

## Research Submission

# Factors Associated With Primary Headache According To Diagnosis, Sex, and Social Group

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**Background.**—We previously showed that migraine and tension-type headache (TTH) have a high prevalence that differs markedly between social groups. Here, we aim to identify factors associated with migraine and TTH (possible risk factors) in three social groups to better understand the difference in prevalence between sexes, between different headache diagnoses, and between different social groups.

**Material and Methods.**—The study included 3124 persons: 1007 blood donors (484 females, mean age 34.1), 1075 workers in an oil and gas factory (146 females, mean age 40.4), and 1042 medical students (719 females, mean age 20.6). Headache diagnoses and associated factors were identified by direct or telephone interview using a semistructured, validated form. It was administered by a neurologist or by specially trained senior medical students under supervision of a neurologist.

**Results.**—We report factors associated with headache according to diagnosis, sex, and social group using multivariate logistic regression analysis. (1) *According to diagnosis.* Many associated factors were common for migraine and TTH: female sex, arterial hypertension, history of head trauma, and consumption of light alcoholic beverages. To be a student was associated with the highest risk of migraine (OR 6.6; 95% CI 4.2-10.4) and TTH (OR 3.6; 95% CI 2.7-4.8). Low physical activity (OR 1.6; 95% CI 1.0-2.4) and family history of headache (OR 2.1; 95% CI 1.5-2.9) were associated only with migraine. Current smoking and BMI > 25 were negatively associated with migraine and TTH. (2) *According to sex.* Common factors associated with migraine and TTH in both sexes included history of head trauma, family history of headache, and arterial hypertension. Use of alcohol was different between sexes: in males consumption of strong alcoholic beverages was associated with TTH (OR 1.5; 95% CI 1.0-2.0) and in females consumption of light alcoholic beverages was associated with migraine (OR 3.49; 2.03-6.02) and TTH (OR 3.0; 95% CI 1.93-4.66). Low physical activity was associated with migraine in females (OR 1.9; 95% CI 1.1-3.2). (3) *According to social group.* Common factors associated with headache in all groups included female sex, family history of headache, history of head trauma, and arterial hypertension. Consumption of light alcoholic beverages was associated with migraine and TTH in blood donors and students. Only two factors were specific to a social group: consumption of strong alcoholic beverages was associated with TTH in blood donors (OR 1.5; 95% CI 1.1-2.1), low physical activity was associated with migraine in students (OR 1.98; 95% CI 1.04-3.74) and with TTH in workers (OR 2.1; 95% CI 1.2-3.7).

**Conclusion.**—Most of the associated factors were shared by the sexes. The associated factors varied somewhat more between migraine and TTH and between social groups. To be a student was associated with the highest risk of headache.

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**Factors different from those in the present and previous studies should be studied in the future in order to better understand the differences in associated factors according to diagnosis, sex, and social group.**

**Key words:** headache, migraine, tension type headache, possible risk factors, students, workers

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## INTRODUCTION

Factors associated with primary headache disorders (possible risk factors) have been estimated in many previous studies.<sup>1-4</sup> Among the most frequently mentioned factors are female sex, family history of headache, and history of head trauma. Some authors found differences in risk factors in different countries.<sup>5</sup> However, none of these studies performed complex analysis of factors associated separately with migraine and tension type headache (TTH) and none used the newly published International Classification of Headache Disorders third edition (ICHD-3beta) to diagnose the different types of headache.<sup>6</sup> Only a few were able to diagnostically separate migraine and TTH and none compared associated factors in sufficiently large social groups.

We previously found that the prevalence of migraine and TTH varied considerably between social groups, primarily because students had a higher prevalence of both migraine and TTH and workers had a lower prevalence of TTH.<sup>7</sup> Our hypothesis in this study was that factors associated with migraine and TTH differ not only between sexes but also between social groups.

We used a validated semistructured professionally conducted interview in three different social groups: students, workers, and blood donors. This diagnostic methodology is optimal for epidemiological studies but it is very resource demanding. Nevertheless, we included over 1000 in each group to allow sufficient statistical strength to document differences between groups and we used ICHD-3beta diagnoses for the first time in this kind of epidemiological study.

## MATERIALS AND METHODS

**Study Design.**—A cross-sectional study was conducted between September 2012 and August 2013. Details of materials and methods have been published before.<sup>7</sup> An abbreviated version follows.

**Study Populations.**—We included 3124 persons who agreed to be interviewed and were able to give characteristics of headaches and information about their associated factors unless the following reasons for exclusion were present: patient had a history of stroke or TIA, subarachnoid hemorrhage, intracranial aneurysm, intracranial hemorrhage, brain tumor, any operation on the brain, multiple sclerosis, epilepsy, encephalitis, meningitis, dementia, other serious neurological or somatic disorder.

The sampling strategy was based on the main hypothesis of this study, that there are significant differences in factors associated with migraine and TTH between different social groups. We, therefore, chose two social groups that could be expected to differ considerably: students who represented the high intellectual social group and workers with manual occupation. Blood donors were chosen as a mixed group who had much similarity with general population. In our previous study of the same population as in the present study, we found that blood donors had a prevalence of migraine and TTH similar to the general population.<sup>7</sup> Social groups are not the same as occupational groups. A social group is defined as “two or more people who interact with one another, share similar characteristics and collectively have a sense of unity” or “a group is defined in terms of those who identify themselves as members of the group.”<sup>8</sup> In each group recruitment was as far as possible consecutive and this was successful as reflected in very high participation rates: 92% in students, 97% in workers, and 98% in blood donors. The selection of the social groups was also somewhat dependent on practical issues. We have previously studied blood donors and knew that they would comply. Workers could be studied as part of an annual compulsory health examination and students were easily available and could also be expected to comply.

As indicated by the high participation rate in all groups, these expectations proved to be true.

**Data Collection.**—All participants were interviewed using a semistructured validated face-to-face interview conducted by a neurologist or by trained senior medical students. Additionally, a neurologist (N.R.K.) called participants and arranged telephone interviews if important information was missed after the initial direct interview. The interview was modified and expanded from a previously validated interview.<sup>9</sup> The student interviewers were recruited after a postgraduate lecture on headache attended by interested medical students. The interview was performed in the student's classrooms when all lessons were finished at the end of day. We included students in all semesters (1-12). Workers of an oil and gas factory were recruited as part of a compulsory annual medical examination of all employees. Office workers were not included. The interview was performed in the room where the neurologist examined these workers during their annual medical examination. Blood donors were recruited consecutively in association with their donation of blood. The interview was performed in the room where donors donated their blood.

