30.20±18.38 minutes | P= 0.029<br>- |
| Flight hours with NP | 1984.80±1494.69 hours | |
| Flight hours without NP | 1948.78±1849.98 hours | 0.119 |
| Flight hours with BA | 2154.00±1969.41 hours | |
| Flight hours without BA | 1488.56±1707.66 hours | 0.029 |

**Table 2:** Main result variables and data.

| VARIABLES | MEAN | P value |
|---|---|---|
| Number<br>With BA<br>Without BA | 133<br>56<br>77 | - |
| BA and NP relationship | - | P=0.004 |

**Table 3:** BA and aircraft association.

| Pilots | Aircraft | P-value |
|---|---|---|
| 47 total<br>With BA<br>Without BA | transport planes (Antonov),<br>22 (48.6%)<br>25 (53.2%) | |
| 16 total<br>With BA<br>Without BA | fighter planes (Sukhoi)<br>4 (26.75%)<br>11 (73.3%) | 0.358 |
| 59 total<br>With BA<br>Without BA | helicopters (MI17)<br>27 (45.8%)<br>32 (54.2%) | |

## Discussion

BA is relatively common in pilots. While passengers have the luxury of getting up and moving around in the cabin, pilots and co-pilots spend most in-flight hours confined to the cockpit; thus, predisposing them to musculoskeletal problems namely BA and cervical pain. Injury prevention is one of the cornerstones of aviation healthcare [4] both in military [8] and civilian [1] populations; prevention is facilitated by early identification of risk factors [8].

Among the potential causes and risk for developing BA in high-performance aircrafts are G-forces. G-forces are forces that counteract the physiological acceleration of the body [2,4].

Wagstaff noted neck pain in fighter pilots to be relatively common. He assessed age, aircraft type, flying hours, and physical activity on NP. Any experience of spinal symptoms related to flight was included, as well as detailed questions on operational factors. Estimates regarding how NP influenced flying performance were established using a Visual Analogue Scales (VAS). Pilots also described their own in-flight techniques to avoid neck symptoms; 72% had experienced NP in flight, while 35% had experienced BP. Of these episodes, 93% were related to neck rotation. Mean G level for an acute incident of in-flight pain was 6.7 G [9]. Wagstaff stated new technologies such as night-vision goggles and helmet-mounted displays to increase helmet weight, thereby adding higher strain on the neck even in moderate G force environments [9].

We noted significant difference was noted in work experience, daily PE duration and flight hours among pilots with BA (P=0.002, 0.034, and 0.029 respectively). Andicochea stated LBP in the aviator to be a significant safety risk because it is a distraction during flight. He found Osteopathic Manipulative Therapy (OMT) as an adjunct to treatment of LBP and showed chronic LBP to respond to three OMT sessions focused at the sacrum, lumbar, and pelvis [10].

One study compared BA in fighter pilots, transport pilots, and HPs and showed that fighter pilots had significantly more chronic pain, longer lasting pain, pain requiring bed rest, and radiating pain to the leg [8]. With regard to G-force, another study found pilots exposed to high G-forces to be at a greater risk for neck pain than those exposed to low G-forces [11]. Orsello [12], found increase in height to increase the odds for developing BA in helicopter pilots. One of the limitations of our study was that we failed to assess this parameter. Our study showed BA was significantly more common among HPs compared to the other aircrafts.

## Conclusion

Our study showed BA was significantly more common among HPs. The relationship between daily PE and flight hours among pilots with vertebral pain suggests physical exercise as a mode of early prevention.

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