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Trigger factors of migraine and tension-type headache: experience and knowledge of the patients

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Abstract The objective was to examine potential trigger factors of migraine and tension-type headache (TTH) in clinic patients and in subjects from the population and to compare the patients' personal experience with their theoretical knowledge. A cross-sectional study was carried out in a headache centre. There were 120 subjects comprising 66 patients with migraine and 22 with TTH from a headache outpatient clinic and 32 persons with headache (migraine or TTH) from the population. A semistructured interview covering biographic data, lifestyle, medical history, headache characteristics and 25 potential trigger factors differentiating between the patients' personal experience and their theoretical knowledge was used. The most common trigger factors experienced by the patients were weather (82.5%), stress (66.7%), menstruation (51.4%) and relaxation after stress (50%). The vast majority of triggers occurred occasionally and not consistently. The patients experienced 8.9±4.3 trigger factors (range 0–20) and they knew 13.2±6.0 (range 1–27). The number of experienced triggers was smallest in the population group (p=0.002), whereas the number of triggers known did not differ in the three study groups. Comparing theoretical knowledge with personal experience showed the largest differences for oral contraceptives (65.0 *vs.* 14.7%, p<0.001), chocolate (61.7 *vs.* 14.3%, p>0.001) and cheese (52.5 *vs.* 8.4%, p<0.001). In conclusion, almost all trigger factors are experienced occasionally and not consistently by the majority of patients. Subjects from the population experience trigger factors less often than clinic patients. The difference between theoretical knowledge and personal experience is largest for oral contraceptives, chocolate and cheese.

Key words Migraine • Tension-type headache • Weather • Stress • Menstruation

Introduction

Identification of trigger factors is frequently recommended as a basic strategy in the treatment of migraine and tension-type headache (TTH) [1, 2]. Potential trigger factors have been examined most frequently in migraine and less often in TTH. Many of these factors are related to migraine as well as to TTH, but their prevalence may differ in the two headache types [3–6]. Menstruation, environmental and psychological factors, sleep disturbances, fatigue, alcohol and nutrition are mentioned most frequently.

Menstruation precipitates not only migraine, but also TTH [4, 7]. In a prospective study [8], menstruation was related to migraine attacks in 32% of the women with migraine and it precipitated headache in 19% of the migraine-free control group. Among the environmental factors, weather is mentioned most often [6]. The findings of controlled studies are inconsistent, but certain meteorological parameters seem to precipitate headache at least in some patients [9, 10]. Sensory stimuli such as flickering light and glare are particularly related to migraine with aura and they are less important in migraine without aura and pure TTH [5, 6, 8, 11, 12]. Psychological factors, in particular stress, are experienced as a major precipitant of migraine and TTH by many patients [4, 8] and this finding was confirmed in prospective and controlled studies [13, 14]. It is under debate, however, whether stress is more important in migraine or in TTH [4, 8, 15]. Sleep disturbances and fatigue are also related to headache, but they are more likely consequences than precipitants of a headache attack [4, 16, 17].

Among the nutritional factors, consumption of alcohol and withdrawal of caffeine seem to be most important in precipitating migraine and TTH [18, 19]. In addition, there is some evidence that missing meals is also an important factor [20]. The relevance of dehydration was recently stressed in a case series [21]. Regarding the 'classical' trigger factors red wine, chocolate and cheese, a selective sensitivity to red wine has been shown in some patients [22], the importance of chocolate has been doubted seriously [23] and scientific evidence for cheese as a migraine and TTH precipitant is totally lacking.

Despite a series of experimental studies demonstrating that parenteral histamine and NO donors such as nitroglycerin cause headache [18, 24], the role of histamine, nitrates and nitrites in food remains unclear. Similarly, other biogenic amines and aspartame have not been proven to precipitate headache [18]. Sodium glutamate causes adverse reactions including headache probably at large doses ingested on an empty stomach only [25].

Numerous other trigger factors such as neck problems, exhaustion, sexual activity, posture, travelling, smoking, head trauma, fruits, vegetables, nuts, milk and dairy products have been suspected to provoke headache attacks, but scientific evidence is poor [26, 27].

In many studies, it remains unclear whether a certain factor precipitates headache consistently or only occasionally. Furthermore, the experience of patients recruited in a headache centre might differ from that of subjects from the population. Finally, the patients' theoretical knowledge about trigger factors as well as the relation between theoretical knowledge and personal experience are widely unknown.