**Definitions of Variables.**—We investigated the following factors for migraine and TTH: female sex, current smoking (defined as smoking at the time of interview), consumption of light alcoholic beverages (at least 0.5 liter per week) and strong alcoholic beverages ( $\geq 150$  g per week), arterial hypertension (participants who had a clinical diagnosis of arterial hypertension), increased body mass index (BMI  $> 25$ ), low physical activity (less than 30 minutes of physical exercises 1 times per week), oral contraceptive use, history of head trauma (history of any head trauma including a brain concussion and more severe forms), and family history of headache (one or more first degree relatives with migraine or TTH). We estimated the role of these associated factors in all participants and in females and males separately and also in each social group separately (blood donors, workers, and students). All groups had a regular compulsory medical examination: in donors every 3 months, in students and workers every year. It included neurological examination, measurement and recording of blood pressure, weight, and auscultation.

We did not include questionnaires if important data were missing and it was impossible to contact the participant. We excluded on this basis 125 participants and also excluded 5 participants according to our exclusion criteria. The total number of participants included in the study was 3124.

**Statistical Analysis.**—Since any differences in associated factors between different diagnoses, sexes or social groups were unknown, it was not possible to formally calculate the necessary sample size. We did this for the prevalence of headache disorders published previously<sup>7</sup> and the present study is based on the same material. Since the power to determine differences in prevalence between social groups in that study was excellent, it could be assumed that it would also be possible to show any major differences between associated factors. The primary outcome variable was the presence of migraine or TTH. The basic comparison was between participants with headache and without headache analyzing differences in associated factors between migraine and TTH, between men and women and between social groups.

Prevalence of different associated factors was calculated by percentage. We included the following factors: female sex, current smoker, consumption of light alcoholic beverages, consumption of strong alcoholic beverages, arterial hypertension, body mass index  $>25$ , low physical activity, history of head trauma, family history of headache, and oral contraceptive use (in females). Significant associations between these factors and migraine or TTH were reported previously.<sup>1-5</sup> The difference in prevalence of associated factors between males and females with migraine/TTH and males and females without headache were statistically examined by an unpaired t-test and chi-square test separately in three different social groups. Univariate analyses were performed to calculate crude odds ratios (OR) with 95% confidence intervals (CI). Subsequently, we performed a multivariate logistic regression analysis to identify independent associated factors. Each covariate was evaluated individually; those meeting the significance level of  $P < .05$  and  $OR > 1$  were then included in multivariate models to identify their independent contributions

**Table 1.—Overview of Study Population and Clinical Characteristics of Participants in Three Different Social Groups**

Characteristics	Blood Donors (n = 1007)	Workers (n = 1075)	Students (n = 1042)	All (n = 3124)
<b>Male</b>	523 (52%)	929 (86%)	323 (31%)	1775 (57%)
mean age and age range	33.0 19-61	39.8 21-67	20.9 17-38	31.3 17-67
<b>Female</b>	484 (48%)	146 (14%)	719 (69%)	1349 (43%)
mean age and age range	35.6 18-64	43.2 25-62	20.5 17-40	33.1 17-64
<b>All</b>	1007	1075	1042	3124
mean age and age range	34.1 18-64	40.4 21-67	20.6 17-40	31.7 17-67
Male with headache	323 (61.8%)	356 (38.3%)	284 (87.9%)	963 (54.2%)
Female with headache	362 (74.8%)	101 (69.2%)	684 (95.1%)	1147 (85.0%)
All with headache	685 (68.0%)	457 (42.5%)	968 (92.9%)	2110 (67.5%)
Migraine in female	94 (19.4%)	27 (18.5%)	250 (34.7%)	371 (27.5%)
Migraine in male	25 (4.8%)	52 (5.6%)	48 (14.8%)	125 (7%)
Migraine in all	119 (11.8%)	79 (7.3%)	298 (28.6%)	496 (15.9%)
TTH* in female	318 (65.7%)	96 (65.7%)	552 (76.7%)	966 (71.6%)
TTH in male	311 (59.5%)	302 (32.5%)	256 (79.2%)	869 (48.9%)
TTH in all	629 (62.5%)	398 (37.0%)	808 (77.5%)	1835 (58.7%)

\*TTH = tension type headache here and in other tables.

after adjusting for the presence of all other variables. These factors were analyzed in participants with headache (migraine or TTH) compared to participants without headache, in males and females and separately in three different social groups. Besides, we included age  $\geq 30$  and a factor to be student or worker and compared with blood donors who were in this calculation a referral group. Associated factors with  $P$  value  $<.05$  and  $OR > 1$  were considered statistically significant. All analyses were processed by SPSS 16.0 and performed by a statistician (D.V.G.).

**Ethical Considerations.**—The Medical Ethics Committee of the Urals State Medical University approved this study. All respondents were informed of the purpose of the survey. Written informed consent was obtained from all participants.

## RESULTS

In Table 1, we present our material of 1007 blood donors, 1075 workers and 3124 students and the most important of our previously published prevalence results.<sup>7</sup> We subdivided all revealed factors associated with headache in three groups: (1) factors according to headache diagnosis; (2) factors according to sex; (3) factors according to social group.

Factors according to headache diagnosis are shown in Table 2. *Univariate analysis* indicated that many associated factors were common for migraine and TTH. These factors included: female sex (for migraine  $OR$  11.9, 95%  $CI$  9.2-15.4; for TTH  $OR$  4.5, 95%  $CI$  3.7-5.3), arterial hypertension (for migraine  $OR$  1.5, 95%  $CI$  1.1-1.9; for TTH  $OR$  1.6, 95%  $CI$  1.3-1.9), low physical activity (for migraine  $OR$  3.7, 95%  $CI$  2.8-5.0; for TTH  $OR$  2.3, 95%  $CI$  1.8-2.9), history of head trauma (for migraine  $OR$  11.2, 95%  $CI$  8.0-15.5; for TTH  $OR$  2.3, 95%  $CI$  1.7-3.5), family history of headache (for migraine  $OR$  3.6, 95%  $CI$  1.0-4.5; for TTH  $OR$  3.0, 95%  $CI$  2.5-3.5). Consumption of light ( $OR$  1.4, 95%  $CI$  1.2-1.6) and strong ( $OR$  1.8, 95%  $CI$  1.4-2.3) alcoholic beverages were associated only with TTH. Current smoking and  $BMI > 25$  were negatively associated with migraine and TTH.

