Original Article

Is backache a serious malady among Indian helicopter pilots: A survey report

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ABSTRACT

Backache among helicopter pilots is a world wide malady, extensively studied, yet with no known remedy. Anecdotal reports and a few field based studies focussing on military aviators in India have also reported a varying incidence. Therefore an extensive questionnaire survey was undertaken among the helicopter pilots of the Indian Air Force (IAF) and a civil organisation operating helicopter fleet to study the incidence of backache. The questionnaire included, besides other inputs, detailed information about their duty related activities including flying and personal life style. The return rate for completed questionnaires was 82.5% (n = 165). The incidence of backache of varying severity was found to be 57.5% (n = 95). 65.2 % (n = 62/95) of the respondents with backache reported that Chetak was the most notorious helicopter to precipitate back pain; with ferry sorties being most troubling (76.8%, n = 73). Respondents reported that they either had backache daily (22.1%) or once a week (25.2%). The pain was invariably located at the lower back for most of them (n = 79, 83.1%), with severity ranging from discomfort (n = 42, 44.2%) to moderate pain (n = 46, 48.2%). The relief from the pain occurred within 2 hours after flying task was over (n = 35, 36.8%) or lasted for 2 to 6 hours (n = 30, 31.5%). Only 12 (12.6%) pilots admitted that they sought medical attention once in the past one year for their backache, 3 (3.1%) of these were advised bed rest with conservative management for a short period. The cause of pain was reported to be helicopter seat ergonomics (78.9%), vibrations during the flight (69.4%) and/or poor sitting posture in flight(49.4%). The suggested remedy to alleviate the back pain was provision of a support to the seatback during the sortie (53.6%) or daily exercise schedule for toning up muscles of the back (40%). The factors responsible for the reported incidence of backache, probable aetiological correlations and various remedial measures attempted in the Indian Air Force (IAF) are discussed. Considering that the backache in helicopter pilots is primarily related to posture during flying and sedentary lifestyle affecting the muscular tone of the spine, the preliminary recommendation of this study is the need for organised toning up exercise for the helicopter pilots. Aviation Medicine specialists can play a significant role in the development of such programme at the Station or unit level. In addition, pilots can be provided with lumbar support for use during the flight to maintain the lumbar lordosis.

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Backache is one of the most commonly reported maladies by helicopter pilots worldwide and has been extensively studied [1-8]. Anecdotal reports and a few field based studies focussing on military helicopter aviators in India have reported varying incidence of backache ranging from 48.4% to 100% [9-11].

An important aspect of helicopter operations in India is that the helicopter fleet is varied, with military fleet predominantly belonging to the erstwhile USSR [12]. Specifically, the Indian Air Force (IAF) helicopter fleet includes Chetak (CTK) (French, Alloutte-III) and Cheetah (French, Llama) , Mi-8, Mi-17, Mi-26, Mi-25/-35 and the indigenous Advance Light Helicopter (ALH or Dhruv) [12]. Civil aviation sector on the other hand employs helicopters from the Western

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world, including Westland Dauphins and various Bell products.

Thus the helicopter pilots in India fly aircraft varying from vintage CTK to the ergonomically designed advanced ones like ALH and Bell. Considering the earlier reports and the anecdotal admissions by helicopter pilots about incidence of backache, there was a need to study the extent of this malady amongst them. This was all the more relevant since most of the earlier Indian surveys were based on either small sample population or were limited to a particular aircraft type, mainly the CTK [10, 11, 13, 14]. IAF helicopter pilots undergo basic helicopter training on the CTK [15] besides its wide employability in different parts of the country. Hence it was important to find if there is a contributory role of this helicopter type in the incidence of backache amongst helicopter pilots, besides ascertaining the incidence of backache among pilots operating other types of helicopters. This survey was therefore undertaken among the helicopter pilots of the IAF and one of the civil organisations operating a helicopter fleet to study the incidence of backache.

Material and Methods

This study needed to approach a larger sample population of helicopter pilots, hence structured questionnaire method was deemed appropriate. The questionnaire used was an earlier validated one, used for a similar survey for pilots operating CTK helicopter [13].

The questionnaire sought several demographic and lifestyle related inputs from the participants. Information was sought about their professional activities including various types of helicopter flown. The remaining questionnaire focussed on different aspects of backache, including the incidence, frequency, location, severity and relief measures. An important aspect was elaboration of flying activity, if that was the considered cause for precipitating backache. The participants were also asked to comment on the probable reason for backache and the measures required either in their lifestyle or ergonomic measures in the cockpit.

