

Name of research institute or organization:

Pneumologie, Medizinische Fakultät der Ludwigs-Maximilians-Universität München

Title of project:

Correlation of blood gas analysis at 3454 m with symptoms of acute mountain sickness – ongoing study

Project leader and team:

Prof. Dr. med. Rainald Fischer, project leader

Project description:

According to current knowledge, acute mountain sickness is induced by hypobaric hypoxia. In a number of studies, there is a correlation of oxygen saturation and acute mountain sickness, while in other studies the correlation is not convincing. As new small portable blood gas monitors are now available, not only oxygen saturation, but arterial blood gas samples can be now easily drawn, even during the ascent to maybe remote areas.

We therefore aim to find out whether we can detect correlations between parameters of arterialized blood gas samples with symptoms of acute mountain sickness during acute exposure to an altitude of 3454 m for at least 24 h.

Methods: The ongoing study will sample blood gases from healthy young subjects with or without previous altitude exposure. The blood gas samples are drawn from the arterialized ear lobe and are measured with a portable point of care blood gas analyser (EPOC, Alere Inc., Ontario, Canada). The blood gas samples are taken at least at three time points during the stay at altitude: after 3 – 4 h (T1), 12 – 15 h (T2) and 22 – 25 h (T3) after arrival at 3454 m. In parallel, symptoms of acute mountain sickness were monitored with the Lake Louise Acute Mountain Sickness Score (AMSS).

Results: Until now (summer 2017), 62 subjects have been studied (22 female, 42 males, mean age 24.3 years). The highest values of AMSS were recorded T2, with a mean of 2.6, median 2 (ordinal scale, minimum 0 – maximum 18). The overall mean AMSS was 2.23. AMS – values of 3 or higher (defining acute mountain sickness) were found in 32/62 subjects. However, if the cut-off point is set at 4 or higher, only 13/62 subjects experienced acute mountain sickness on T1. At T2 (the first morning at altitude), 30/62 had AMS, and from these subjects 11 had values equal or higher than 4 points. The highest score with 18 was found in a child after the first night at altitude. In one subject, rescue oxygen had to be given due to beginning high altitude pulmonary edema, although AMS score was only 5 in this subject. For all other subjects, no rescue medication had to be given.

Mean PaO₂ at arrival was 51.8 mmHg, increased to 57.0 after the first night at altitude and decreased again to 54.2 mmHg on the second evening. Mean PaCO₂ was 33.1-34.1 mmHg, mean SaO₂ was between 87 and 84 percent, depending of time of measurement.

With the current measurements, we found no significant correlation of AMS-score and oxygenation, neither measured with PaO₂ or with SaO₂.

Conclusion: With the current sample size we are not able to detect a significant correlation of AMS and oxygenation at an altitude of 3454 m. This may be due to relative low severity of AMS at the high altitude research station Jungfrauoch, but we still expect that increasing the sample sizes will help us to find out if arterialized blood gas sampling is superior to the measurement of SaO₂ for predicting acute mountain sickness. However, our data challenge the theory that low PaO₂ or SaO₂ is directly related to AMS symptoms. As during two samplings in winter and summer 2015 the PaCO₂ measurements were not reliable, we hope to increase our sample size further to expand our knowledge on the relationship between

AMS and alveolar ventilation. In addition, the relative regular occurrence of at least one severe HAPE or AMS case during each ascent, the availability of enough oxygen to treat these patients is highlighted. In our opinion, an oxygen concentrator should be available at the HFSJG to permanently deliver oxygen in case of emergency.

Key words:

Acute mountain sickness, oxygenation, blood gas sampling

Scientific publications and public outreach 2017:

As the study is ongoing, no publications have been written 2017

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