Results of *multivariate logistic regression analysis* confirmed significance of many of these associated factors (Table 3). However, consumption of strong alcoholic beverages, low physical activity, and family history of headache lost association with TTH. We also compared a factor of social group in the multiple logistic regression analysis. To be a student was associated with the highest risk of migraine ( $OR$  6.6; 95%  $CI$  4.2-10.4) and TTH ( $OR$

**Table 2.—Factors Associated With Migraine and TTH in All Participants Compared to Participants Without Headache**

Associated Factors in All Participants	Migraine (n = 496)	P, OR, 95% CI	TTH (n = 1835)	P, OR, 95% CI	Without Headache (n = 1014)
Female sex	371 (74.8%)	<.001 11.9;9.2-15.4	966 (52.6%)	<.001 4.5;3.7-5.3	202 (19.9%)
Current smoker	119 (23.9%)	<.001 0.3;0.3-0.4	642 (34.9%)	<.001 0.6;0.5-0.7	484 (47.7%)
Consumption of light alcoholic beverages	129 (26.0%)	0.5	639 (34.8%)	<.001 1.4;1.2-1.6	282 (27.8%)
Consumption of strong alcoholic beverages	47 (9.5%)	0.9	280 (15.3%)	<.001 1.8;1.4-2.3	94 (9.3%)
Arterial hypertension	106 (21.4%)	.004 1.5;1.1-1.9	416 (26.7%)	<.001 1.6;1.3-1.9	156 (15.4%)
BMI > 25*	126 (25.4%)	<.001 0.3;0.2-0.4	680 (37.1%)	<.001 0.5;0.4-0.6	548 (54.0%)
Low physical activity	132 (26.6%)	<.001 3.7;2.8-5.0	332 (18.1%)	<.001 2.3;1.8-2.9	90 (8.9%)
History of head trauma	189 (38.1%)	<.001 11.2;8.0-15.5	210 (11.4%)	<.001 2.3;1.7-3.5	53 (5.2%)
Family history of headache	306 (61.7%)	<.001 3.6;1.0-4.5	1049 (57.2%)	<.001 3.0;2.5-3.5	312 (30.8%)

\*BMI = body mass index here and in other tables.

3.6; 95% CI 2.7-4.8) and a factor to be worker was negatively associated with TTH.

**Factors According to Sex.**—The results of *univariate analysis* are shown in Tables 4 and 5. In *females* low physical activity was associated with migraine (OR 2.2, 95% CI 1.4-3.4) and TTH (OR 4.4, 95% CI 3.0-6.5), history of head trauma was associated

with migraine (OR 5.3, 95% CI 2.9-9.5), and family history of headache were associated with migraine (OR 1.5, 95%, CI 1.1-2.2) and TTH (OR 1.6, 95% CI 1.2-2.2). Oral contraceptive use (OR 5.2, 95% CI 3.1-8.8) was associated with TTH. In *males* a history of head trauma was associated with migraine (OR 40.6, 95% CI 25-66.4) and TTH (OR

**Table 3.—Results of the Logistic Regression Analysis of Factors Associated With Migraine and TTH in 3124 Participants**

Factors	All Participants		Males		Females	
	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI
Age ≥30	1.0 0.7-1.6	0.8* 0.6-0.9	0.9 0.5-1.7	0.8* 0.6-0.9	1.1 0.6-2.0	0.8 0.5-1.2
Female sex	0.2** 0.1-0.3	0.5** 0.4-0.6	—	—	—	—
Current smoker	0.8 0.6-1.2	0.9 0.7-1.1	0.8 0.5-1.46	0.9 0.7-1.1	0.9 0.5-1.4	0.9 0.7-1.4
Consumption of light alcoholic beverages	2.4** 1.6-3.5	1.7** 1.3-2.1	1.5 0.8-2.8	1.2 0.9-1.7	3.5** 2.03-6.02	3** 1.9-4.7
Consumption of strong alcoholic beverages	1 0.6-1.7	1.3 0.9-1.7	1.83 0.922-3.63	1.46* 1.0-2.0	0.5 0.3-1.1	0.7 0.4-1.2
Arterial hypertension	3.3** 2.2-4.8	2.3** 1.8-2.9	4.3** 2.4-7.4	2.47** 1.9-3.2	2.5** 1.5-4.3	1.7* 1.1-2.6
BMI >25	0.7 0.5-1	0.9 0.8-1.1	0.8 0.5-1.4	0.9 0.8-1.2	0.6 0.4-1.0	0.9 0.6-1.2
Low physical activity	1.6* 1.0-2.4	1.2 0.9-1.6	1.2 0.6-2.6	1.1 0.8-1.7	1.9* 1.1-3.2	1.3 0.8-2.0
History of head trauma	5.9** 3.6-9.5	1.6* 1.1-2.3	6.8** 3.6-12.8	1.7* 1.1-2.6	4.8** 2.3-10.1	1.5 0.8-3.0
Family history of headache	2.1** 1.5-2.9	0.9 0.8-1.1	2.1** 1.3-3.4	0.7* 0.6-0.9	2.2** 1.4-3.3	1.5* 1.1-2.1
Oral contraceptive use	—	—	—	—	1.4 0.7-3.0	1.7 1.0-3.0
Students	6.6** 4.2-10.4	3.6** 2.7-4.8	12.2** 5.5-27.1	3.9** 2.6-5.9	5.2** 2.9-9.2	3.3** 2.1-5.2
Workers	0.9 0.6-1.5	0.5** 0.4-0.6	1.1 0.6-2.3	0.4** 0.3-0.5	1.0 0.5-2.0	1.2 0.8-2.0
N	496	1835	125	869	371	966

\*P < .05, \*\*P < .01.