Therefore, the objectives of the present study were (1) to examine clinic patients as well as patients from the general population, (2) to record whether a certain factor precipitates headache consistently or only occasionally and (3) to compare the patients' personal experience to their theoretical knowledge about trigger factors.

Patients and methods

We examined a total of 120 patients comprising 66 patients with migraine and 22 with TTH from a headache outpatient clinic (MIG-C, TTH-C) and 32 persons with migraine (n=5) or TTH (n=27) from the population (HA-P) recruited by one of the authors (JH) in her neighbourhood. We included subjects aged 18–65 with migraine without aura, migraine with aura and/or TTH according to the criteria of the second edition of the International Classification of Headache Disorders (ICHD-II) [18]. Subjects suffering from migraine as well as from TTH were classified as migraine [4]. We excluded subjects with medication overuse, medication overuse headache, other types of headache and other clinically relevant diseases. All participants gave their informed consent.

Clinic patients were recruited at a headache outpatient clinic of a university hospital by screening the records. Among 161 consecutive clinic patients whose records indicated that the inclusion and exclusion criteria were fulfilled, 55 (34%) could not be reached, 18 (11%) refused to participate and 88 (55%) completed the interview. Subjects from the population were recruited in the neighbourhood of one of the authors (JH) and the rate of completers was 97%.

We recorded biographic data, lifestyle, general medical history and headache characteristics and we asked the patients about potential trigger factors of migraine and TTH. The biographic data included age, gender, marital status, number of children, level of education and occupation. Lifestyle covered physical activity, sleep, consumption of alcohol, caffeine and chocolate and smoking habits. The medical history comprised current and previous diseases, operations, medication and hormonal contraception. The headache characteristics included onset, frequency and duration of headache as well as all pain characteristics and associated symptoms required to establish the diagnosis

of migraine and TTH according to the IHS criteria. Regarding the trigger factors, the first set of questions referred to the patients' personal experience and the second set to their theoretical knowledge. The participants had to state for each of 25 factors whether this factor precipitated headache in their own personal experience using a three-point scale (always, sometimes, never/don't know) and they had to specify whether they had heard or read that this factor might precipitate headache using a two-point scale (yes, no).

All subjects were interviewed by the same person (JH) either face-to-face or by phone. The interviews lasted between 20 and 40 min.

For calculations and statistical analyses SPSS for Windows software was used. Data are given as mean and standard deviation (SD) or as median and range. To compare the findings in the study, Kruskal-Wallis and Wilcoxon tests, respectively, were calculated.

Results

Biographic data

The patients' age ranged between 36.8±11.4 and 39.5±12.7 years and was comparable in the three study groups. The majority of patients were female. The proportion of women was lowest in the TTH-C group and significantly higher in the two other groups (TTH-C: 63.6%; MIG-C: 92.4%, HA-P: 93.7%; $p<0.001$). Marital status, number of children, highest level of education and occupation did not differ in the three groups.

Lifestyle

Physical activity, quality of sleep, consumption of alcohol, caffeine and chocolate and smoking habits were similar in the two groups of clinic patients and in the subjects from the population. Some of the parameters showed numerical differences, but none of these differences reached the level of statistical significance. The number

participating in sport ranged between 65.6% and 83.3%. Biking, jogging and swimming were most popular and the median time spent on sport was 4.8–7.0 h/month. Quality of sleep was good in 63.6%–81.3%. The number of poor sleepers was largest in the TTH-C (27.3%) and smallest in the HA-P group (3.1%). Details on the consumption of alcohol, caffeine and chocolate, and smoking habits are given in Table 1.

Medical history

One quarter of the patients reported current diseases beside headache. The most frequent diagnoses were arterial hypertension (n=13), followed by elevated serum cholesterol, allergies, hypothyreosis and glaucoma. In none of the hypertensive patients was there evidence of headache attributed to arterial hypertension. One third of the patients took medication for disorders other than headache. The percentage was largest in the TTH-C group and smaller in the two other groups, but the difference was statistically not significant. In addition, there was a non-significant trend towards a smaller number of women taking oral contraceptives in the group of headache patients from the population (MIG-C: 44.3%, TTH-C: 38.5%, HA-P: 23.3%).

Headache characteristics and treatment

The time since onset of headache was similar in the three study groups, whereas all other headache characteristics differed markedly (Table 2). Working capability as well as quality of life were impaired most severely in the MIG-C group (Table 3).

