J Headache Pain (2004) 5:181–187
DOI 10.1007/s10194-004-0098-6

ORIGINAL

Ottar Sjaastad
Leiv S. Bakketeig

Hangover headache. Prevalence: Vågå study of headache epidemiology

Received: 23 January 2004
Accepted in revised form: 24 May 2004

O. Sjaastad (✉)
Gautes gate 12,
N-7030 Trondheim, Norway
e-mail: berit.mjoen@medisin.ntnu.no
Tel.: +47-73-525276
Fax: +47-73-551539

O. Sjaastad
Department of Neurology,
St. Olavs Hospital,
Trondheim University Hospitals (NTNU),
Trondheim, Norway

O. Sjaastad
Vågå Communal Health Centre,
Vågåmo, Norway

L.S. Bakketeig
University of Southern Denmark,
Institute of Public Health, Epidemiology,
Odense, Denmark

Abstract In Vågå, Norway, with 3907 inhabitants, there were 2075 18–65-year-old dalesmen available for the headache epidemiology study. A total of 1838 dalesmen (88.6%) were personally examined. However, due to uncertainty whether hangover headache could be incorporated, this part of the study was started at no. 500. Of the remaining 1338 dalesmen, 1122, i.e., 83.9%, were questioned about hangover headache. The parochial "drinking culture" could probably best be characterised as binge drinking and not as a constant, daily consumption. Inclusion criteria were: intoxication by alcohol; headache; and the headache manifesting itself more than three hours after the end of drinking. In the whole series, 714 dalesmen had experienced hangover headache ("delayed alcohol-induced headache") during their lifetime (64%). This may be the best way to express hangover headache prevalence. Among those who had been "exposed to proper amounts of alcohol", the prevalence was considerably higher: 88%. With the existing drinking pattern, hangover headache clearly dominated in males (M/F ratio: 1.50 *vs*. 0.72 in those without hangover headache ($p<0.0005$)). Consistency tests showed high Kappa values.

Key words Headache • Headache epidemiology • Hangover headache • Alcohol

Introduction

Hangover headache is a well-recognised and frequently occurring headache. To the best of our knowledge, large-scale population studies, with details regarding hangover headache and based on face-to-face interview methodology, have so far not been published in headache literature. Hangover, rather than hangover headache, has been described in detail [1, 2].

The IHS [3] has described two types of alcohol response: (1) Code no. 8.1.4: ("Alcohol-induced headache") and (2) Code no. 8.3.1: "Alcohol withdrawal headache (hangover)". The first one sets in early. These are the response patterns and criteria that will be adhered to in this context, because they were the available ones at the time of the Vågå study.

Recently, the ICHD II has been published [4]. The two variants of alcohol-induced headache have been joined under a common heading: "Alcohol-induced headache" (8.1.4):

1. Immediate alcohol-induced headache (8.1.4.1). This corresponds to 8.1.4 in the 1988 IHS version [3].
2. "Delayed alcohol-induced headache" (8.1.4.2). This corresponds to "hangover headache" (8.3.1), the main theme in the present communication. For practical reasons, obviously, the internal arrangement of the two subgroups has been changed by IHS. The new classification [4] does not appear to have any negative influence upon the presently used ("old") IHS classification.

In the Vågå study of headache epidemiology, it was originally intended to include alcohol only as a precipitant for other headaches, on line with stress, dietary factors, climatic changes and the like. It was not foreseen that the dalesmen, generally, would speak openly about the short term consequences of excessive alcohol ingestion. However, already after the first three to four months of the study, one started to get a feeling that, with a certain wording of the questions, one would get frank and open-hearted information pertaining to alcohol consumption; and – even more importantly – dalesmen generally would not feel that such questions were impertinent.

Consequently, an additional protocol was made, and from that point in time, headaches were included. Presently, the Vågå hangover headache lifetime prevalence figures will be presented. The data collection technique will also be validated.

Background

It is surmised that the following represents necessary background information for understanding the alcohol/headache situation in this parish.

State alcohol policy and the parochial drinking pattern

The Norwegian state policy has been to regulate the overall sales of alcoholic beverages "above the ale-stage" through a monopoly arrangement. Moreover, state monopoly shops ("vinmonopol", i.e., "wine monopoly") were until recently located only in selected population centres, not in the countryside. Thus, as for Vågå, the closest shop was approximately 140 km away (at Lillehammer, the winter Olympics town). The rationale has been to impede access to such beverages, and in this way, supposedly contributing to an idealistic aim: a reduction in total consumption; a secondary gain, as viewed through governmental lenses: the state finances are shored up by this arrangement. This monopoly on wine and liquor has probably, combined with stiff prices (considerably higher than in other Scandinavian countries) – and also through mechanisms elaborated upon in the following – to a not inconsiderable extent contributed to the local drinking style.