**Table 4.—Factors Associated With Migraine and TTH in Females Compared to Females Without Headache**

Associated Factors in Females	Migraine (n = 371)	P, OR, 95% CI	TTH (n = 966)	P, OR, 95% CI	Without Headache (n = 202)
Current smoker	82 (22.1%)	0.2	224 (23.2%)	0.2	56 (27.7%)
Consumption of light alcoholic beverages	65 (17.5%)	<.001 0.3;0.2-0.5	229 (23.7%)	<.001 0.5;0.4-0.6	81 (40.1%)
Consumption of strong alcoholic beverages	32 (8.6%)	0.6	93 (9.6%)	0.9	20 (9.9%)
Arterial hypertension	(19.4%)	0.9	173 (17.9%)	0.5	40 (19.8%)
BMI > 25	83 (22.4%)	<.001 0.4;0.3-0.6	234 (24.2%)	<.001 0.5;0.4-0.6	80 (39.6%)
Low physical activity	106 (28.6%)	<.001 2.2;1.4-3.4	224 (23.2%)	.01 4.4;3.0-6.5	31 (15.4%)
Oral contraceptive use	44 (11.9%)	0.1	142 (14.7%)	.01 5.2;3.1-8.8	16 (7.9%)
History of head trauma	105 (28.3%)	<.001 5.3;2.9-9.5	110 (11.4%)	.06	14 (6.9%)
Family history of headache	250 (67.4%)	<.001 1.5;1.1-2.2	658 (68.1%)	.002 1.6;1.2-2.2	115 (59.9%)

1.4, 95% CI 0.9-2.1), family history of headache was associated with migraine (OR 2.5, 95% CI 1.7-3.7) and TTH (OR 1.1, 95% CI 0.9-1.4), consumption of light alcoholic beverages was associated with migraine (OR 3.2, 95% CI 2.2-4.7) and TTH (OR 2.7, 95% CI 2.2-3.3), consumption of strong alcoholic beverages was associated with TTH (OR 2.7, 95% CI 2.0-3.6), low physical activity was associated with migraine (OR 3.3, 95% CI 2.0-5.6) and TTH (1.8, 95% CI 1.3-2.5), and arterial hypertension was associated with migraine (OR 2.2, 95% CI 1.4-3.5) and TTH (OR 2.3, 95% CI 1.8-2.9).

Results of *multivariate logistic regression analysis* confirmed significance of many of these factors

in females and males (Table 3). Besides this, arterial hypertension in females became significantly associated with migraine (OR 2.52, 95% CI 1.47-4.33) and TTH (OR 1.69, 95% CI 1.09-2.62) and consumption of light alcoholic beverages in females also became significant factors associated with migraine (OR 3.49, 2.03-6.02) and TTH (OR 3.0, 95% CI 1.93-4.66). However, oral contraceptive use lost significance with TTH in females, consumption of light alcoholic beverages lost association with migraine and TTH in males, and low physical activity lost association with TTH in females and males. Low physical activity was associated with migraine only in females (OR 1.9, 95% CI 1.1-3.2).

**Table 5.—Factors Associated With Migraine and TTH in Males Compared to Males Without Headache**

Associated Factors in Males	Migraine (n = 125)	P, OR*, 95% CI	TTH (n = 869)	P, OR, 95% CI	Without Headache (n = 812)
Current smoker	37 (29.6%)	<.001 0.4;0.2-0.6	418 (48.1%)	0.06	428 (52.7%)
Consumption of light alcoholic beverages	64 (51.2%)	<.001 3.2;2.2-4.7	410 (47.2%)	<.001 2.7;2.2-3.3	201 (24.7%)
Consumption of strong alcoholic beverages	15 (12%)	0.3	187 (21.5%)	<.001 2.7;2.0-3.6	74 (9.1%)
Arterial hypertension	34 (27.2%)	<.001 2.2;1.4-3.5	243 (27.9%)	<.001 2.3;1.8-2.9	116 (14.3%)
BMI > 25	43 (34.4%)	<.001 0.11;0.1-0.2	446 (51.3%)	.01 0.8;0.6-0.9	468 (57.6%)
Low physical activity	26 (20.8%)	<.001 3.3;2.0-5.6	108 (12.4%)	<.001 1.8;1.3-2.5	59 (7.3%)
History of head trauma	84 (67.2%)	<.001 40.6;25-66.4	100 (11.5%)	<.001 1.4;0.9-2.1	39 (4.8%)
Family history of headache	56 (44.8%)	<.001 2.5;1.7-3.7	391 (44.9%)	<.001 1.1;0.9-1.4	197 (24.3%)

\*OR = odds ratio; CI = confidence interval.

**Table 6.—Factors Associated With Headache in All Participants in Three Different Social Groups**

Associated factors	A. Blood Donors (n = 1007)			Workers (n = 1075)			Students (n = 1042)		
	Migraine (n = 119) (%, P, OR, 95% CI)	TTH (n = 629) (%, P, OR, 95% CI)	No Headache (n = 322)	Migraine (n = 79) (%, P, OR, 95% CI)	TTH (n = 398) (%, P, OR, 95% CI)	No Headache (n = 618)	Migraine (n = 298) (%, P, OR, 95% CI)	TTH (n = 808) (%, P, OR, 95% CI)	No Headache (n = 74)
Sex (female)	94 (78.9%) <.001 6.2;3.8-10.1	318 (50.6%) <.001 11.7;1.3-2.2	122 (34.9%)	27 (34.2%) <.001 6.6;3.8-11.5	96 (24.1%) <.001 4.0;2.8-5.9	45 (7.3%)	250 (83.9%) <.001 5.8;3.3-10.1	552 (68.3%) <.001 2.4;1.5-3.8	35 (47.3%)
Current smoker	28 (23.5%) <.001 0.3;0.2-0.5	268 (42.6%) 0.2	152 (47.2%)	27 (34.2%) .006 0.5;0.3-0.8	179 (44.9%) 0.08	313 (50.6%)	64 (21.5%) 0.4	195 (24.1%) 0.8	19 (25.7%)
Consumption of light alcoholic beverages	32 (26.9%) <.001 0.2;0.1-0.3	294 (46.7%) <.001 0.4;0.3-0.5	223 (69.2%)	5 (6.3%) 0.8	96 (24.1%) <.001 4.1;2.8-6.1	44 (7.1%)	92 (30.8%) 0.07	249 (30.8%) 0.06	15 (20.3%)
Consumption of strong alcoholic beverages	12 (10.0%) 0.03 0.5;0.3-0.9	163 (25.9%) 0.01 1.5;1.1-2.1	60 (18.6%)	3 (3.8%) 0.9	15 (3.8%) 0.9	23 (3.7%)	32 (10.7%) 0.3	102 (12.6%) 0.6	11 (14.9%)
Arterial hypertension	28 (23.5%) 0.6	86 (13.6%) .007 0.6;0.4-0.8	69 (21.4%)	26 (32.9%) <.001 3.3;2.0-5.6	136 (34.2%) <.001 3.5;2.6-4.8	80 (12.9%)	52 (17.5%) 0.09	94 (11.6%) 0.6	7 (9.5%)
BMI > 25	43 (36.1%) 0.06	289 (46.0%) 0.9	148 (46.7%)	49 (62.0%) 0.9	278 (69.9%) .02 1.4;1.0-1.8	389 (62.9%)	34 (11.4%) 0.4	113 (14.0%) 0.8	11 (14.9%)
Low physical activity	11 (9.2%) 0.7	4 (0.6%) <.001 0.1;0.0-0.2	26 (8.1%)	11 (11.9%) .02 2.3;1.1-4.6	51 (12.8%) <.001 2.1;1.3-3.2	41 (6.6%)	110 (36.9%) 0.35	237 (29.3%) 0.75	23 (31.1%)
History of head trauma	94 (53.7%) <.001 63.5;33.2-121.5	38 (6.0%) 0.8	18 (5.6%)	13 (16.5%) <.001 3.7;1.9-7.5	45 (11.3%) <.001 2.4;1.5-3.9	31 (5.0%)	82 (27.5%) <.001 6.6;2.4-18.8	127 (15.7%) .02 3.3;1.2-9.1	4 (5.4%)
Family history of headache	86 (72.3%) <.001; 5.7;3.6-9.1	396 (63.0%) <.001 3.7;2.8-4.9	101 (31.4%)	34 (43.0%) .02 1.8;1.1-2.8	205 (51.5%) <.001 2.5;1.9-3.2	186 (30.1%)	186 (62.4%) <.001 3.3;1.9-5.6	448 (55.5%) <.001 2.4;1.5-4	25 (33.8%)

