

Cold Protecting Ointments and Frostbite

A Questionnaire Study of 830 Conscripts in Finland

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Application of ointments to the face is one of many measures used to avoid frostbite of the head in cold climates. A recent epidemiological study indicated, however, that the use of ointments in the cold may be a considerable risk factor in development of frostbite of the face and ears. A questionnaire on the use of protective ointments was completed by 830 young male conscripts divided into 4 groups by climatic home region on the south–north axis of Finland. Personal estimates of cold exposure, sensitivity to cold, smoking, and cumulative incidence of frostbite to the face and ears were reported. Twenty-one percent of the conscripts had used cold protective ointments, mostly at school age or earlier. In 25% of the conscripts' families some other member (mostly women and children) had used emollients in order to prevent cold injuries. Both the conscripts and their families living in southern Finland used protective ointments more often than those in northern Finland. Almost half (47%) of the conscripts had had frostbites of the head, 42% of the ears and 23% of the face. Those who had used ointments in the cold had a significantly higher cumulative incidence of frostbites on the face ($p=0.0031$), especially on the cheeks and chin. Their subjective experience concerning the protective effect of ointments in the cold was somewhat or clearly positive in 84% of respondents. The controversy between subjective experience and increased incidence of facial frostbite in ointment users needs further investigation. Key words: emollient; cold injury; prevention.

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Exposure to cold is a natural part of winter life in Finland. Winters can vary in respect to both geographic regions and climatic periods. Cold injuries are common, especially when an exceptionally cold winter follows several mild winters, catching people off guard (1, 2). Feet and hands are the body parts most prone to cold injuries, but the unprotected parts of the head; the ears, nose and cheeks, are also vulnerable (3–7). Use of protective clothing, a warm hat, earflaps, scarf, etc. (5), together with preventive behaviour (avoiding high-risk situations, turning bare areas of the head away from the wind, etc.) are the most important measures in preventing frostbite of the head. Protective ointments applied to the face are traditionally used against cold injuries by many Finns during their outdoor work, play or wintertime activities. A common belief is that waterless ointments have the best protective qualities.

Epidemiological (3, 5) and preliminary laboratory observations (8) cast serious doubt on the protective effect of ointments

in the cold. Contrary to popular belief, their use was shown to be a considerable risk factor for frostbite (5). The benefits of the use of ointments against the cold have not been substantiated by the scientific literature.

The purpose of the present study was to evaluate the use of cold protecting ointments by young Finnish conscripts and their family members. The cumulative lifetime incidence of frostbite on the conscripts' ears and faces was also studied.

SUBJECTS AND METHODS

Subjects

A total of 832 Finnish Army male conscripts, mean age 19.3 years (range 17–29 years) completed a questionnaire during their first week of service in three garrisons: Santahamina, Kajaani and Sodankylä, which are located in different regions of Finland (Fig. 1). Two of the questionnaires were inadequately filled out and were excluded from the study. The subjects were divided into 4 groups, A, B, C and D, by their geographical home regions in the south–north axis (Fig. 1). The characteristics of the groups are shown in Table I. Conscripts living in areas C and D smoked more frequently than others. In other respects the groups did not statistically differ from one another, even in respect to subjective estimation of cold exposure.

Data collected

In addition to the background of the subjects (age and location of homes), the following factors were evaluated: estimation of exposure and sensitivity to cold, smoking habits, previous and present use of protective ointments by both the conscripts and their family and experience of using the ointments in cold weather. The assumed correct timing of the application and an estimation of optimal composition (especially the water content) of ointments were recorded, together with the trade names of used or otherwise known cold protecting ointments. The sales statistics of ointments for outdoor activities in 1990–1997 were obtained from the Technochemical Infocenter in Finland.

The conscripts reported their cumulative lifetime incidence of all frostbite of the head (ears and face). The severity grading of frostbite was based on three categories from a study of Orr & Fainer (9). Their grades III and IV were combined into a grade III (10). In grade I frostbite the skin becomes reddish and oedematous, in grade II it starts to blister and form bullae, and in grade III local necrosis of the dermis develops over 1–2 weeks. This grading system was explained to the conscripts in the questionnaire.

Statistics

Statistical analysis of the data was performed using primarily SPSS software. The relationship between different variables was analysed using the chi-squared test. The significance was set at $p < 0.05$. Risk ratios (RR), the relative risks of the exposed group compared with the unexposed group, were calculated using Epi-Info software to measure the strength of the association between exposure and its effect. Confidence intervals (CI) of 95% were given for each RR.