Regarding medical management of the headache, 4 of the 32 subjects from the HA-P group (12.5%) had been seen by a general practitioner because of headache, but none had been seen by a neurologist. As expected, pharmacotherapy was used more frequently by clinic patients than by subjects from the population (Table 4).

Table 1 Number of patients consuming alcohol, caffeine, and chocolate, and number of smokers in the three study groups

	MIG-C (n=66)		TTH-C (n=22)		HA-P (n=32)		p-value
Alcohol, n (%)	27	40.9	7	31.8	14	43.8	n.s.
Caffeine, n (%)	64	97.0	20	90.9	32	100.0	n.s.
Chocolate, n (%)	52	79.9	17	77.3	28	87.5	n.s.
Smoking, n (%)	22	33.3	3	13.6	9	28.1	n.s.

MIG-C, clinic patients with migraine; *TTH-C*, clinic patients with TTH; *HA-P*, subjects from the population with headache (migraine or TTH)

Table 2 Headache characteristics in the three study groups

	MIG-C (n=66)		TTH-C (n=22)		HA-P (n=32)		p-value
HA onset (years) median, range	13.5	1.8–45.0	7.0	1.0–44.0	10.0	0.0–50.0	n.s.
HA days per month median, range	4.8	0.5–30.0	8.0	1.0–30.0	1.0	0.2–8.0	<0.001
Duration (hours) median, range	24.0	4.0–72.0	12.0	4.0–48.0	4.5	0.2–72.0	<0.001
Intensity							
Mild, n (%)	9	13.6	4	18.2	17	53.1	
Moderate, n (%)	28	42.4	14	63.6	15	46.9	
Severe, n (%)	49	74.2	7	31.8	7	21.9	<0.001
Aggravation, n (%)	52	78.8	10	45.5	12	37.5	<0.001
Nausea, n (%)	53	80.3	5	22.7	5	15.6	<0.001
Vomiting, n (%)	37	56.1	0	0.0	3	9.4	<0.001
Photophobia, n (%)	56	84.8	12	54.5	6	18.8	<0.001
Phonophobia, n (%)	58	87.9	9	40.9	11	34.4	<0.001

MIG-C, clinic patients with migraine; *TTH-C*, clinic patients with TTH; *HA-P*, subjects from the population with headache (migraine or TTH)

Table 3 Working capability and quality of life in the three study groups.

	MIG-C (n=66)		TTH-C (n=22)		HA-P (n=32)		p-value
Impairment of working capability							
None, n (%)	2	3.0	0	0.0	11	34.4	
Mild, n (%)	7	10.6	7	31.8	14	43.8	
Moderate, n (%)	26	39.4	13	59.1	5	15.6	
Severe, n (%)	31	47.0	2	9.1	2	6.3	<0.001
Impairment of quality of life							
None, n (%)	1	1.5	1	4.5	24	75.0	
Mild, n (%)	17	25.8	9	40.9	7	21.9	
Moderate, n (%)	23	34.8	6	27.3	1	3.1	
Severe, n (%)	25	37.9	6	27.3	0	0.0	<0.001

MIG-C, clinic patients with migraine; *TTH-C*, clinic patients with TTH; *HA-P*, subjects from the population with headache (migraine or TTH)

Table 4 Pharmacotherapy of headache in the three study groups.

	MIG-C (n=66)		TTH-C (n=22)		HA-P (n=32)		p-value
Acute medication							
Yes, n (%)	58	87.9	15	68.2	17	53.1	
No, n (%)	8	12.1	7	31.8	15	46.9	0.001
Preventive medication							
Yes, n (%)	12	18.1	7	31.8	0	0.0	
No, n (%)	54	81.8	15	68.2	32	100.0	0.005

MIG-C, clinic patients with migraine; *TTH-C*, clinic patients with TTH; *HA-P*, subjects from the population with headache (migraine or TTH)