**Table 7.—Results of the Logistic Regression Analysis of Factors Associated With Migraine and TTH in Blood Donors**

Factors	All Donors		Male Donors		Female Donors	
	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI
Age ≥30	1.5 0.9-2.6	0.8 0.6-1.1	2.0 0.6-6.3	0.8 0.6-1.2	1.5 0.8-2.9	0.9 0.5-1.4
Female sex	0.1** 0.07-0.2	0.6** 0.4-0.8	—	—	—	—
Current smoker	0.7 0.4-1.2	0.9 0.6-1.1	0.9 0.3-2.8	0.8 0.6-1.2	0.6 0.3-1.3	0.9 0.5-1.4
Consumption of light alcoholic beverages	3.0** 1.6-5.5	1.6** 1.2-2.1	4.5* 1.2-17.5	1.0 0.7-1.5	3.7** 1.7-7.9	3.6** 2.0-6.3
Consumption of strong alcoholic beverages	1.7 0.8-3.5	1.6** 1.1-2.4	4.8** 1.5-14.8	2.1** 1.3-3.2	0.7 0.3-2.0	0.9 0.5-1.8
Arterial hypertension	2.5** 1.4-4.7	1.4* 1.0-2.0	8.2** 2.1-32.3	1.7* 1.1-2.6	1.7 0.8-3.4	1.2 0.7-2.0
BMI >25	0.2** 0.1-0.4	0.8 0.6-1.1	0.2* 0.1-0.8	0.9 0.6-1.3	0.2** 0.1-0.5	0.7 0.4-1.1
Low physical activity	0.9 0.4-2.3	0.7 0.4-1.1	0.5 0.1-4.7	0.6 0.3-1.2	1.2 0.4-3.6	0.7 0.3-1.7
History of head trauma	5.3** 2.1-13.1	0.4* 0.2-0.9	22.9** 3.7-142	0.3* 0.1-0.9	4.2* 1.4-12.5	0.7 0.3-2.1
Family history of headache	2.8** 1.6-4.8	1.8** 1.4-2.4	12** 2.7-53.2	1.8** 1.2-2.6	1.9 1.0-3.6	1.8** 1.2-2.9
Oral contraceptive use	—	—	—	—	1.9 0.7-4.8	1.5 0.8-3.0
N	119	629	25	311	94	318

\* $P < .05$ , \*\* $P < .01$ .

**Factors According to Social Group.**—In Table 6, we compare factors associated with migraine or TTH in all participants in three social groups. According to *univariate analysis* common factors associated with migraine and TTH in all social groups included female sex, family history of headache, and history of head trauma. We found also some factors specific to social groups. In workers, the following factors were associated with headache: consumption of light alcoholic beverages (it was associated with TTH, OR 4.1, 95% CI 2.8-6.1), arterial hypertension (it was associated with migraine, OR 3.3, 95% CI 2.0-5.6 and TTH, OR 3.5, 95% CI 2.6-4.8), BMI > 25 (it was associated with TTH, OR 1.4, 95% CI 1.0-1.8), low physical activity (it was associated with migraine, OR 2.3, 95% CI 1.1-4.6 and TTH, OR 2.1, 95% CI 1.3-3.2). In blood donors, we found that consumption of strong alcoholic beverages was associated with TTH (OR 1.5, 95% CI 1.1-2.1). In students we did not find any specific factors among all these investigated factors.

Results of the *multivariate logistic regression analysis* confirmed significance of many these factors (Tables 7–9). However BMI > 25 and consumption of light alcoholic beverages lost association with TTH in workers, family history of headache lost significance in association with TTH in blood donors, low physical activity lost association with migraine in workers, consumption of light alcoholic beverages became a significant factor associated with migraine (OR 2.97, 95% CI 1.61-5.48) and TTH in blood donors (OR 1.58, 95% CI 1.16-2.14), arterial hypertension became a significant factor associated with migraine (OR 2.54, 95% CI 1.38-4.69) and TTH (OR 1.44, 95% CI 1.02-2.03) in blood donors, consumption of light alcoholic beverages became significantly associated with migraine (OR 3.12, 95% CI 1.5-6.51 and TTH (OR 2.03, 95% CI 1.13-3.67) in students, arterial hypertension became significantly associated with migraine (OR 7.03, 95% CI 1.93-25.6) and TTH (OR 3.76, 95% CI 1.13-12.5) in students, and low physical activity became significantly associated with migraine (OR 1.98, 95% CI 1.04-3.74) in students.

