Cohort Study on the Recurrence Rate of High Altitude Pulmonary Oedema

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Abstract

Keeping in view the importance of High Altitude Pulmonary Oedema (HAPO) as well as the absence of published evidence as regards recurrence rate of this disease, a cohort study was undertaken, based on data available with the Central Diseases Registry. The inception cohort consisted of all cases of HAPO occurring over a one year period. This cohort was followed up for another 12 months, to observe any recurrence. The study revealed that the recurrence rate of HAPO in terms of incidence density was 1.83 per 1000 person-months of those who had an initial episode (95% confidence limit 0.53 to 3.13 per 1000 person-months). The cumulative incidence was 32.9 per 1000, over an average follow up of 18 months (95% confidence limit 4.55 to 61.25 per 1000). The time gap between the initial episode and recurrence was 115 to 208 days. All recurrent cases had their initial as well as recurrent episode at the first stage of high altitude (9000 to 12000 feet), with the onset being within 48 hours of entry into high altitude. Based on the findings, some recommendations for prevention of recurrence of HAPO have been submitted.

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Key Words : High Altitude Pulmonary Oedema; Incidence rate; Recurrence rate

Introduction

HAPO has assumed considerable importance for the Indian Armed Forces, especially during the past 4 decades. It was in 1960, that Charles Houston had given the first scientific description of this condition in English language [1]. This was followed, in our country, by a series of descriptive and analytical epidemiological studies in the army settings, by Menon [2], Singh et al [3] and Bhalwar et al [4], mainly directed towards analysis of putative risk factors for HAPO.

While obtaining epidemiological evidence regarding risk factors for HAPO, as undertaken by the above mentioned studies is undoubtedly important, another factor which also deserves scientific evaluation is the "recurrence rate" of HAPO. However, to the best of the knowledge of the workers of the present study, there is hardly any published work which has specifically addressed this issue of recurrence rate of HAPO. It was this backdrop of the importance of HAPO, coupled with the lack of evidence regarding recurrence rate, which prompted the workers to undertake the present study with the objective of studying the recurrence rate of HAPO among persons who had already developed the condition once, over a prospective follow up period of at least one year.

Material and Methods

The Armed Forces Central Diseases Registry (CDR) has a well established central registry for HAPO. All cases of HAPO occurring in Indian Armed Forces (including any recurrence) are reported to CDR on a structured format and the data is maintained on electronic data base files. In the

present study, an "inception cohort" was recruited. This included all cases of HAPO, which occurred over a 1 year period starting from 1st March 1998 till 28th February 1999. Follow up was ensured in a way so that all cases in the inception cohort got a follow up of at least 12 months. Thus, the cases which occurred on 1st March 98 got a follow up of 24 months (till 29th February 2000) while those which occurred on 28th February 1999 got a follow up of 12 months; intervening cases got a follow up of 12 to 24 months depending on their date of onset. For this reason, since different cases got different follow up time, incidence density rates were also calculated in addition to cumulative incidence rates. Recurrence was confirmed by primarily matching the service number, which was used as the primary key field. In addition, further confirmation was done by matching the name, surname and age, besides the primary key field. The total inception cohort was 152 cases (episodes) of HAPO which occurred between 1st March 1998 to 28th February 1999, out of which 5 cases of recurrence occurred.

Statistical methods included calculation of point estimates, viz., incidence density and cumulative incidence and estimation of their parameters through calculation of 95% confidence limits.

Results

(a) Incidence rate of recurrence of HAPO :

The details are presented in Table 1. It was observed that out of subjects who had initially suffered from HAPO, the incidence density was 1.83 per 1000 person-months, with a 95% confidence limit of 0.53 to 3.13 per 1000 person-months. Similarly, the cumulative incidence was found to be 32.9 per 1000 subjects (over an average follow up of 18 months) with a 95% confidence limit of 4.55 to 61.25 per 1000.

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Table 1

Incidence rates of recurrences of HAPO

Type of incidence measure	Point estimate	95% Confidence limit
Incidence density (per 1000 person-months of subjects who had initially suffered from HAPO)	1.83	0.53 to 3.13
Cumulative incidence (per 1000 subjects who had initially suffered from HAPO)	32.9	4.55 to 61.25

(b) Altitude of initial episode and altitude of recurrence :

The details are presented in Table 2. It was observed that all the five cases, who subsequently had recurrence, had both, their initial episode as well as the recurrent episode at the first stage of altitude (9000 to 12000 feet). 3 of the cases had recurrence at the same altitude at which they had their initial episode while 2 had the recurrence at slightly higher altitude, albeit at the same (first) stage of acclimatization.