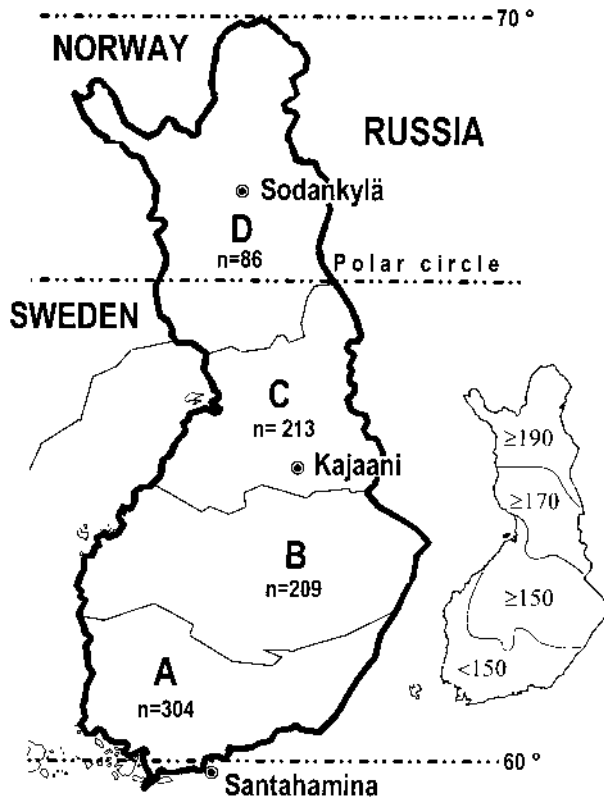


Fig. 1. Geographical home regions of 830 Finnish conscripts and corresponding climatic areas (number of winter days with a mean temperature $< 0^{\circ}\text{C}$ in 1931–1960 (Finnish Meteorological Institute)).

RESULTS

Use and experience of cold protective ointments

Use of cold protective ointments. A total of 173 out of 827 (21%) conscripts had used cold protective ointments, 50% in early childhood, 62% at school age, and 31% after school age in addition. A total of 39 out of 830 (5%) still used them all the time or frequently and 97 out of 830 (12%) only seldom. Conscripts living in southern Finland had used them 2.7 times more often than those in northern Finland ($p < 0.0001$) (Fig. 2). A total

of 96% of all users had applied ointments to the facial skin, 4% on the ears and 10% elsewhere, mostly on the hands, feet and lips.

High or moderate exposure to cold was associated with the use of emollients ($p = 0.0158$). Neither cold sensitivity nor smoking was significantly correlated with the use of protective ointments. The use of cold protective ointments by a family member was reported by 203 out of 813 (25%) of the conscripts. This occurred 10 times more often in families in which the conscripts themselves had also used protective ointments ($p = 0.0001$). Women and children had used ointments much more often than adult men, in a ratio of

6 : 3 : 1
women children men

Seventy-nine percent of conscripts reporting personal use of cold protective ointments and 81% of all subjects remembering the trade name of an ointment for outdoor activities named Nivea® crème (Beiersdorf, Kungsbacka) or Vitalis® crème (Valkoinen Risti, Helsinki) or both. Both are waterless, greasy ointments. According to statistics for 1990–1997 the annual sale of all ointments for outdoor activities in Finland reached 2.54–2.21 million Finnish marks. The sales have been slowly declining over recent years.

Experiences of the effects in cold. Twenty-eight percent of users thought that ointments had a protective effect in the cold. Fifty-six percent judged this effect to be weakly advantageous. Skin dryness in the cold was judged to be prevented or diminished by 69% of ointment users.

Beliefs on the correct timing of application and the optimal water content of ointments. Opinions concerning the right timing of application of the ointments varied greatly: 42% had no opinion, 33% suggested that the application should be made less than 15 min, and 24% more than 15 min before cold exposure. Half of the subjects had no opinion on the optimal water content of ointments. However, waterless and water-poor ointments had more supporters than water-rich emollients.

Cumulative lifetime incidence of frostbite of the ears and face

A total of 378 out of 811 (47%) conscripts had experienced at least one incidence of frostbite of the head. A total of 330 out of

Table I. Characteristics of 830 Finnish conscripts in 4 geographical groups

	Home region ^a									
	A		B		C		D		All	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Mean age (years)	304	(37)	209	(26)	213	(26)	86	(11)	830 ^b	(100)
Number of smokers	150	(50)	112	(54)	132	(63)	61	(71)	464	(57)
Cold exposure										
high	45	(15)	31	(15)	24	(11)	11	(13)	112	(14)
moderate	145	(48)	107	(52)	137	(65)	46	(54)	445	(54)
low	112	(37)	69	(33)	51	(24)	29	(34)	268	(32)
Cold sensitive	121	(40)	86	(42)	71	(34)	26	(31)	313	(38)

^aA–D, see Fig. 1.

^bIncludes 18 conscripts with non-classifiable home region.

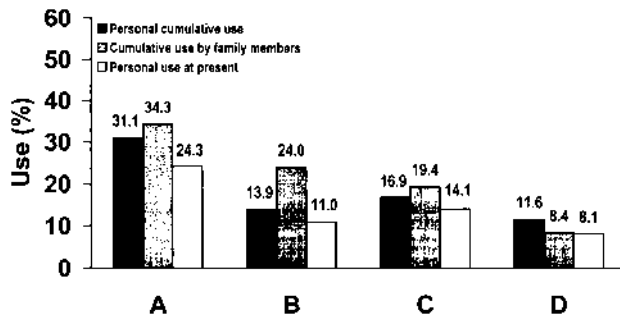


Fig. 2. Use of cold protective ointments by 830 Finnish conscripts and their families in 4 geographical home regions (A–D, see Fig. 1).