**Table 8.—Results of the Logistic Regression Analysis of Factors Associated With Migraine and TTH in Workers**

Factors	All Workers		Male Workers		Female Workers	
	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI
Age $\geq$ 30	0.6 0.3-1.2	0.7* 0.5-0.9	0.6 0.3-1.4	0.7 0.5-1.0	0.2 0.02-1.5	0.5 0.1-2.1
Female sex	0.1** 0.06-0.2	0.2** 0.1-0.3	—	—	—	—
Current smoker	0.9 0.5-1.7	0.9 0.7-1.3	1.0 0.5-2.0	0.9 0.7-1.3	0.2 0.04-1.5	0.7 0.3-1.8
Consumption of light alcoholic beverages	0.9 0.3-2.6	1.3 0.8-2.1	1.3 0.4-4.0	1.5 0.9-2.4	0.5 0.03-7.8	0.3 0.04-1.5
Consumption of strong alcoholic beverages	1.6 0.4-6	0.5 0.2-1.2	1.6 0.4-6.1	0.5 0.2-1.3	—	—
Arterial hypertension	3.7** 1.9-6.9	3.3** 2.3-4.7	3.4** 1.6-7.1	3.1** 2.1-4.5	4.4* 1.1-18.6	4.7** 1.5-14.3
BMI $>$ 25	1.6 0.8-3.2	1.0 0.7-1.4	1.3 0.6-2.8	0.9 0.7-1.4	6.4 0.9-44.4	1.2 0.5-3
Low physical activity	1.7 0.7-4.1	1.9* 1.3-3.2	1.8 0.6-5.7	2.1* 1.2-3.7	1.3 0.3-5.9	1.3 0.4-4.5
History of head trauma	5.4** 2.4-11.9	2.6** 1.5-4.4	4.5** 1.9-10.7	2.3** 1.3-4.0	3.7** 1.9-7.5	2.4** 1.5-3.9
Family history of headache	0.6 0.3-1.1	0.1** 0.06-0.2	0.5 0.2-1.2	0.08** 0.05-0.1	0.4 0.1-1.5	0.107** 0.04-0.3
Oral contraceptive use	—	—	—	—	—	2.4 0.2-23.5
N	79	398	52	302	27	96

\* $P < .05$ , \*\* $P < .01$ .**Table 9.—Results of the Logistic Regression Analysis of Factors Associated With Migraine and TTH in Students**

Factors	All Students		Male Students		Female Students	
	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI	Migraine OR, 95% CI	TTH OR, 95% CI
Female sex	0.2** 0.1-0.4	0.6* 0.4-0.9	—	—	—	—
Current smoker	1.4 0.6-3.0	1.2 0.7-2.2	1.5 0.3-6.7	1.0 0.5-2.4	1.7 0.6-5.0	1.5 0.556-3.8
Consumption of light alcoholic beverages	3.1** 1.5-6.5	2.0* 1.1-3.7	1.1 0.3-4.8	1.1 0.5-2.5	5.8** 2.0-16.8	4.6** 1.7-12.5
Consumption of strong alcoholic beverages	0.3* 0.1-0.8	0.8 0.4-1.5	0.1 0.01-1.0	1.4 0.5-3.5	0.3 0.1-1.05	0.3* 0.1-0.8
Arterial hypertension	7.0** 1.9-25.6	3.8* 1.1-12.5	30.3* 1.8-522	5.7 0.7-44.4	3.6 0.8-16.5	2.2 0.5-9.4
BMI $>$ 25	1.8 0.7-4.6	1.6 0.8-3.5	1.7 0.4-6.6	1.4 0.6-3.2	4.1 0.5-33	3.8 0.5-29.8
Low physical activity	2.0* 1.0-3.7	1.5 0.9-2.6	1.6 0.4-6.8	1.2 0.5-2.9	2.2* 1.0-4.7	1.8 0.9-3.6
History of head trauma	8.5** 3.0-23.8	2.9* 1.1-7.3	86.1** 5.3-1389	6.9 0.9-52.3	3.8* 1.2-11.7	1.8 0.6-5.4
Family history of headache	4.3** 2.4-7.7	3.0** 1.9-4.6	9.5** 2.5-35.6	3.6** 1.7-7.5	3.4** 1.7-6.8	2.4** 1.4-4.4
Oral contraceptive use	—	—	—	—	1.5 0.4-5.3	2.0 0.7-5.9
N	298	808	48	256	250	552

\* $P < .05$ , \*\* $P < .01$ .

We compared factors associated with migraine or TTH in all participants in three social groups also in a sex-specific fashion because sex distribution varied considerably between groups (Tables 10 and 11). In female workers (Table 10), the following factors were associated with headache: consumption of light alcohol beverages (it was associated with TTH, OR 3.6, 95% CI 1.3-10.1), arterial hypertension (it was associated with migraine, OR 4.3, 1.4-13.1, and with TTH, OR 3.6, 1.4-8.8). In female blood donors, oral contraceptive use was associated with TTH (OR 2.1, 95% CI 1.1-3.9) and history of head trauma was associated with migraine (OR 7.3, 95% CI 3.1-17.7). In female students, we did not find any specific factors.

In males, the following associated factors were common (Table 11): consumption of light alcoholic beverages and family history of headache were associated with TTH in all groups; history of head trauma was associated with migraine also in all groups; low physical activity was associated with migraine in male blood donors and male students and with TTH in male workers. The following associated factors differed between social groups in males: consumption of strong alcoholic beverages (it was associated with TTH only in blood donors, OR 2.1, 95% CI 1.4-3.2), BMI > 25 (it was associated with TTH only in workers, OR 1.5, 95% CI 1.1-2.1). In male students, we did not find any specific factors.

Results of the logistic regression analysis showed that almost all factors associated with migraine and TTH were common in females and males in three social groups except two factors (Tables 7-9). Consumption of strong alcoholic beverages was associated with migraine (OR 4.7, 95% CI 1.5-14.8) and TTH (OR 2.0, 95% CI 1.3-3.2) in male blood donors (Table 7). Low physical activity was associated with TTH only in male workers (OR 2.1, 95% CI 1.2-3.7) (Table 8).

To summarize our findings, many factors associated with headache were common in females and males. Only consumption of light/strong alcoholic beverages and low physical activity were different between sexes. Only two factors were different between migraine and TTH: low physical activity and family history of headache were associated with migraine but not with TTH. Only two factors

were specific to a social group: consumption of strong alcoholic beverages was associated with TTH in blood donors and low physical activity was associated with migraine in students and with TTH in workers. To be a student was associated with the highest risk of development of migraine and TTH.