Table 2

Altitude of initial episode and altitude of recurrence for the 5 cases who had recurrence

Altitude of initial episode (a)	Altitude of recurrence (b)	Difference between (a) and (b)
11500	11500	Nil
9100	9100	Nil
9100	11500	(+) 2400
11500	11500	Nil
10500	11500	(+) 1000

Note : Altitudes are in feet above mean sea level

(c) Time gap between initial and recurrent episode :

The time gap between the two episodes for the five recurrent cases (arranged in ascending order, in days) were :- 115, 129, 147, 171 and 208 days. Thus, all recurrences occurred within a range of approximately 4 to 7 months from the first episode.

(d) Type of induction during initial and recurrent episode :

The details are presented in Table 3. It was observed that there was very little agreement within cases as regards the mode of induction into high altitude, with only 2 cases having similar induction (by air) during both the episodes.

(e) History of physical exertion immediately after entry into high altitude, during the two episodes :

The details are presented in Table 4. It was observed that a large majority of the cases did not give history of physical exertion, both during initial, as well as recurrent episode.

(f) Time lag between entry into high altitude and onset of HAPO during the two episodes :

The details are presented in Table 5. It was observed that the time lag was same day to 2 days (i.e. within a few

Table 3

Type of induction into high altitude during the initial and recurrent episode for the 5 cases

Types of induction during	
Initial episode	Recurrent episode
Road	Air
Air	Air
Air	Road
Air	Air
Road	Air

Table 4

History of physical exertion soon after entry into high altitude, during the two episodes

History of physical exertion immediately after entry into high altitude	
Initial episode	Recurrent episode
No	No
No	Yes
No	No
No	No
Yes	Yes

Table 5

Time taken for onset of HAPO following entry into high altitude during the two episodes

Time taken for onset of HAPO	
First episode	Recurrent episode
Same day	Same day
1 day	2 days
1 day	Same day
Same day	Same day
2 days	2 days

Discussion

The present study was undertaken with the background that, at present, cases of HAPO occurring for the first time are discharged to the unit in a fully fit medical category after recovery; however, if there is a recurrence of HAPO, the medical category is downgraded. Apparently, scientifically collected and analysed data would be required to reinforce these medical administrative procedures. The present study indicates that there is a small but definite risk of recurrence of HAPO among those who have suffered once. Secondly, the present study also indicates that the recurrences (as well as the first episodes in these recurrent cases), occur at the first stage of high altitude acclimatization (9000 to 12000 feet). This highlights the importance of meticulous enforcement of the laid down acclimatization procedures at the first stage. It needs to be emphasized to all concerned that the first stage acclimatization is vital and should not be taken

ing suffered from HAPO earlier.

Thirdly, it was also observed that recurrences, if they occur, are likely to occur within 4 to 7 months of the first episode. Against this background, it is recommended that once a person has developed HAPO, he should be kept under supervision by unit regimental medical officer for 6 months. As far as possible, a person who has suffered from HAPO should not be sent down to low altitude for 6 months after the initial episode (unless there are adequate reasons for him to move down), so that he is not 'reinducted' and 'reexposed' to high altitude environment.

This study has also brought out the fact that all the episodes, whether initial or recurrent, occurred within 48 hours of entry into high altitude, and that too at the first stage of acclimatization (9000 to 12000 feet). This observation strongly highlights the importance of proper acclimatization, especially of meticulous acclimatization during the first 48 hours following entry into high altitude, since this period of 48 hours seems to be crucial. This observation is also supported by an earlier study [4]. It would be, therefore, highly desirable from the preventive point of view that medical

functionaries duly advise commanders at all levels to strictly ensure proper acclimatization, especially during the first 48 hours following entry into high altitude.

Finally it is suggested that more data may be generated on clinico-pathological variables in respect of cases of HAPO, so that those variables which may help in predicting the person who is at high risk of developing recurrence of HAPO may be identified by epidemiological analysis, so as to be able to predict the person who is at high risk of developing recurrence, at the point of time when he develops his initial attack.

References

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President Bush was asked to give his opinion on euthanasia "Well", he quipped, "youth in Asia are just like kids everywhere else."

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Primary school teacher - Your father has 5 dollars, he gives you one. How many are left with him?

Pupil - 5 dollars!

Teacher - You do not know your Maths.

Pupil - You do not know my father!

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