The questionnaires were sent to the local Medical authorities of seven helicopter bases, elaborating the purpose of the study. They in turn administered the structured questionnaire to the helicopter pilots at their bases. The filled and the unused blank questionnaire were returned within a period of 45 to 60 days. In order to seek the perspective of helicopter pilots in civil sector, this questionnaire was also administered to the pilots of a civil organisation operating similar helicopters as IAF. The total number of questionnaire administered was 200, including 10 to the civil organisation.

The analysis in the present survey is limited to descriptive statistics to get an insight into the extent of the incidence of backache among Indian helicopter pilots.

Results

There were a total of 165 (82.5%) respondents to the questionnaire survey, including all 10 from the civil organisation. Their mean age was 30.18 $\pm$ 6.49 years. They were employed to fly different helicopter types (Fig 1). Their mean total flying hours were 1986.54 $\pm$ 1622.95 hours, of which 721.23 $\pm$ 822.10 hours were logged on CTK including the mandatory hours during basic helicopter flying training (Table 1).

The respondents spent an average of 8.61 $\pm$ 1.44 hours on duty (Fig 2), of which flying accounted for an average of 2.06 $\pm$ 1.03 hours.

Table 1: Flying experience of the helicopter pilots

Aircraft Type	Mean Total Flying Hours (SD)	Mean CTK Flying Hours (SD)
CTK	1851.49	666.52
	(± 1126.84)	(± 699.90)
Mi-8	2223.00	928.20
	(± 2071.28)	(± 977.80)
Mi-17	3500.00	650.82
	(± 1141.24)	(± 712.23)
Mi-35/-25	2049.68	770.96
	(± 1433.93)	(± 853.58)
Cheetah	1332.22	789.55
	(± 1138.02)	(± 479.50)
CTK & Cheetah	2043.33	541.66
	(± 1816.93)	(± 655.43)
Overall	1986.54	721.23
	(± 1622.95)	(± 822.19)

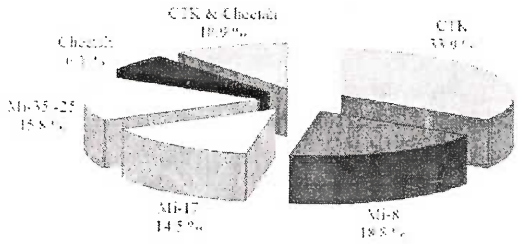

Fig 1: Percentage of pilots as per helicopter type

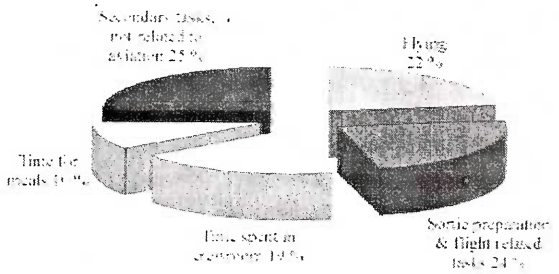

Fig 2: Average hours spent by pilots on duty Total duty hours =8.6 H (±1.4)

The aircrew spent rest of the duty hours performing secondary duties, related to preparation for flying or squadron responsibilities (Mean 2.16 ± 1.41 hours); taking rest in the aircrew rest room (Mean 1.73 ± 1.15 hours); performing 'other' jobs which had no relation to their aviation duties (Mean 2.30 ± 1.22 hours); and taking pre-flight or other meals in the aircrew cafeteria (Mean 0.93 ± 0.66 hours).

The average number of hours spent sleeping at night by the aircrew was 8.69 ± 0.90 hours.

The aircrew (n = 84) spent an average of 1.00 ± 0.53 hour in some form of physical activity or the other, except 9 who did not indulge in any physical activity per choice. The activity included daily walks (n = 67), jogging (n = 29) and / or games (n = 39).