790 (42%) of subjects reported to have had frostbite on the ears, and 179 out of 808 (22%) on the face (15% on the cheeks, 14% on the nose, 5% on the chin and 2.6% elsewhere). Sixty-six percent of ear frostbites and 70% of facial frostbites had occurred at school age (7–16 years). Ear frostbite, but not the cold injuries to the face, showed a significant increase ($p=0.0002$) from south to north (Fig. 3). Eighty-three percent of ear frostbites were of grade I and only 3% of grade III. Of facial frostbites, 91% were of grade I and only 1% of grade III. Smoking was associated with more frequent frostbites of the ears and nose ($p<0.05$ in both), but not with those in other parts of the face.

Relation between the use of ointments and the incidence of frostbite

Use of protective ointments was significantly associated ($p=0.0031$) with a higher incidence of facial frostbite (RR 1.54, 95% confidence interval 1.17–2.03), especially with cold injuries of the cheeks (RR 1.79, 95% CI 1.26–2.53) and chin (RR 2.16, 95% CI 1.15–4.04), but did not reach statistical significance with those on the ears and nose.

DISCUSSION

The geographical location north of latitude 60° N and the shape of Finland cause a relatively big climatic difference between south and north. The administrative geographical home regions in this study correspond quite well with climatic areas (Fig. 1). A total of 25% of families of the Finnish con-

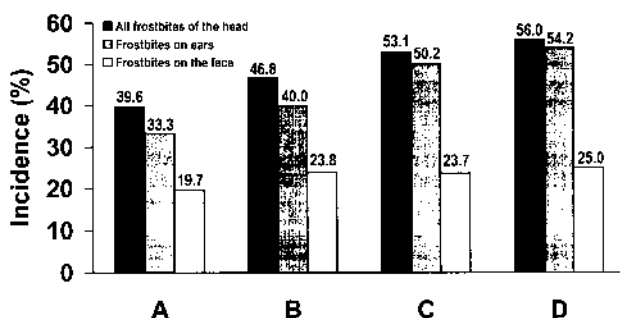


Fig. 3. Cumulative lifetime incidence of frostbite of the head (proportion of conscripts with 1 or more frostbites in this location) in 830 Finnish conscripts from 4 geographical home regions (A–D, see Fig. 1).

scripts had used cold protective ointments sometimes, mostly on the face and rarely on the ears. The formulation of the questionnaire concerning the use of ointments on the ears may have led to its underreporting, as respondents may have included the ears in their understanding of the term “face area”. The statistically significant reduction in the use of ointments from south to north, in contrast to the increasing incidence of ear frostbite, may reflect “habituation” to cold (i.e. a combination of physiological and behavioural responses) (11) among people living in regions with regular cold winters. Southern Finland can have several mild winters between cold ones. The faces of people living in Arctic areas may also acclimatize, mainly through the control and regulation of facial vasculature (12). The question of acclimatization to cold in humans has been a subject of much controversy (13, 14).

The early stage (first week) in army service was chosen for administering this questionnaire in order to acquire the opinions of the young men without army influence. Two greasy and waterless non-medicated ointments, Nivea® and Vitalis®, have gained a major proportion of the sales in Finland for prevention of facial cold injuries. Tradition, advertising and positive subjective experiences by the majority of users have led to a common belief that these ointments are protective.

Frostbite of the ears or face had affected almost half of the conscripts by 19 years of age. In an earlier study (3) 2054 mostly mild frostbite had occurred during the service of Finnish conscripts in 1976–89. A total of 913 of them (44% of all) affected the head, 58% the ears, 22% the nose and 20% other areas of the face, mostly the cheeks. The results of the present study, showing that the cold injuries of the ears are more than twice as common as those of the nose and cheeks, are in accordance with this. Also the high proportion of mild, grade I frostbite was common to both studies.

In this study, subjects who had used protective emollients had nearly a two-fold cumulative incidence of facial frostbite on the cheeks and chin, both areas where the ointments were usually applied. Both the use of ointments and the occurrence of frostbite peaked while the subjects were at school age, but the exact temporal association was not the focus of this study.

In an earlier epidemiological study (5), the high occurrence of frostbite was associated with simultaneous use of ointments, indicating the possibility of a causal relation. Even then, there may still be other factors, such as severe cold exposure, that may lead to both increased risk of frostbite (a statistically significant association with self-estimated cold exposure was not found in this study) and to use of “protective” ointments (association was found), causing a fundamental bias. The frostbite is, of course, always a result of cold exposure, not of ointment application. Although both epidemiological and preliminary laboratory studies (8) indicate that the routine use of cold protective ointments may be harmful, further investigations in freezing conditions should be carried out before any conclusive recommendations can be given. The mechanisms that may lead to harmful consequences also need to be clarified.

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