Artificially raised prices and reduced accessibility have, of course, activated the sound reasoning of the dalesmen. The situation is partly coped with by "shopping tours" to neighbouring countries and – what probably quantitatively speaking has a significant effect – illicit, domestic distilling. The importance of the shopping tours increases the nearer one gets to the border. In Vågå, it is probably the home distilling which is more important, but it is probably not more abundant in this area than elsewhere in countryside Norway. In recent years, large-scale smuggling of alcohol has played a steadily more important part.

Minor, daily consumption of alcohol ("sundowners", "night caps", etc.), which is part of the culture in many places around the world, has not been part of the regular countryside/peasant lifestyle in this part of the world. Traditionally, there has been a drinking culture, characterised by drinking mostly on particular occasions, private or public arrangements, for example at Christmas/New Year. In some circles, however, there could be a more regular weekend consumption. Some might indulge in excessive drinking ("bouts", "binge" drinking) on these occasions. In the early post-war generation, heavy drinking probably mostly took place from the late teens and in early manhood; drinking tended to fade away *pari passu* with increasing responsibility in adult life, combined with decreasing tolerance for heavy drinking. More recently, steadily younger age categories have been involved in drinking bouts, in line with development in other parts of the country [5]. While males previously dominated, as far as inebriation is concerned, females certainly have taken their share in recent decades.

Wine has – slowly – been trickling (literally!) into this area in recent years, partly as a consequence of increasing tourism to southern European countries, but also due to the opening of a new state liquor shop, approximately 30 km away, in 1986. A comparison between the consequences of wine and liquor consumption can, therefore, probably be made in some dalesmen.

The "mean sales" of alcoholic beverages in Norway has been estimated to be ca. 45% of the mean sales in Europe [6]. On top of that comes the illicit, private distilling, smuggling, etc. Even with this included, the consumption in Norway would still not be above 60% of the average European consumption [6].

Even though the total volume of alcohol consumed in Norway could be well below that in southern Europe, the special drinking pattern may *per se* bring about a disease panorama of its own. This panorama may be at variance with that in countries with a considerably higher calculated individual average daily consumption.

Material and methods

Vågå is a parish in the mountainous area of southern Norway, mid-way between Trondheim and Oslo. At the time of the start of the Vågå study, i.e., 1995, there were 3907 inhabitants within the precincts of the parish. All 18–65-year-old dalesmen, men and women, were invited to participate in the study. However, those who did not master the language (e.g., asylum seekers, stroke patients, etc.), long-term absentees (students in foreign countries, sailors, draftees, etc.), and seriously ill dalesmen were excluded. A total of 1838, or 88.6% of the eligible 18–65-year-old dalesmen (n=2075), were examined personally by the principal investigator (O.S.) [7]. A systematic study of hangover headache was initiated at parishioner no. 501. The main reason for this delay was uncertainty as to whether a sensitive topic like alcohol intoxication could be incorporated into the study; whether concentrated attention upon these personal matters would be tolerated by the dalesmen. Conceivably, this approach would be felt as an intrusion into personal matters, as obnoxious and distasteful and even could be made an object for discussions at women's club meetings.

Why could not a pilot study have been carried out to find out whether a full-scale group of questions about hangover headache would be tolerable? The mentality would most likely change from one part of the country to another. To be reliable, such a pilot study should, therefore, probably be carried out in the same area as the study proper. But, if carried out locally and proving to be a failure, the whole study could be jeopardised. In retrospect, the decision to probe the situation instead of plunging into it was probably the correct one. At the time of inclusion of hangover headache in the questionnaire, it was felt that this would generally be acceptable, but that great caution had to be exercised. The optimal number of dalesmen that could have been included after this part of the study was initiated, would be 1338 (1838–500=1338, Table 1). However, the total number of dalesmen who were actually questioned about hangover headache was 1122; 216 dalesmen were thus not included, even after this part of the study was initiated (see below). The number examined with regard to alcohol consumption – and the consequences thereof – represents 83.9% of the total number of those examined during the actual period (see Table 1). The principal investigator used his best judgment in this selection process, and based the judgment upon intimate knowledge of the mentality of this population and insight into the family background. The decision whether to include a certain dalesman or not had to be taken on the spot, after having heard the dalesman's detailed account and having had the opportunity to appraise the emotional make-up. The sole reason for omission was the same as for the delay in including alcohol questions as such in the study: not to hurt the feelings of the dalesmen. No other exclusion guidelines were adhered to. It is close to unthinkable that no wrong decisions have been made in this context: some – or even a considerable part – of those excluded would probably have tolerated an inclusion.