## DISCUSSION

This study was able to accurately diagnose migraine and TTH and presents new information about associated factors for TTH while confirming a number of factors associated with migraine. It also presents sex-specific information about associated factors and finally, for the first time, presents differences in associated factors between social groups. We used the gold standard of headache diagnosis, a professional semi-structured interview and systematically collected information about associated factors. Our results, therefore, are probably generalizable to the Russian population minus low social strata. When similar studies from other countries were available, they generally showed the same as in this study, underlining that our results are also representative of other countries. We have presented results of both univariate and multivariate analysis because they each have merit. However, we summarized our findings and drew conclusions according to multivariate logistic regression analysis.

**Differences in Associated Factors Between Migraine and TTH.**—We found that such factors as female sex, family history of headache, and arterial hypertension were shared. This was confirmed in other studies. A history of head trauma was positively associated with migraine in some studies too<sup>10,11</sup> in accordance with our results. Female sex and family history of headache are well known factors associated with headache.<sup>4,12,13</sup> The role of arterial hypertension is still debatable. Some authors found association with migraine<sup>14-18</sup> while others found nothing.<sup>19,20</sup>

Consumption of alcoholic beverages, low physical activity, and history of head trauma differed between migraine and TTH. Alcohol consumption has most often been negatively associated with migraine but not with TTH.<sup>21-26</sup> Our findings are in accordance with a previous study that found

**Table 10.—Factors Associated With Headache in Females in Three Different Social Groups**

Associated factors	Female Blood Donors (n = 484)			Female Workers (n = 146)			Female Students (n = 719)		
	Migraine (n = 94) (%, P, OR, 95% CI)	TTH (n = 318) (%, P, OR, 95% CI)	No headache (n = 122)	Migraine (n = 27) (%, P, OR, 95% CI)	TTH (n = 96) (%, P, OR, 95% CI)	No headache (n = 45)	Migraine (n = 250) (%, P, OR, 95% CI)	TTH (n = 552) (%, P, OR, 95% CI)	No headache (n = 35)
Current smoker	27 (28.7%) 0.6	94 (29.6%) 0.6	39 (32%)	6 (22.2%) 0.5	25 (26%) 0.7	13 (28.9%)	49 (19.6%) 0.3	105 (19%) 0.3	4 (11.4%)
Consumption of light alcoholic beverages	16 (17%) <.001 0.1; 0.07-0.3	140 (44%) .005 0.6; 0.4-0.8	72 (59%)	2 (7.4%) 0.6	30 (31.3%) 0.01 3.6; 1.3-10.1	5 (11.1%)	47 (18.8%) 0.3	59 (10.7%) 0.9	4 (11.4%)
Consumption of strong alcoholic beverages	12 (12.8%) 0.8	49 (15.4%) 0.7	17 (13.9%)	2 (7.4%) 0.6	4 (4.2%) 0.2	2 (4.4%)	20 (8%) 0.9	40 (7.3%) 0.8	3 (8.6%)
Arterial hypertension	22 (23.4%) 0.9	88 (27.7%) 0.5	29 (23.8%)	12 (44.4%) 0.009 4.3; 1.4-13.1	38 (39.6%; 0.005 3.6; 1.4-8.8	7 (15.6%)	38 (15.2%) 0.6	47 (8.5%) 0.6	4 (11.4%)
BMI >25	43 (45.7%) 0.9	149 (46.9%) 0.7	55 (45.1%)	19 (70.4%) 0.2	58 (60.4%) 0.4	24 (53.3%)	21 (8.4%) 0.3	27 (4.9%) 0.6	1 (2.9%)
Low physical activity	5 (5.3%) 0.3	28 (8.8%) 0.9	11 (9%)	7 (25.9%) 0.3	18 (18.8%) 0.6	7 (15.6%)	94 (37.6%) 0.9	178 (32.3%) 0.6	13 (37.1%)
Oral contraceptive use	14 (14.9%) 0.4	62 (19.5%) 0.03 2.1; 1.1-3.9	13 (10.7%)	0 (0%) 0.4	4 (4.2%) 0.6	1 (2.2%)	27 (10.8%) 0.3	76 (13.8%) 0.2	2 (5.7%)
History of head traumas	29 (30.9%) <.001 7.3, 3.1-17.7	16 (5%) 0.8	7 (5.7%)	4 (14.8%) 0.1	7 (7.3%) 0.2	1 (2.2%)	6 (24.4%) 0.21	72 (13%) 0.4	3 (8.6%)
Family history of headache	66 (70.2%) 0.9	219 (68.9%) 0.6	87 (71.3%)	16 (59.3%) 0.1	53 (55.2%) 0.09	18 (40.0%)	155 (62.0%) 0.6	325 (58.9%) 0.8	20 (57.1%)