Trigger factors

Personal experience

In the entire group of patients, the most common trigger factors were weather (82.5%), stress (66.7%) and menstruation (51.4%). The mean number of trigger factors experienced by the patients at least sometimes was 8.9±4.3 (range 0–20) in the entire group, 10.0±4.3 in the MIG-C group, 8.5±3.6 in the TTH-C group and 6.7±4.0 in the HA-P group ($p=0.002$). In each of the three subgroups, weather and stress were cited most frequently, followed by menstruation in the MIG-C group, noise in the TTH-C group and hunger in the HA-P group (Fig. 1). Menstruation, relaxation after stress, stress, physical activity, red wine and noise were experienced sig-
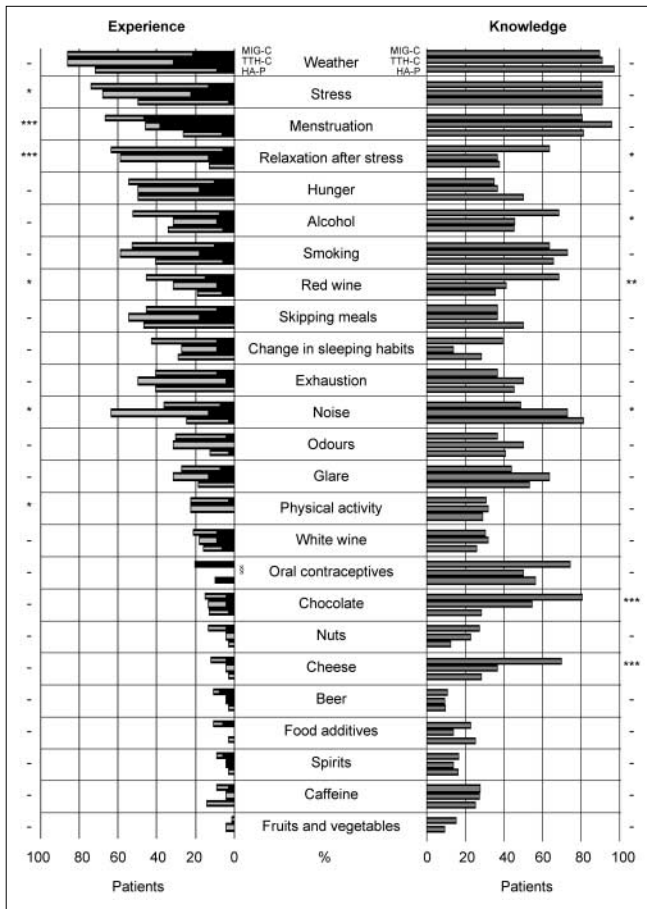
Fig. 1 Potential trigger factors of migraine and TTH: personal experience and theoretical knowledge. In each set of three bars, the percentages in clinic patients with migraine (MIG-C, top) and TTH (TTH-C, middle), and subjects with headache from the population (HA-P, bottom) are given. §Answer only yes or no. Left: bars in black, consistent trigger; bars in light grey, occasional trigger. Right: bars in dark grey, known to the patient as trigger factor. ***$p<0.001$, **$p<0.01$, *$p<0.05$; –, no statistically significant difference between the three study groups

nificantly less often in the HA-P group. None of the other factors differed in the three study groups (Fig. 1).

Evaluating the consistency of the trigger factors in the entire group of patients showed that 14 of the 15 most common factors were experienced significantly more often occasionally than consistently. Menstruation was the only exception, being cited more often as a consistent trigger factor (Fig. 2).

Theoretical knowledge

In the entire group of patients, the best known trigger factors were weather (91.7%), stress (90.8%) and menstruation
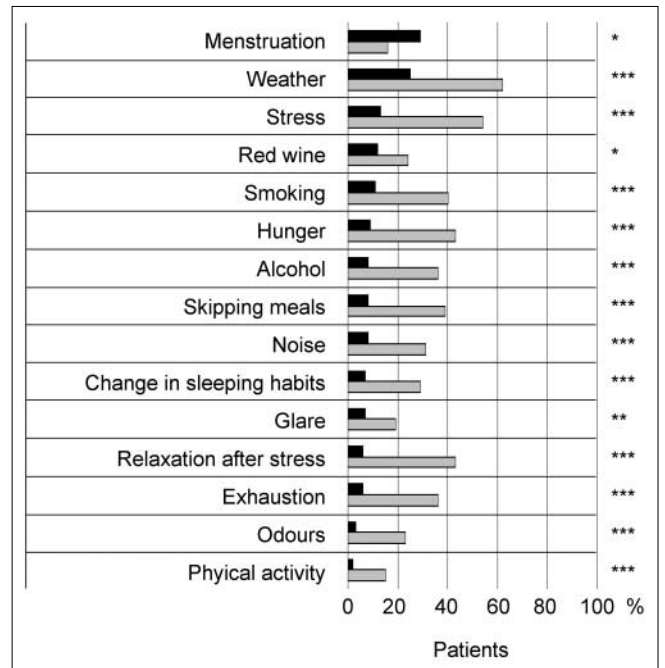