The dalesmen prior to no. 500 were rejected, indiscriminately, and cannot be taken into any prevalence calculation. Anyhow, 1122 dalesmen is a sizable group. The dalesmen questioned about their drinking pattern seem comparable to the first 500 dalesmen not being questioned. The male/female ratios in the questioned/non-questioned groups were 1.14 and 1.08, respectively (Table 1). The mean ages were: 42.3 and 42.2 years, respectively. Social status of the examined and non-examined ones seemed equal, and we have no particular reason to suspect that there was any drinking pattern difference between these two groups.

On defining the quantity of alcohol consumption

It was soon realised that any attempt to quantify the alcohol consumption during drinking sprees, e.g., in "units" [6, 8], would be an unrealistic approach, the reasons for this being:

The inebriation might have taken place one or more decades ago, e.g., during drinking sprees in youth. Most frequently, domestically distilled alcoholic beverages of various brands had been consumed during one particular drinking spree. There might have been drinking directly from the open bottle – or from various bottles – which much of the time even belonged to someone else. Diluted samples had also partly been ingested. Neither the volume, "brand", nor the exact alcohol concentration would be known. A possible "measure" could for instance have been a "great many mouthfuls". This being said, one can probably safely assume that the volume consumed, on certain occasions, easily would exceed 5–6 standard alcohol units [6], a rough estimate of the requirement for intoxication. During this part of the examination, the principal investigator never primarily used the term intoxication; dalesmen, however, frequently brought this aspect into the picture: "Do you mean intoxication (examples of local terms: "fyllesjuke", "rotbløyte")?" "Well, yes, but these are terms used by you, not by me!"

Table 1 Hangover headache material

Category		Sex ratio (M/F)
Total no. dalesmen, questioned, Vågå study	1838	0.94
No. dalesmen, from the last "non-questioned one" for hangover headache (no. 500)	1338	–
No. not questioned after no. 500	216	1.08
Hangover headache material	1122	1.14 (M: 599; F: 523)
Percentage examined among those questioned after no. 500 (1122 out of 1838)	83.9%	

The examination

Each dalesman was questioned according to a detailed questionnaire. The questionnaire was in its entirety administered by the principal investigator (O.S.). The participants were not allowed to see the questionnaire. A short or a long version neurological examination was carried out, the latter in case the clinical condition seemed to necessitate it [7]. Details of the protocol have been published elsewhere [7].

Diagnostic guidelines used

The IHS criteria (code 8.3.1) are not so informative, as regards hangover headache [3]. The following diagnostic guidelines were adhered to in the present context:

1. "Is preceded by intake of sufficient alcohol to make the particular individual drunk" (IHS, 8.3.1).
2. Among the various hangover symptoms, headache should be an obligatory ingredient.
3. The headache would follow after a respite, i.e. roughly >3 hours after discontinuation of alcohol consumption.

The discriminating point of time (guideline no. 3, i.e., >3 hours), was derived indirectly from IHS code 8.1.4: "alcohol-induced headache", which: "… occurs within three hours after ingestion of alcohol". Presumably, hangover headache (IHS code 8.3.1) should then appear >3 hours after the end of drinking.

The characteristic traits of hangover headache, set forth by e.g., Raskin [9], have also been useful, but they can probably not be characterised as criteria. This communication deals with IHS 8.3.1 (hangover headache) and not with 8.1.4 (alcohol-induced headache) [3]. And it should be emphasised that it deals with "hangover headache" and not only "hangover". The chi-square test has been used for statistical calculations. Kappa-values were calculated for the consistency tests.

Hangover headache among the last 29 dalesmen

After the Vågå study was intentionally interrupted at 1809 dalesmen, we were fortunate enough to obtain contact with 29 other dalesmen approximately 2 months later. In this way, a comparison between "early" and "late" results could be made. Would the results have been changed, had the study been extended/prolonged?

Validation studies

The data collection system has been validated with two particular tests as regards hangover headache; both tests were carried out by the principal investigator (O.S.).

Recheck of work-ups
The work-ups of 92 dalesmen were rechecked in an entirely blinded way [7] and the results compared.