**Table 11.—Factors Associated With Headache in Males in Three Different Social Groups**

Associated factors	Male Blood Donors (n = 523)			Male Workers (n = 929)			Male Students (n = 323)		
	Migraine (n = 25) (% , P, OR, 95% CI)	TTH (n = 311) (% , P, OR, 95% CI)	No headache (n = 200)	Migraine (n = 52) (% , P, OR, 95% CI)	TTH (n = 302) (% , P, OR, 95% CI)	No headache (n = 573)	Migraine (n = 48) (% , P, OR, 95% CI)	TTH (n = 256) (% , P, OR, 95% CI)	No headache (n = 39)
Current smoker	1 (4%) <.001 0.03; 0.0-0.2	174 (56.0%) 0.9	113 (56.5%)	21 (41.2%) 0.09	154 (51.0%) 0.7	300 (52.4%)	15 (31.3%) 0.5	90 (35.2%) 0.7	15 (36.5%)
Consumption of light alcoholic beverages	16 (64.0%) 0.2	154 (49.5%) <.001 0.3; 0.2-0.5	151 (75.5%)	3 (5.8%) 0.8	66 (21.9%) <.001 3.8; 2.5-5.9	39 (6.8%)	45 (93.8%) <.001 38.2; 9.8-148.9	190 (74.2%) <.001 7.3; 3.5-15.5	11 (28.2%)
Consumption of strong alcoholic beverages	0 (0%) 0.01 0.07; 0.0-1.2	114 (36.7%) <.001 2.1; 1.4-3.2	43 (21.5%)	3 (5.77%) 0.5	11 (3.64%) 0.8	23 (4.01%)	12 (25.0%) 0.6	62 (24.2%) 0.6	8 (20.5%)
Arterial hypertension	6 (24%) 0.6	98 (31.5%) .004 1.8; 1.2-2.8	40 (20%)	14 (26.92%) .005; 2.5; 1.3-4.9	98 (32.5%) <.001 3.3; 2.3-4.6	73 (12.7%)	14 (29.2%) <.001 4.9; 1.3-18.7	47 (18.4%) 0.09	3 (7.7%)
BMI >25	0 (0%) <.001 0.02; 0.0-0.4	140 (45.0%) 0.7	93 (46.5%)	30 (57.7%) 0.4	220 (72.9%) .006 1.5; 1.1-2.1	365 (63.7%)	13 (27.1%) 0.88	86 (33.6%) 0.3	10 (25.6%)
Low physical activity	6 (24%) .008 3.9; 1.4-11.2	16 (5.1%) 0.3	15 (7.5%)	4 (7.7%) 0.6	33 (10.9%) 0.008 1.9; 1.2-3.2	34 (5.9%)	16 (33.3%) <.001 1.7; 0.6-4.3	59 (23.1%) 0.9	9 (23.1%)
History of head trauma	6 (24%) .001 5.4; 1.8-16.3	22 (7.1%) 0.5	11 (5.5%)	9 (17.3%) .001 3.8; 1.7-8.5	38 (12.6%) <.001 2.6; 1.6-4.3	30 (5.2%)	21 (43.8%) <.001 9.3; 2.5-34.5	55 (21.48%) .04 3.3; 0.9-11.1	3 (7.69%)
Family history of headache	14 (56%) <.001 16.9; 6.5-44.1	177 (56.9%) <.0001 17.6; 9.8-31.6	14 (7.0%)	18 (34.6%) 0.4	152 (50.3%) <.001 2.4; 1.8-3.3	168 (29.3%)	31 (64.6%) <.001 12.4; 4.1-37.6	123 (48.1%) <.001 6.3; 2.4-16.6	5 (12.8%)

significantly lower alcohol use in participants with migraine when compared to participants with TTH.<sup>27</sup> A large population-based cross-sectional study in Norway showed a tendency for the prevalence of migraine to decrease with increasing alcohol consumption,<sup>28</sup> and another large population-based cross-sectional study in the Netherlands showed that migraine sufferers were less likely to consume alcohol.<sup>29</sup> A prospective analysis of migraine sufferers in Austria showed that consumption of beer was associated with a lower headache and migraine, as well as a lower risk of headache persistence.<sup>30</sup> Some studies did not find a difference in association of alcohol consumption with migraine with aura and without aura.<sup>4,31,32</sup> Other studies did not confirm that alcohol is a risk factor for TTH.<sup>12,13,25,26</sup> Yokoyama found that people with headache used alcohol significantly less than people without headache.<sup>33</sup>

Our study showed that low physical activity is a risk factor for migraine. A study conducted in Denmark reported a significant association between low physical activity and TTH in men, but not in women or in subjects with migraine.<sup>13</sup> An inverse association between headaches and walking/exercise was observed in a Japanese study, and was most prominent among subjects who reported a walking/exercise frequency of “2 days/week.”<sup>33</sup>

**Differences in Associated Factors Between the Two Sexes.**—It is interesting that despite the much higher prevalence in females in our study, they share many associated factors with men. Only two factors were different. Low physical activity was associated with migraine in females. Consumption of strong alcoholic beverages was associated with TTH only in males and consumption of light alcoholic beverages was associated with migraine and TTH in females.

We found no studies that examined differences in associated factors between males and females except Le et al.<sup>2</sup> Subjects with weekly or more often alcohol consumption had a lower prevalence of migraine with or without aura compared to nonmigrainous subjects. This is most likely explained by avoidance of alcohol by migrainous subjects in whom alcohol often provokes attacks.

**Differences in Associated Factors Between Social Groups.**—We found that only two factors were different between social groups: consumption of strong alcoholic beverages was associated with TTH only in blood donors, low physical activity was associated with migraine in students and with TTH in workers. After comparisons of associated factors between sexes in social groups, only these two factors were different. It is interesting that low physical activity was associated with TTH in workers and migraine in students. In agreement, results of the longitudinal Nord-Trøndelag Health Study indicated that physical inactivity among headache-free individuals is a risk factor for non-migraine headache and that individuals with headache are less physically active than those without headache.<sup>34,35</sup> Most workers had a lot of physical exercise but those who had low physical activity had a particularly high prevalence of headache. This suggests that physical activity could be a protective factor against headache. Students have low physical activity, which may perhaps explain part of their high prevalence of migraine.

On balance, the factors studied did not differ very much between social groups. They can certainly not explain anything but a small fraction of the higher prevalence of migraine and TTH in students. Thus, other factors, perhaps from the personal sphere, should be studied in the future.

**Strengths and Weaknesses of This Study.**—The main importance of our findings is that it is the first study with a precise diagnosis that can distinguish between migraine and TTH because we conducted a direct professionally validated semistructured interview within population based studies. Sample sizes were large for a direct interview study. The use of ICHD-3beta in this kind of study was also new. Besides we performed complex diagnosis, sex and group-specific studies of factors associated with headache.

Conversely, the materials were not quite large enough for some subgroup comparisons. Some findings may therefore be spurious and need confirmation. The skewed sex distribution in the different groups could not be avoided but we compensated by sex specific comparisons between social groups.

It is highly unlikely that associated factors vary much within the age range of our participants.

All three social groups together are representative of the population except for the lack of participants from low social strata who have a high prevalence of headache in many previous studies.<sup>36-39</sup> Blood donors are typically healthier than the general population when it comes to serious diseases. It seems unlikely, however, that having migraine should deter anybody from becoming a blood donor and it is certainly not an exclusion criterion for blood donors. Furthermore, our results in blood donors are very similar to findings in other populations in other countries. Nevertheless, associated factors were almost the same. It suggests that some pathophysiological mechanisms must be shared between these two primary headache disorders. It is an important task for future studies to identify factors that are specific to headache type.

## CONCLUSION

We confirm many factors associated with migraine and show for the first time that they also are associated with TTH. Only a few factors varied between migraine and TTH. There was also little difference between the sexes (except for female hormonal relations). The three social groups shared most factors but some notable differences were identified. To be a student was associated with the highest risk of headache, but the present study provided little explanation for this. It is important to study other possible risk factors that may be more specific for headache diagnoses and social groups.

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### Category 3

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