Fig. 2 Potential trigger factors of migraine and TTH: consistent (black bars) *vs.* occasional triggers (grey bars) in the entire group of 120 patients. ***$p<0.001$, **$p<0.01$, *$p<0.05$; –, no statistically significant difference in the three study groups

(83.3%). The mean number of trigger factors known to the patients was 13.2 ± 6.0 (range 1–27) in the entire group, 14.1 ± 5.5 in the MIG-C group, 13.0 ± 6.5 in the TTH-C group and 11.4 ± 6.5 in the HA-P group. This trend was statistically not significant. Details on the theoretical knowledge in the three subgroups are given in Figure 1. Chocolate, cheese, red wine, alcohol and relaxation after stress were best known in the MIG-C group. Noise was given most often in the HA-P group. None of the other factors differed statistically significantly in the three study groups.

Comparison of personal experience and theoretical knowledge

In the entire group of subjects, the number of patients having heard or read that a certain factor might precipitate migraine or TTH usually was larger than the number of patients who themselves experienced this factor as a headache precipitant. The difference between theoretical knowledge and personal experience was statistically significant in 20 factors (Fig. 3) and it was largest for oral contraceptives (65.0 *vs.* 14.7%, $p<0.001$), chocolate (61.7 *vs.* 14.3%, $p>0.001$) and cheese (52.5 *vs.* 8.4%, $p<0.001$). Surprisingly, the number of patients who experienced hunger, skipping meals and changes in sleeping habits was
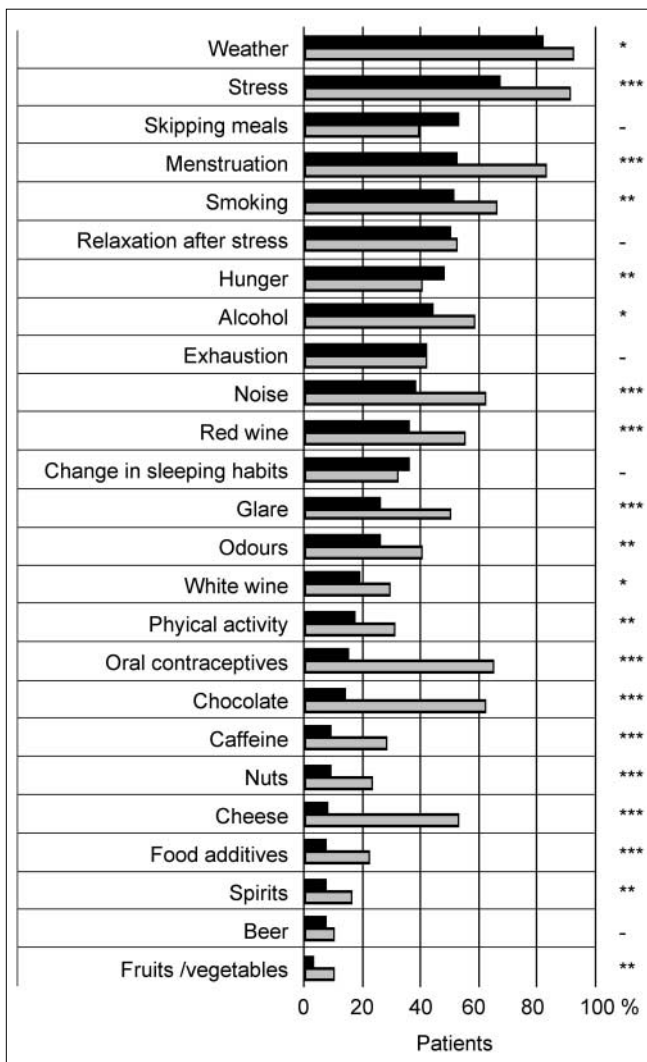
Fig. 3 Potential trigger factors of migraine and TTH: personal experience (black bars) *vs.* theoretical knowledge (grey bars) in the entire group of 120 patients. ***$p<0.001$, **$p<0.01$, *$p<0.05$; −, no statistically significant difference in the three study groups

larger than the number of patients who had heard or read about these factors. The difference was statistically significant for hunger ($p<0.01$, Fig. 2).