Recheck of dalesmen (41~26)
A recheck was carried out in a totally blinded way [7] in 26 dalesmen. The mean interval between examinations I and II was 14.8 months (range 4–23 months). This group originally consisted of 41 dalesmen. Fourteen dalesmen in this control group stemmed from the early part of the study where "hangover headache questions" were not asked (crf. Material and methods) and one was a teetotaller, leaving 26 dalesmen for check/recheck comparison.

Results

A categorisation of the responses is presented in Table 2. The total sum of the numbers in the solitary response sub-groups originally exceeded the total number of dalesmen included, because the same dalesman could be plotted in various sub-groups. An example will illustrate this:

A dalesman might in his own estimation have been "careful" with alcohol consumption (Table 2). However, the response might have been two-fold: occasionally, "hangover headache" ensued ("n" in the total material=80), but, at other times, there was "no headache". Both these possibilities were, accordingly, plotted. In Table 2,

Table 2 Hangover headache (IHS: 8.3.1). Response groups among 1122 dalesmen

Category	Headache (no.)	No headache	M/F ratio
Dalesmen with hangover headache*	714		1.50
Teetotallers		21	
"Careful" with alcohol: no hangover headache		291	0.72
"Adequate amounts", but still no headache		96	
Total	714	408	
	1122		1.14

* Also included is a group: "Careful with alcohol, but still hangover headache": n=80
(A) Percentage with hangover headache, total series: 714 of 1122=64%
(B) Percentage with hangover headache in those with probable, proper exposure: 714 of 810 (714+96)=88%
M/F ratio in those with hangover headache (1.50) *vs*. those without (0.72), $p<0.0005$

the solitary figures have been "rectified". As regards the above example, this specific dalesman was plotted as a hangover headache case, as he virtually also had had hangover headache. The "no headache" alternative was deleted. In other words, the fact that a dalesman has been categorised as a case of hangover headache in Table 2, indicates that he, of course, had experienced hangover headache, but it does not imply that a hangover headache would appear on every occasion.

Prevalence

A fraction of those questioned were teetotallers, respectively, they had tried alcohol in such small quantities that hangover headache probably could not be expected (Table 2). The "careful with alcohol: no hangover headache" group was a sizable one. These dalesmen contended that they had not experienced intoxication or intemperance. Obviously, the quantities consumed by the "careful" ones would also vary from one occasion to another.

There are naturally various ways of calculating hangover headache prevalence. The most sensible way of doing it is probably to calculate the number of headache cases in relation to the number of dalesmen questioned. Calculated in this way, 64% of the dalesmen had experienced hangover headache (Table 2, A). The extremes that could have been obtained by including every one of the 216 who were excluded would have been: 53% and 69%; i.e., none or all of the 216 (Table 1), respectively, demonstrating hangover headache. The correct prevalence will, of course, not be at the extremes, but somewhere in the middle, i.e., somewhat around 64%. Another, but probably less sensible, way of calculating hangover headache prevalence would be to include only those who had been properly exposed to alcohol. In that case, 88% had had hangover headache (Table 2, B).

In the first demography concerning "sobriety" in Norway (1857) [10], Vågå was specifically mentioned, but not the alcohol consumption. It was mentioned that in neighbouring parishes, coffee seemed to be replacing alcohol in various situations.

Sex ratio

In dalesmen with proper hangover headache, there was a clear male preponderance, i.e., a male/female ratio of 1.50 (Table 2), while in those "careful with alcohol: no hangover headache" (n=291), the ratio was 0.69 (not shown in Table 2). Among the teetotallers, there also seemed to be a tendency to female preponderance, but this group was too limited in number for decisive conclusions to be drawn. The hangover headache sex ratio differed essentially from that in the total Vågå material: 0.94 (see Table 1) [11]. The sex ratio figures in the entire Vågå material should, however, not be used in this comparison: Among the first 500 dalesmen not asked about hangover headache, there was a clear female preponderance (Fig. 1). In the remainder of the Vågå material, there was a sex ratio of 1.14 (Table 2). Even when compared with that figure, there was a significantly increased male/female ratio for hangover headache ($p<0.0005$).

