

Arctic environment triggers migraine attacks

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Patients with difficult headaches referred from general practitioners to a neurology department in North Norway regularly complain of seasonal variation of headache. Svalbard, which comprises a number of islands located in the Arctic Ocean between Norway and the North Pole, is inhabited by approximately 2000 people and is one of the largest populated areas close to the North Pole (Figure 1)¹. The seasonal variation in this area is extreme—midnight sun is present from April 20 to August 23, while from November 11 to January 30 (the polar dark season) the sun is completely absent.

A previous study in North Norway showed that migraine patients, especially those suffering from migraine with aura (MA), reported more incidences of migraine in the Arctic light season.^{2,3} We present 3 patients living in Svalbard who illustrate some features of migraine typical in arctic populations.

Case 1

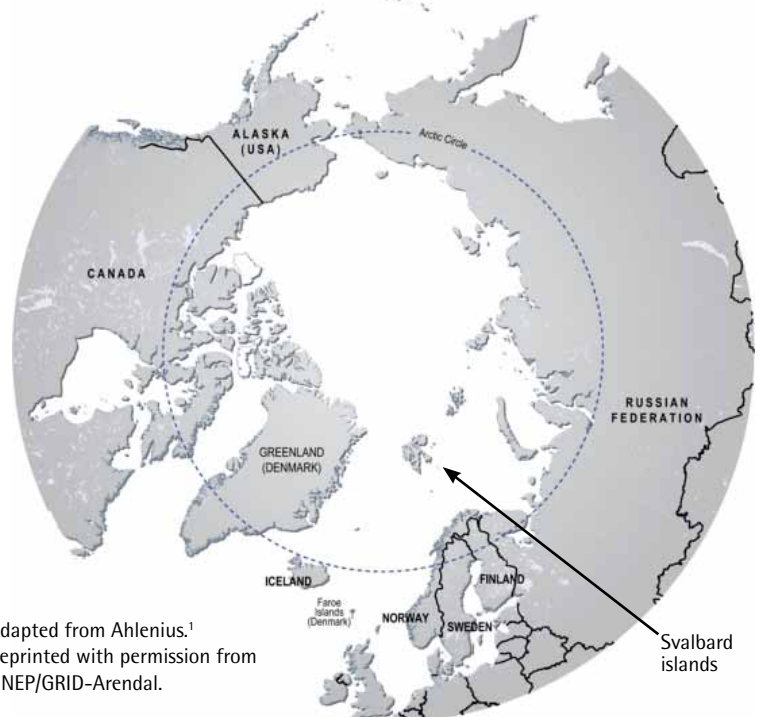
A 41-year-old woman worked as a teacher in Svalbard for the past 16 years. Previously, she lived in the northern part of Norway, at 68° north. At the age of 9 she developed typical MA. Before moving to Svalbard she experienced 1 to 3 migraine attacks per month. She was otherwise healthy and had never been hospitalized. After she settled in Svalbard, she began to experience stronger and more frequent migraine attacks in March and April when the sun appeared over the horizon. To prevent the attacks, she wore sunglasses daily in the period between March and September. Reflection from snowy mountains and from the sea usually reinforced the effect of light as a trigger factor. Her symptoms regularly improved after staying in a dark room for a while. She had previously been prescribed a triptan, but experienced tiredness as a side effect and instead used acetaminophen, ibuprofen, and naproxen as pain relievers.

Case 2

A 47-year-old female personnel manager, previously living in the middle

of Norway at 65° north, had a 34-year history of MA. For the past 4 years she has lived in Svalbard. Her migraine attacks frequently occur in relation to menstruation. Before moving to Svalbard she experienced 2 to 3 migraine attacks per month and never had any seasonal variation of headache. After she moved to Svalbard, the frequency of migraine attacks increased to 5 to 6 per month. At the time of conversion from dark season to light season (March to May), the frequency of migraines increased to about 2 to 3 per week. During these periods she used sumatriptan about 14 days per month. She also wore sunglasses almost every day from March to June because of light sensitivity. By June, the situation usually calmed down; when she would leave Svalbard for a vacation midsummer, the migraine attacks almost disappeared. In addition to migraine, she also complained about sleep disturbances 3 days or more per week during the same period. It was recommended that she reduce her use of sumatriptan and initiate prophylactic β -blockers from March to June to prevent medication-overuse headache in addition to her regular migraines.

