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Letter to the Editor

Is it time to revise the acclimatization schedule at high altitude?

Dear Editor,

We read with great interest the article recently published by Sikri et al¹ in this journal. The authors convincingly demonstrate the impressive preventive efficacy of pretreatment with acetazolamide or acetazolamide plus dexamethasone on the development of acute mountain sickness (AMS) when rapidly ascending (3 days) to an altitude of 4220 m (13,850 ft). However, both types of treatment were similarly effective in the prevention of AMS, and aerobic exercise performance was more favorably maintained when dexamethasone was added to acetazolamide. These findings may be especially important for non-acclimatized people who have to ascend rapidly to high altitudes, e.g., for emergency missions or rescue or military operations. Another objective of this study was to compare the AMS prevalence between the rapid ascent (3 days) with pharmacological pretreatment and a conventional acclimatization strategy with staging for 7 days at 2866 m (9404 ft) before ascending to 4660 m (15,280 ft). The AMS prevalence of the “rapid pharmacological” strategy was only about 1.6% (assessed at 4220 m) and that of conventional acclimatization was about 19.1% (assessed at 4660 m). In our opinion, the comparability of these two different ascent strategies needs further discussion. The authors claim that the conventional acclimatization follows an extra safety margin by not exceeding 500-m gain in sleeping altitude per day above 3000 m. However, this is not true for the ascent on day 10 from 2866 m to 4660 m (1794-m gain in altitude). Therefore, the higher AMS prevalence of “conventional” acclimatization is not surprising despite the prolonged stay at the altitude of 2866 m. Although study participants may have nearly fully acclimatized to the altitude of 2866 m,² more susceptible subjects are put at risk for AMS development with the further rapid gain of nearly 1800 m. Nevertheless, the AMS risk was dramatically reduced to 19% as an AMS prevalence of about 70% might be expected when directly ascending from the sea level to an altitude of 4300 m (14,110 ft).³ This observation is in accordance with that from Staab et al³ who demonstrated an AMS prevalence of 22% when residents of moderate altitude (2000 m) ascended to an altitude of 4300 m. Thus, the conventional

acclimatization strategy applied by the Indian Army is surely effective in proper acclimatization to an altitude of about 3000 m but also reinforces the necessity to consider the safety rule (not more than 500-m gain in sleeping altitude per day) during the subsequent ascent to higher altitudes. On the other hand, the rapid ascent after staging at 2866 m could be helpful to detect more AMS-susceptible subjects who would benefit from pharmacological pretreatment.

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Reply

Dear Editor,

We appreciate the letter to the editor and are pleased to respond regarding our field study carried out in Western Himalayas. We agree with the readers that comparability of two different ascent profiles at dissimilar altitudes (4660 m vs. 4220 m) requires further elaboration. This work was a field study with its inherent limitations in the form of fixed points of evaluation (transit camps) on the axis from sea-level to high altitude (SH) road. The limited resources on the SH road had to be used judiciously and optimally. This was one of the early field studies carried on acclimatization with operational precincts and implications at high altitude (HA). We had a choice between altitudes 4660 m (stage III HA) and 4220 m (stage II HA) for stay during the rapid ascent.¹ Because there were few supporting data regarding safety of undergoing this form of a rapid ascent in the study population at the time the study was considered, the ethical committee did not provide clearance to take participants (on pharmaco-prophylaxis) of the rapid road induction schedule (RRIS) after overnight stay at an altitude of 2866–4660 m. Moreover, the data on acute mountain sickness (AMS), during a conventional acclimatization schedule (AS), on comparable altitude on the SH road are available only for the 4660 m altitude. Normally, troops moving on the SH road, while following the AS, do not stay overnight at the transit camp located at an altitude of 4220 m because of its limited capacity to accommodate them. However, for the present study, the transit camp at an altitude of 4220 m was modified temporarily to make the participants of the study to stay overnight to address the concerns raised by the ethical committee. Hence, the only viable and closest option along the SH road, in terms of altitude and comparable AMS data, was to keep the participants at a transit camp located at the altitude of 4220 m on day 3. It is further reiterated that the move of the participants was planned depending on the travel time required to reach the final destination located at the altitude of 3500 m high altitude location (HAL). Travel time on the SH road does not only depend on the actual road distance between the transit camps but also depend on road conditions, which is highly dependent on sudden landslides occurring owing to melting of snow at peaks due to increasing temperature during the day. Still, we agree with the readers that this was a limitation of our study in pure scientific terms.

The study quoted by the readers involved a rapid ascent of physically active lowlanders (n = 18) from 50 m to 4300 m.² These lowlanders have shown a prevalence of AMS as 70% after 12 h of stay at 4300 m, which reduced to 56% after 24 h and remained at 56% after 48 h. Generally, symptoms of AMS appear within 6–12 h of stay at HA and resolve within 1–2 days

with appropriate measures.³ Such a high reporting of AMS after 48 h of stay at 4300 m could be attributed to a small sample size and use of the Environmental Symptom Questionnaire III (ESQ) score in the study by Staab et al.² ESQ involves 67 questions (containing many superfluous questions); of which, only 11 are relevant to AMS. On the other hand, we assessed AMS by using the Lake Louise Score (LLS) based on the self-reported questionnaire, which is a robust and practical tool to diagnose AMS.^{4,5} Moreover, ESQ labels 20% of individuals differently (presence or absence of AMS) when compared with the LLS.⁴

We still stand by our claim of existence of the “extra safety margin” in the AS if compliance is possible in an operational scenario. For entry in stage II of HA, an ascent of 900 m (from 2700 m to 3600 m), 4 days of night stay at an altitude of 2700 m have been recommended.⁶ But in the actual ground situation on the SH road, the troops move to stage III of HA (transit camp at an altitude of 4660 m) while following the AS owing to logistic limitations and topographic peculiarities on the SH axis. These are pragmatic issues in any field study carried out in alignment with the operational scenario based on the terrain and topography of that particular axis. Therefore, we had concluded our work by stating that the RRIS provides an alternative to the AS on the SH road, and similar to the RRIS, a “customised tailor-made” acclimatization schedule may be developed and validated specifically for each of the axes in HA area.

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