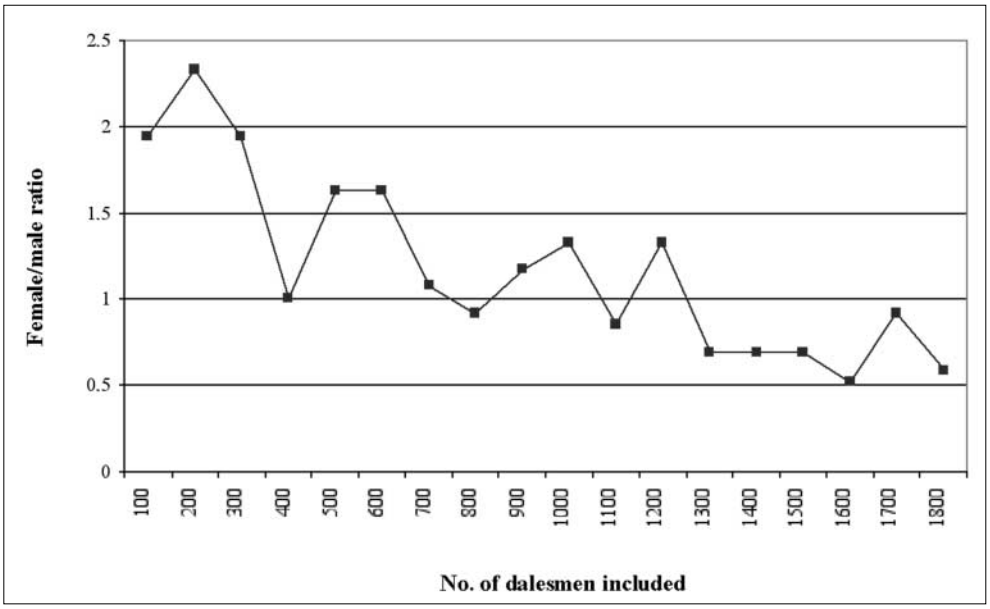

Fig. 1 Female/male ratio as a consequence of increasing the number of inclusions

Age at first hangover headache experience

The exact time of the first experience was hard to determine in many cases. Most dalesmen seemed to have experienced hangover headache already in the mid/late teens or early twenties.

Hangover headache among the last 29 examined dalesmen

Among the 29 dalesmen examined approximately 2 months after the study was intentionally discontinued, the percentage of hangover headache corresponded well to the overall prevalence (Table 3). This provides evidence that the prevalence rate would not have been drastically changed if this study had been extended.

Validation studies

The data collection system was validated with two particular tests:

Blinded recheck of work-ups (n=100–92)
Two of those with a positive record for hangover headache on examination I were found to have a somewhat dubious story for hangover headache on examination II. Otherwise, there was a consistency of the results (Table 4). κ-value: 0.96.

Table 3 Hangover headache among the 29 last examined dalesmen

Category	No.
Hangover headache	16
"Careful" with alcohol, but still hangover headache	3
"Careful" with alcohol; no hangover headache	6
Not asked about hangover headache	4
Total	29

Percentage with hangover headache: 76% (19 out of 25)

Table 4 Recheck of records (n=~92)

Hangover headache	
Examination I	Examination II
(+/–)	(+/–)
+61	+59
	–2
–31	–31
Total 92	92

Kappa-value: 0.96

Table 5 Re-examination of dalesmen regarding hangover headache (n=41–26)

Hangover headache	
Examination I	Examination II
(+/–)	(+/–)
+11	+10
	–1
–15	–13
	+2
Total 26	26

As regards: discrepancy between original number of examined dalesmen (n=41) and the actual one (n=26), see text
Kappa-value: 0.77

Repeat, blinded examination of dalesmen (n=26)
In three cases, there was a discrepancy between examinations I and II results, mostly minor ones. Such cases were considered as failures in this context. Thus, there were 23 out of 26 with consistent results, i.e., 83.5%. κ-value: 0.77 (Table 5).

Discussion

Prevalence of hangover headache

Excluding "teetotallers" and those "careful with alcohol", the prevalence of hangover headache in the Vågå study would be: 88% (Table 2). With heavy amounts, almost all individuals could, in theory, get hangover headache; this may be a question of the massiveness of the stimulus. The most relevant prevalence figure is probably based on those who really had experienced hangover headache in their lifetime, irrespective of the degree of the exposure, i.e., 64% in the Vågå study (Table 2).

In this context, a comparison will first and foremost be made with studies, employing a "face-to-face" interview technique, as regards hangover headache [12, 13]. Although the Copenhagen study [13] professes to study IHS code 8.1.4 (headache occurring "within three hours after ingestion of alcohol"), "hangover", IHS code: 8.3.1, is specified in the text (in Table 4, [13]). Hangover headache proper has, therefore, probably been studied. Interpreted in this way, hangover headache prevalence seems to be of the same order of magnitude in the Copenhagen [13] and present studies, i.e., 72% and 64%,

respectively. In a study from another Nordic country, Finland [12], based on experimental alcohol ingestion in 30 individuals, hangover headache apparently invariably appeared during the experiment. However, the selection of this group was particular in that – due to the aim of the study – only individuals who had experienced hangover headache beforehand were selected.

