

Original Article

**INCIDENCE OF  
HYPERVENTILATION IN  
IAF AIRCREW -  
A PRELIMINARY SURVEY**

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This questionnaire survey, conducted amongst the fighter pilots of Indian Air Force, listed the symptoms of hyperventilation and the respondents had to mark the symptoms personally experienced during flying, their frequency of occurrence and whether or not they could recognise the symptoms as those of hyperventilation. 45.8% had experienced one or more of the symptoms as listed. This had occurred once/twice/rarely in 10.4% and occasionally in 35.3% of the respondents. 26.1% of them could recognise the symptoms as those of hyperventilation. Majority of the incidences of symptoms had occurred during high stress / workload circumstances indicating a psychological origin.

Keywords: Aircrew stress, workload, performance.

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Hyperventilation is pulmonary ventilation in excess of that necessary to maintain carbon dioxide tension in the body at the normal value (2). There are many potential situations in military aviation, whether environmental, physiological or psychological, which are capable of precipitating hyperventilation in normal healthy individuals. The effects of hyperventilation in reducing cerebral blood flow and causing a decrement in psychomotor performance are considered hazardous in flight (1,2,5).

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Although hyperventilation has been demonstrated to occur in flight, the frequency of its incidence is uncertain (5,6). Measurement of suitable respiratory variable, viz., alveolar or arterial  $PO_2$  in flight is not appreciated as feasible. On the other hand, postflight physiological measurements are not considered reliable.

This paper presents the results of a questionnaire survey conducted among the fighter pilots in Indian Air Force (IAF). It brings about a certain estimate of the significance of the problem of hyperventilation as experienced by the aircrew.

**Material and Methods**

A questionnaire was prepared for the pilots listing the symptoms of hyperventilation and the respondents were to mark their experience of such symptoms personally experienced during their flying career, frequency of occurrence of such symptoms, and recognition of the symptoms as those of hyperventilation. The questionnaire also included their opinion about its incidence in military flying. Personal details like age, length of service, flying experience, etc, were also asked for. Name and service number were not warranted in the questionnaire for ensuring anonymity.

**Results**

The questionnaire was distributed amongst 200 fighter pilots in various squadrons in IAF. A total of 153 pilots responded to the survey. They were 22 to 48 years of age (mean 29.1 years), with 1.5 to 28.5 years of service (mean 8.0 years) and having 300 to 4,896 h of total flying (mean 1,042 h). Out of the total 153 respondents, 70 (45.8%) indicated having experienced one or more of the symptoms during flying, 54 (35.3%) experiencing them 'occasionally', 16 (10.5%) 'once/twice/rarely' and none 'frequently'. 26.1% indicated that they could identify the symptoms as those of

**Table-I**  
**Aircrew Response on Incidence of Hyperventilation**

	No	%
1. Total respondents	153	
2. Experienced symptoms as listed ?		
YES	70	45.7
NO	83	54.2
3. Frequency of occurrence of symptoms ?		
ONCE/TWICE/RARELY	16	10.4
OCCASIONALLY	54	35.3
FREQUENTLY	-	-
4. Symptoms identified as of hyperventilation ?		
YES	40	26.1
NO	30	19.6
5. General opinion on the incidence ?		
RARE	83	54.2
OCCASIONAL	40	26.1
FREQUENT	4	2.6
NOT KNOWN	26	17.0

**Table-II**  
**Aircrew Response on Types of Symptoms of Hyperventilation**

	No	%
Total respondents	153	
Those experiencing one or more symptoms	70	45.7
<b>Symptoms</b>		
Awareness of heavy fast breathing	58	37.9
Dryness of mouth	42	27.4
Loss of concentration	18	11.7
Tingling sensation in fingers/tips/earlobes	9	5.8
Dizziness/light headedness	7	4.5
Hazy vision	6	3.9
Tightness of head	3	1.9
Tightness of chest	1	0.6

hyperventilation. While asking for their opinion on the incidence of hyperventilation in military aviation in general, 83 (54.2%) of them considered it to occur rarely, 40 (26.1%) occasionally and 4 (2.6%) frequently while 26 pilots offered no opinion (Table I). Table II presents the number of aircrew reporting positively about various types of symptoms experienced. 'Awareness of fast heavy breathing' and 'dryness of mouth' were the two most frequently reported symptoms. Table III indicates the circumstances of occurrence of the symptoms.

**Table-III**  
**Circumstances of Experiencing Symptoms of Hyperventilation**

Circumstances	No of Aircrew
Close formation flying	20
Combat flying	17
Testing assignment	17
Low level flying	16
Heat Stress	15
Instrument flying	14
Live range work	12
Inflight emergency	11
Operation	10
Instructional	10
Hill flying	9
Night flying	8
Bad weather	8
High Gz manoeuvre	6
Initial training phase	5
Conversion/Initiation of new phase	4
Fatigue	2
Vibration	1
Hypoxia	0

## Discussion

Hyperventilation in military flying has remained an illusive phenomenon, people generally believing that it occurs more frequently than reported but not being in a position to reduce the occurrence into a

figure of incidence. Presently available methods for measuring respiratory variables are not considered feasible for use in flight environment and the postflight physiological measurements are doubted of their validity (5). Retrospective diagnosis of hyperventilation from the history of symptoms as reported by the aircrew has a very limited scope as most often the incidence of occurrence of symptoms may not be reported at all by the aircrew for fear of intensive medical investigations. In this questionnaire survey, care had been taken to keep the individual identity of the subject population protected.

As evident from Table I, a good number of the pilots (45.8%) indicated that they had experienced the symptoms. 35.3% had experienced the symptoms occasionally and 26.2% of the respondents could identify the symptoms as those of hyperventilation. Though it is generally agreed that a differentiation between the symptoms of hypoxia and hyperventilation is almost impracticable (5,7), it is the pilot who knows best the functioning of his oxygen system and thus his opinion on identification of the symptoms has a special significance. As seen in Table III, none of the pilots implicated hypoxia for his symptoms.

Majority of the reported symptoms occurred under circumstances of high stress/workload of flying (Table III) and thus can be related to psychological origin. Heat stress and high-G manoeuvres were also found to be circumstances of some consequence, other environmental factors remaining inconsequential.

While asked about their general opinion about the occurrence of hyperventilation in aviation, 54% of the pilots considered it to be rare, 26% considered it occasional and 2.6% thought that it occurred frequently.

The merit of the observations made from this type of study depends very much on the general awareness of the sample population about the subject of reference. Nevertheless, under the circumstances, false negative incidences are expected to be larger than the false positive ones. The observations of this preliminary study are thus indicative of a larger incidence of hyperventilation in aviation. A sustained effort in indoctrination of the aircrew on various aspects of hyperventilation, its aetiology, early recognition and suitable corrective action is recommended.

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