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Study of low back pain in Indian armed forces: Issues and future challenges

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Abstract

Introduction: Low back pain (LBP) is one of the commonest disabilities affecting serving personnel of Indian armed forces. Till date there is no consistent data linking LBP to the job profile of air force personnel performing duties on ground or in flight. High gravitational force, whole body vibrations, working in closed space or high altitudes have effect on lumbar spine. With advent of space travel, problem of lumbar spine will be compounded by microgravity and radiation exposure. This study aims to study the prevalence of low back pain in Indian armed forces. An attempt is made to find the risk factors affecting the lumbar spine among pilots, paratroopers, deep sea divers and ground personnel.

Materials & Methods: This observational study covered a period of six years (2012 to 2018). Data was collected from medical directorates & Service Hospitals regarding prevalence of LBP. Factors studied were, hospital admissions, demographic characteristics and type of LBP among personnel of all three services. Data collected was compared with that of the world militaries. Analysis was done to find the risk factors affecting lumbar spine in pilots, commandos, deep sea divers and ground duty Air force personnel.

Observation & Results: The prevalence of LBP was found to be 0.35%, 1.98% and 0.82% in Army, Air Force and Navy respectively. Total Hospital admissions in 2012 were 4513 while in 2018; it was 4834. LBP affected 70% of personnel between the age group of 30 to 39 years. Air force pilots with 10 to 15 years of service had maximum complaints of LBP. The job profile did not show a definitive association. Astronauts had a 53–68% increased risk of experiencing LBP and a fourfold increased risk of developing herniated intervertebral discs during microgravity exposure and within one-year post flight.

Keywords: low back pain, job profile, gravitational force (g), whole body vibration (WBV), low medical category (LMC)

Introduction

The annual global firepower review of 2019 ranks India as 4th among the 137 countries in terms of military strength. Of this Land strength is ranked 6th, Aircraft strength is ranked 4th and Naval Assets at 7th out of 137 world militaries. In order to maintain itself at a high level of preparedness the serving personnel need to be physically fit and in combat readiness.

Low back pain (LBP) is one of the commonest disabilities affecting serving personnel of Indian armed forces. Across the globe, it is one of the most common forms of chronic pain^[1], and is a significant cause of disability and cost to society^[2]. In Indian Armed forces; it is one of the commonest reasons, to seek health care.

The Armed Forces Personnel depending on their job profile have a tendency to adopt faulty posture while performing strenuous physical work resulting in aggravation of their existing disability. These factors lead to substantial loss of manpower & working hours. Reduction of disability from LBP is a significant research priority.

Till date there is no consistent data linking LBP to the job profile of air force personnel performing duties on ground or in flight. High gravitational force, whole body vibrations, working in closed space or high altitudes seem to have an effect on lumbar spine.

With advent of space travel, problem of lumbar spine will be compounded by microgravity and radiation exposure. This study aims to study the prevalence of low back pain in Indian armed

forces (all three services). An attempt is made to find the risk factors affecting the lumbar spine among pilots, paratroopers, and ground service personnel.

Materials and Methods

This observational study covered a period of six years (2012 to 2018). Data was collected from medical directorates & Service Hospitals regarding prevalence of LBP. Factors studied were, hospital admissions, demographic characteristics and type of LBP among personnel of all three services. Data collected was compared with that of the world militaries. Analysis was done to find the risk factors affecting lumbar spine in pilots, commandos, and ground duty Air force personnel.

Observation and Results

The prevalence of LBP was found to be 0.35%, 1.98% and 0.82% in Army, Air Force and Navy respectively. Total Hospital admissions in 2012 were 4513 while in 2018; it was 4834. LBP affected 70% of personnel between the age group of 30 to 39 years.

Air force pilots with 10 to 15 years of service had maximum complaints of LBP. The job profile did not show a definitive association. Study on Astronauts returning from outer space flights reveal a 53–68% increased risk of experiencing LBP and a fourfold increased risk of developing herniated intervertebral discs during microgravity exposure and within one-year post

flight.

Table 1: Showing the Hospital admission in service hospitals due to spine related problems. [Source: Medical & Health (MISO) (2012-2018)]

Year	Number of admissions in Service hospitals(n=35560)
2012	4513
2013	4645
2014	5053
2015	6017
2016	5314
2017	5184
2018	4834

Table 2: Showing the Demographic character of the population studied.

Characteristics	Study population(n=35560)
Age Group (years)	
<25	5334(15%)
25-29	1778(05%)
30-39	24892(70%)
> 39	3556(10%)
Years of Service	
<05	1067(3%)
5-10	3556(10%)
10-15	28448(80%)
>15	2489(07%)

Army (Ground Forces)

The prevalence of LBP is 0.35% in Army. Army constitutes the maximum strength of personnel’s among the three services. It also has soldiers working in a wide spectrum of geographical terrain and climatic conditions. The Para troopers & Infantry soldiers have a more physically demanding job as compared to supporting services. Keeping in view their job profile, they are more prone to developing LBP.

Table 3: Showing the distribution LBP among various Arms & Services.

Arms and Services	Percentage (n= 35560)
Infantry	28946(81.4%)
Artillery	4125(11.6%)
Services	2489 (07.0%)

Table 4: Showing the characteristic of pain suffered by the LBP afflicted serving personnel.

Characteristic of pain	Percentage(n=35560)
Vertebral pain	27737(78%)
Vertebral + Radicular pain	6401(18%)
Radicular pain	1422(04%)

Air Force

Data accessed of 2019 shows that 2622 Air Force personnel are in LMC. 802 personnel in flying duties are in LMC of which 226 consist of those with spine related problems. Among the pilots a total of 105 are in LMC for spine related problems. Fighter pilots constitute 70 while transport and Helicopter pilots constitute 18 and 17 respectively.