The overall reported incidence of back pain was 57.5% (n = 95). Incidentally none of the pilots from the civil organisation reported to have backache. All those who did not report backache (n = 70) did not answer the remaining part of the

Table 2: Incidence of backache

Aircraft Type	Pilots (percent)	Backache (percent)	Backache due to current helicopter type(percent)
CTK	33.9	53.5	46.4
Mi-8	18.8	67.7	61.2
Mi-17	14.5	75	58.3
Mi-35/-25	15.8	38.3	34.6
Cheetah	6.1	80	80
CTK & Cheetah	10.9	44.4	33.3
Overall (n = 160)	100	57.5	49.6

questionnaire. The brief findings as per aircraft type are placed at Table 2 and Figure 3. Flying was the commonest activity responsible for induction of pain (n = 82/160; 86.3%), followed by inadequate period of rest (n = 32; 19.3%).

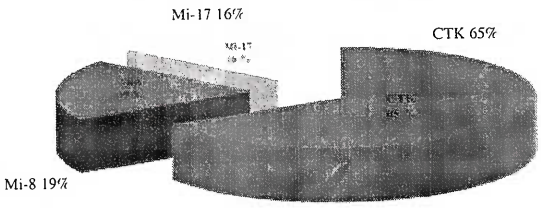

Fig 3: Perceived incidence of backache as per helicopter type

The results hereafter are discussed as a collective response from all the respondents who reported to suffer from backache (n = 95), rather as per helicopter type. CTK was reportedly the most notorious helicopter in general to precipitate back pain (n = 62; 65.2%) (Fig 3); but to the specific question about the current helicopter type likely to precipitate backache, it was the Cheetah (80%) and not CTK (46.4%) (Table 2) that reportedly had the highest incidence of backache. Ferry sorties were reported to be the most troubling (n = 73; 76.8%), followed by night flying (n = 14; 14.7%) and instrument flying (n = 13; 13.6%). Majority of pilots complained that they had the pain either once in a week (n = 24; 25.2%) or daily (n = 21; 22.1%). The pain commonly appeared after about 2-3 hours of flying (n = 48; 50.5%) or between 1-2 hours (n = 40; 42.1%). The commonest location of the pain was the lower back (n = 79; 83.1%), with neck being the second common location (n = 14; 14.7%), and then the upper back (n = 8; 8.42%). For most of them the severity ranged between discomfort (n = 42; 44.2%) to moderate pain, not affecting flying performance (n = 46; 48.2%). The relief from the pain occurred within 2 hours after flying task was over (n = 35; 36.8%) or lasted for 2 to 6 hours (n = 30; 31.5%). The relief from pain was obtained either by taking rest on hard bed (n = 48; 50.5%) or by some bending and stretching exercise immediately after the sortie (n = 44; 46.3%). Responding to a specific question about being symptomatic in the past one year, only 12 (12.6%) pilots reportedly sought medical attention only once and 1 each twice and thrice. Only 3 (3.1%) of them were advised bed rest with conservative management for a short period, and others responded to either physiotherapy alone or to prescription pain-killers.

Majority of pilots in this survey responded that their back pain was because of helicopter seat ergonomics (n = 75, 78.9%); vibrations during the flight (n = 66, 69.4%); and / or poor sitting posture

in flight (n = 47, 49.4%). The suggested remedy to alleviate the back pain due to aircraft ergonomics or poor posture was provision of a support to the seat back during sortie (n = 51, 53.6%) or daily exercise schedule especially to tone up the muscles of the back (n = 38, 40%). At an individual level as well, to alleviate the pain, the pilots reported that they would like to tone up their back muscles (n = 49, 51.5%) and improve their physical activity level, including playing games (n = 48, 50.5%).

Discussion

This questionnaire survey included helicopter pilots spread across the country, including a civil organisation, with the objective of assessing the incidence of backache irrespective of the type of aircraft, age or flying experience. An important aspect of this survey was to find out if flying CTK helicopter could be the reason of the oft-complained backache by the helicopter pilot fraternity. This was in view of the earlier body of work pinpointing the CTK seat and the resulting posture during flight being the main cause of backache among helicopter pilots [9-11, 13, 14]. This was important since CTK is not only meant for basic training [15] but almost all the pilots serve in the CTK operating units, sometime or the other.

This survey included only those pilots who were actively flying helicopters. A questionnaire fill rate of 82.5% reflects a healthy and active participation by the helicopter pilots. The survey did not discriminate pilots according to gender, considering relatively recent induction of women pilot in IAF and their relatively low numbers.