Harburg et al. [1] found that among hangover cases: 41% had hangover headache and that approximately 20% of current drinkers had no hangover symptoms after being "tipsy, high, or drunk". The closest one can get to a comparison with this last figure in our series would be 100–88%=12% (Table 2, B). This means that in approximately 40% of their cases (1) there was "hangover" and not hangover headache. It should be emphasised that their categories are not identical to the present ones. Their study was also based on questionnaires and not on a "direct" technique.

Gender and hangover headache

In the present series, there was a clear male preponderance of hangover headache. We are not aware of comparable data as regards hangover headache. However, there is ample evidence in the literature that males tend to start drinking earlier in life than females [5], that they are heavier drinkers than females [1, 5], and that they get drunk more frequently [14]. Indirectly, this gives some support for a higher preponderance also of hangover headache in the male.

Control studies

Our validation studies give support to the view that the anamnestic information obtained is reliable. The study of 29 latecomers showed results analogous to those in the earlier part of the study. This indicates that the results in the first 500, systematically not examined, probably would not have differed appreciably. It also indicates, but does not prove, that the results in the intervening, non-examined dalesmen would also not have differed appreciably, as they were excluded – in this context – only to take care not to hurt their feelings. It appears that with a "Nordic" drinking pattern, characterised by sizable quantities at intervals, as detailed in this communication, hangover headache is a frequent event.

Acknowledgements We are indebted to GlaxoSmithKline of Norway, Pharmacia & Upjohn, and the Alf Harborg Foundation, Department of Neurology, St. Olavs Hospital, Trondheim, Trondheim University Hospitals, for generous support during the various phases of the investigation. The authors are also grateful to the personnel at the Vågå Health Centre at Vågåmo for their aid. Last, but not least, we thank the inhabitants of the Vågå commune for their collaboration.

References

1. Harburg E, Davis D, Cummings KM, Gunn R (1981) Negative affect, alcohol consumption and hangover symptoms among normal drinkers in a small community. J Stud Alcohol 42:998–1012
2. Wiese JG, Shlipak MG, Broconer WS (2000) The alcohol hangover. Ann Intern Med 132:897–902
3. – (1988) Classification and diagnostic criteria for headache disorders, cranial neuralgias, and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 8[Suppl 7]:1–96
4. – (2004) The international classification of headache disorders, 2nd edn. Headache Classification Subcommittee of the International Headache Society. Cephalalgia 24[Suppl 1]:1–160
5. Jægtvik T, Schei E (1999) Hjemmebrent og ungdomsfyll. (Adolescent alcohol behaviour in northern Norway). Tidsskr Nor Lægeforen 119:2010–2014
6. Bråthen G (2001) The classification and clinical diagnosis of alcohol-related seizures. Thesis, Trondheim University
7. Sjaastad O, Båtnes J, Haugen S (1999) The Vågå study: an outline of the design. Cephalalgia 19[Suppl 25]:24–30
8. Gillies HC, Rogers HJ, Spector RG, Trounce JR (1986) A textbook of clinical pharmacology, 2nd edn. Edward Arnold, London, pp 848–856
9. Raskin NH (1986) Ice cream, ice pick and chemical headaches. In: Vinken PJ, Bruyn GW, Klawans HL, Rose FC (eds) Handbook in clinical neurology, Vol 48. Elsevier, Amsterdam, pp 441–448
10. Sundt E (1857) Om ædruelighets-tilstanden i Norge. (On sobriety in Norway). Oslo
11. Sjaastad O, Pettersen H, Bakketeig LS (2001) The Vågå study; epidemiology of headache I: The prevalence of ultrashort paroxysms. Cephalalgia 21:207–215
12. Kaivola S, Parantainen J, Österman T, Timonen H (1983) Hangover headache and prostaglandins: Prophylactic treatment with tolfenamic acid. Cephalalgia 3:31–36
13. Rasmussen BK (1994) Epidemiology of headache. Thesis. Københavns Universitet, Copenhagen
14. Wechsler H, Isaac N (1992) "Binge" drinkers at Massachusetts colleges. Prevalence, drinking style, time trends, and associated problems. JAMA 267:2929–2931