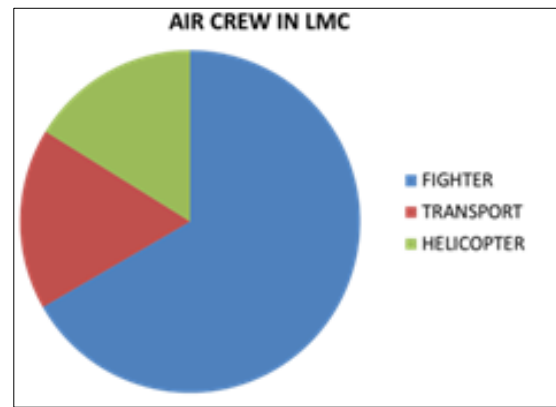


Fig 1: Pie chart showing the distribution of Pilots in LMC.

High Performance aviators (Fighter Pilots)

Literature search and our observation reveal higher aircraft performance is associated with higher prevalence of spine injuries. Increasing pilot’s age is associated with increased prevalence of major injuries. Commonest G associated injury was muscle strain. Muscle strengthening exercise may be helpful in prevention and early recovery. High G exposure predisposes pilots to slight increase in occurrence of cervical disc degeneration [3].

Helicopter Pilots

Transportation systems such as airplanes, trains, sea vessels, and cars induce whole body vibrations (WBV) that affect pilots and passengers. WBV refers to the transfer of low-frequency vibrations to the whole body from the body contact area, such as the seat of a truck, tractor, bus or other vehicle, or the floor of a workplace. Prolonged exposure to WBV causes physiological effects and is associated with musculoskeletal disorders and diseases of the nervous, digestive, and circulatory systems [4-8].

In musculoskeletal disorders, the incidence of low back pain, degenerative osteoarthritis, disc changes, and herniated nucleus pulposus in spines are higher in employees with job categories involving WBV exposure than in those without WBV exposure [9-11]. Helicopter pilots are exposed to higher WBV levels than fixed-wing aircraft pilots [9]. Helicopters are increasingly used for firefighting, rescue, sightseeing tours, and military operations. Recent studies have observed lower back and neck pain in helicopter pilots [12-16]. Causes include occupational conditions, such as long work duration, flight time, flight accelerations, helmets and headgear, and awkward postures during the flight, as well as general conditions, such as age, being overweight, smoking, and drinking [17]. The Institute of Aerospace Medicine Bangalore have done extensive studies to determine the cause of LBP by evaluating the Human factor and getting inputs from pilots by way of structured questionnaires [18, 19]. Our study in Indian Air Force has showed a clear association of poor seat design, prolonged sitting in postures unfavorable to spine as the main cause of LBP rather than WBV.

Some studies have shown that fixed-wing aircraft pilots and helicopter pilots have more degenerative changes in the cervical and lumbar spines than non-flying controls [20, 21], but other studies have reported no relationships between musculoskeletal disorders suffered by pilots and job-related factors, especially regarding WBV [22, 23]. There is currently insufficient evidence to

indicate an exposure-response relationship between exposure to seated WBV and lower back disorders [24,25].

This study was carried out to examine the relationship between helicopter flight and degenerative changes in the cervical and lumbar spines. Although not conclusive, Helicopter Pilots may have detectable degenerative lumbar findings [26]. This may be a contributory factor for LBP.

Paratroopers

Lumbar intervertebral disc degeneration (IVD) is a dominant factor in the etiology of LBP [27] and is an age-related process which may be influenced by many factors such as genetics [28], systemic disorders [29] and nutrient supply to the disc [30]. Mechanical overloading has been identified as a major Extrinsic component in the onset and progression of Prolapsed Intervertebral Disc [31]. Recently, it has been reported that asymmetrical axial compression loading can induce IVD affecting cellular and structural responses [32]. It is well known that significant axial forces act on the spine during parachuting. At the moment of parachute opening, the spine is subjected to decelerations in the order of 4 g for a standard military parachute and on landing, peak deceleration g-forces on the spine are 3.2–17 g, depending on the type of parachute [33]. Since the maximal spinal tolerance to deceleration g-forces has been reported to be at 20 g [34], the spinal column can tolerate the axial force during parachuting.

In our study there was no significant difference in prevalence of LBP among Paratroopers and ground duty personnel. The probable reason is the physical preconditioning which plays an important role in withstanding abnormal stress and overload to spine.

Conclusion

Indian Armed forces is ranked 4th best among the world militaries. Low Back Pain is a fairly common condition afflicting the serving personnel of Indian armed forces belonging to different arms and services. Depending on the job profile people have a tendency to adopt faulty posture while performing strenuous physical work resulting in aggravation of their existing disability. These factors lead to substantial loss of manpower & working hours. Amongst pilots they also raise issues about flight safety and operational readiness. Reduction of disability from LBP is a significant research priority for the Armed forces. As on date world literature and our study suggest that primary prevention and physical conditioning is the most effective intervention to reduce disability from LBP. Technological advances will make the working ergonomic environment more conducive for a healthy spine. Our study shows that each job profile has its peculiar effect on the spine but ensuring disability free work depends mainly on individuals physical fitness level. The Spine requires to be conditioned as per the job profile of the serving personnel. This is achieved by job specific physical training. Available data on LBP across militaries of world reveal that there is no significant co relation between job profile and LBP among personnel of armed forces.

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