Figure 1. Map of the Svalbard islands in relation to the North Pole



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Case 3

An otherwise healthy 27-year-old woman with migraine without aura (MO), treated with sumatriptan, moved from the capital of Norway (Oslo, at 59° north) and stayed permanently in Svalbard for 3 years. Trigger factors known to initiate her migraine attacks included irregular sleep, physical activity, light and darkness, alcohol, and stress. After moving to Svalbard, she experienced stronger attacks with increased frequency, nausea, and sensitivity to light and noise in periods of complete darkness as well as in the Arctic light season. When she performed outdoor activities in the light season, she regularly wore sunglasses to avoid migraines. She tried to balance the total amount of light by turning on extra light in the winter and protecting herself against the sun in the summer. She explained it in the following way: "It is very important to differentiate day from night."

Discussion

All 3 patients shared an aspect of their cases in common: seasonal variation of migraine that became a problem after they moved to an arctic area. It seems as though extreme change in light conditions stimulates an underlying susceptibility to migraine during shifting seasons.

In a previous study, we found that 47% of the patients with MA reported more frequent attacks during the Arctic light season compared with 17% of those with MO.³ Seasonal variation of migraine, regardless of light or dark periods of the year, was reported in 75% of the MA group and 46% of the MO group, supporting the hypothesis that seasonal variation in migraine headaches is a problem mainly for the former group. This is illustrated by the first 2 patients presented in this article. Both of them had MA and reported increased migraine headache in the Arctic light season, along with interictal photosensitivity. The third patient experienced increase in migraine frequency in periods of unbalance between light and darkness. This observation indicates that variation in light conditions rather than isolated light intensity might trigger symptoms. There might also be a connection between migraine symptoms and lack of light. In a previous questionnaire study, 9% of patients experienced worse migraines in the arctic dark season compared with almost 12% who experienced more migraines in the light season.²

There is some evidence that migraine attacks tend to appear in a circadian pattern, with higher frequency in the morning.^{4,5} In a diary study, a peak incidence of migraine attacks in the middle of the day was detected, but there were no differences between incidence of MA and MO.⁶ In a recent questionnaire study of people living in an extreme arctic population in Svalbard, no indication of more-than-usual seasonal variation of headache

EDITOR'S KEY POINTS

- Patients with migraine headaches might experience more frequent and severe migraine headaches when living under the seasonal variation of Arctic light conditions.
- Patients with a history of migraine with aura might be substantially more susceptible than those who do not experience aura.
- Physicians should take this into account when developing treatment strategies for patients living in these environmental conditions.

POINTS DE REPÈRE DU RÉDACTEUR

- Les patients qui souffrent de migraines peuvent éprouver des maux de tête migraineux plus fréquents et plus douloureux s'ils vivent dans les conditions de lumière variables saisonnières des régions arctiques.
- Les patients qui ont des antécédents de migraines avec aura sont plus vulnérables que ceux qui n'ont pas d'épisodes avec aura.
- Les médecins devraient prendre en considération ces constatations quand ils élaborent des stratégies thérapeutiques pour des patients vivant dans ces conditions environnementales.

was detected. However, the strength of the conclusion was considerably limited by a low response rate and small sample size.⁷

Dysfunction of the suprachiasmatic nucleus in the prodromal phase might play a role in the symptom production of migraine headaches.⁸ Melatonin is a key hormone in the regulation of the circadian rhythms, with low levels during the day and high levels at night. When melatonin was measured in migraine subjects during a symptom-free interval and compared with controls, exposure to light suppressed melatonin levels more in migraine sufferers than nonsufferers, supporting the assumption of suprachiasmatic nucleus involvement.⁹ Alternatively, seasonal migraine variation could be a response to external stimuli without underlying dysfunction of the hypothalamic-pituitary system.

Both light as a trigger factor and interictal light hypersensitivity is common in migraines, especially in MA.^{3,10,11} Hypersensitivity to light might theoretically be related to enhanced melatonin suppression interictally, and some suggest that melatonin is efficacious in migraine prevention.^{9,12} Melatonin secretion is prolonged in the winter and might be more biologically effective in periods when the sun is completely absent.¹³

Another interesting hypothesis exemplified by the patient in case 2 is whether seasonal variation occurs more often in patients with menstrual-related migraine (MRM). Menstrual-related migraine and pure menstrual migraine are conditions generally not associated with

aura and they are less responsive to therapy.¹⁴ In a recent study, we found that women with MRM had more frequent headaches compared with others, suggesting that those with a hormonal trigger might have more frequent migraine attacks.¹⁵ No seasonal variation of migraine headache was found in those with MRM. As the number of migraine attacks in MRM was almost identical in light and dark seasons, the data do not support an important role for melatonin in explaining increases in frequency of migraine attacks in those with MO.¹⁵

Conclusion

Migraine attacks might be stronger or more frequent in patients living in arctic areas. This should be taken into account when clinicians help patients cope with the disease and work out treatment strategies, such as prophylactic drugs or melatonin, for geographically affected patients. ❁

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Competing interests

None declared

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