The average total flying hours including those on CTK, indicate that the pilots included in this survey had reasonable flying experience. The pilots reported that on an average they spent one-third of the day on duty and the same amount of time for sleeping. A quarter of the duty hours were spent flying and another quarter preparing for the flight, while an equal amount of time was spent in tasks not related to flying. Majority of the pilots reported to be leading an active lifestyle, spending an average of an hour each day in some physical activity or the other including walking, jogging or participating in games.

Most of the pilots felt that flying was the cause of their backache, in particular CTK flying. This has been highlighted in earlier studies as well [10, 11, 13, 14]. Malik had reported that the most likely reason for the backache in CTK helicopter was the ergonomic deficiencies due to location of cyclic and collective. This resulted in a twisted stooping posture of the pilot [10]. Among the type of sorties causing backache, ferry sorties were reported to be the most troubling by 76.8% of the pilots.

When specifically enquired whether their current helicopter type was likely to precipitate backache, the Cheetah and not CTK emerged as the one with reportedly highest incidence of backache (Table 2). This contrasts with pilots operating both CTK and Cheetah reporting an incidence of only 33.3%. This evident difference was apparently not because of the aircraft type but the terrain of operations. IAF and Indian Army have deployed Cheetah helicopter for operations at high altitudes (HA), near the upper limit of the envelope of its recommended service ceiling. Thus the operations are at the extremes of both the machines' and the human performance limits. This requires increased attention, high alertness and probably heightened arousal levels, leading to increased fatigue. This could be the probable reason for the reported higher incidence of backache. In contrast, the mixed CTK and Cheetah units, despite being involved in similar operational roles, are operating from lower altitudes and in much safer environs where the

mental workload of the flying task is not the same as required for HA operations. One important factor that must be considered is the role of hypoxia during HA Cheetah operations. Hypoxia may possibly aggravate fatigue during the HA operations, but the hypothesis needs substantiation.

The frequency of backache varied between daily to once a week. The commonest location of the pain was the lower back. The severity ranged from discomfort to moderate pain, with spontaneous relief for the majority within 2 hours or up to 6 hours. For the most, either bed rest or some sort of bending and stretching exercise relieved the pain. Considering the frequency, location and time for relief, it was evident that the backache was predominantly muscular in nature and relates to the awkward posture that a helicopter pilot has to adopt to handle the controls [9, 10]. The origin of the pain being muscular in nature was all the more evident since only 12.6% of respondents had sought medical attention for their backache, of which only 3.1% required short term conservative management including bed rest.

However, a very small percentage of pilots seeking medical attention for their backache could also suggest that either the pilots were reluctant to seek medical intervention for fear of this affecting their flying fitness or accepted backache as an occupational hazard which they might have learnt to cope up with. This aspect needs to be verified as a follow up to this study.

The flight related factors for backache were helicopter seat ergonomics, vibrations during the flight and / or poor sitting posture in flight. The respondents reported that the possible remedies to alleviate the back pain could be support to the lower back during sorties or daily exercise schedule to tone up the muscles of the back. IAF has already taken pre-emptive action on both these accounts. Helicopter operating units can procure commercial lower back support as per the pilots' requirement under local arrangements [Personal Communication] based on the earlier field based surveys [13, 14]. Gomez initiated an active physical exercise schedule for the helicopter pilots at one of the bases, which was reportedly successful and well received by the pilots [16].

An interesting aspect in this study was the nil incidence of backache among the respondents from the civil organisation. This was predominantly due to recent induction of Commercial Pilot Licence (CPL) holding fixed wing pilots into the helicopter stream of this organisation [Personal Communication]. Therefore limited helicopter flying experience with an active lifestyle could explain why none of them reported backache.

Recommendation

Considering a high incidence of backache, it is necessary that helicopter pilots must participate in organised toning up exercise schedule at the unit level. Aviation Medicine specialists can play a significant role in encouraging active participation by all the pilots at the Station or the unit level. Secondly, helicopter pilots must be encouraged to use lumbar support for the lower back during flight. This shall help retain the lumbar lordosis to prevent or delay the muscular strain, which results in backache during prolonged flight.

Conclusion

Backache remains a serious malady for the helicopter pilots. It is primarily due to the posture related muscular strain and is not pathological. Organised exercise schedule for the pilots each morning before flight commitment shall help most of the pilots, so also provision of the lumbar support during the flight with pilots being

encouraged to use it. Hence education about the correct seated posture in flight, with use of a lumbar support; and measures to tone up the lower back must be regularly imparted to the pilots.

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