Discussion

In this study, weather changes, stress and menstruation were cited most frequently as precipitants of migraine and TTH, respectively. Clinic patients experienced trigger factors more often than subjects from the general population. This was true for the mean number of trigger factors experienced by each patient as well as for six specific factors, i.e., menstruation, relaxation after

stress, stress, red wine, noise and physical activity. Apart from menstruation, trigger factors were experienced significantly more often occasionally than consistently. The number of trigger factors known to the patients was similar in the three study groups. The theoretical knowledge of a certain trigger factor usually exceeded the personal experience with this factor. The difference between theoretical knowledge and personal experience was largest for oral contraceptives, chocolate and cheese, which were frequently taken for headache precipitants but rarely experienced.

The trigger factors cited most often in our study are similar to those reported in the literature. Menstruation and stress were most important in many other studies [27]. However, the number of patients citing weather was extremely high, exceeding the rates in all previous reports [6, 27]. In contrast, changes in sleeping habits cited frequently in other studies were given less often in the present one [8].

The finding that personal experience with trigger factors was more common in clinic patients than in the subjects from the population might be explained by more frequent and more disabling headaches in the two clinic groups. One could assume that frequent and/or disabling headaches cause the patients to observe trigger factors more closely. Data from the literature are not available, as this is the first study including subjects from the population as well as from a headache centre.

Apart from that, the present study is one of very few asking not only whether a certain trigger was observed or not, but also whether this precipitated headache consistently or only occasionally. Our study clearly indicates that trigger factors do not function in an all-or-none fashion. Scharff et al. [5] argued that it may be more appropriate to allow subjects to respond along a continuum of likelihood or frequency than using the dichotomy of yes or no to assess headache triggers and to identify subtle differences in diagnostic categories. The findings in our study support this argument.

The general level of information did not differ in the three study groups, even though patients from the population had significantly less severe headaches with significantly less impact on working capability and quality of life. Comparable to the findings regarding the patients' personal experience, weather was best known, followed by stress and menstruation. The level of knowledge about specific trigger factors differed most markedly in the "classical" nutritional triggers of migraine attacks, i.e., red wine, chocolate and cheese, which were best known in the MIG-C group. However, there is only evidence supporting the role of red wine, whereas chocolate and cheese have not been proven to trigger migraine attacks [22, 23, 26].

The marked discrepancy between personal experience and theoretical knowledge regarding the precipitation of migraine and TTH by chocolate and cheese indicates also that patient information – from whatever source ever [28] – overestimates these factors. It seems more reasonable to inform the patients that there is no evidence that the strict avoidance of chocolate and cheese reduces the frequency or severity of headache attacks. Similarly, the prominent role of the weather as the most frequently experienced and best known trigger factor in this study might be due to an over-representation in sources of information used by headache patients.

Apart from chocolate and cheese, personal experience and theoretical knowledge differed markedly in oral contraceptives. Women with migraine should know that oral contraceptives are well tolerated by the majority of migraineurs, but that it is useful to observe characteristics and frequency of migraine attacks after starting or changing oral contraceptives and that the use of oral contraceptives is restricted in patients with aura symptoms and additional vascular risk factors such as hypertension, diabetes mellitus or smoking [27].

Limitations of the study are the relatively small number of subjects, the way of selecting the patients from the population, the high number of dropouts among the clinic patients and the fact that some of the interviews were performed by phone. Apart from that we did not take into account the different pathogenetic mechanisms underlying migraine and TTH.

Strengths of this study are the inclusion of clinic patients and patients from the population, the comparability of the three study groups regarding not only biographic data (with the exception of sex), but also lifestyle and general medical history, the strict headache diagnosis according to the ICHD-II criteria, the differentiation between consistent and occasional trigger factors and the consideration of the patients' theoretical knowledge about trigger factors.

In conclusion, this study indicates that almost all trigger factors precipitate migraine and TTH only occasionally and not consistently in the vast majority of patients. In addition, it demonstrates that patients from the population experience trigger factors less often than clinic patients, whereas the general knowledge about trigger factors does not differ. Finally, the study shows differences between theoretical knowledge and personal experience, which are largest in oral contraceptives, chocolate and cheese. Educating patients about trigger factors should be based on scientific evidence and should focus on those factors that can be modified.

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