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Tension-type headache in 40-year-olds: a Danish population-based sample of 4000

Received: 15 August 2005

Accepted in revised form: 4 November 2005

Published online: 15 December 2005

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Abstract The aim of this study was to evaluate the one-year prevalence of tension-type headache in the general population. Three thousand men and one thousand women aged 40 years from the Danish population were included. They received a mailed questionnaire and the response rate was 87%. The self-reported one-year prevalence of tension-type headache was 84.7%. The one-year prevalence of infrequent episodic, frequent episodic and chronic tension-type headache was 48.2%, 33.8% and 2.3%, respectively. No tension-type headache and infrequent episodic tension-type headache was significantly more frequent in men than women ($p < 0.0005$ and $p = 0.004$), while frequent and chronic tension-type headache was significantly more frequent in women than men ($p < 0.0005$ and $p < 0.0005$). No tension-type headache and infrequent

tension-type headache was significantly more frequent among those without than with self-reported migraine (*no headache*, men, $p < 0.0005$ and women, $p = 0.002$ and *infrequent*, men, $p < 0.0005$ and women, $p < 0.0005$), while episodic frequent and chronic tension-type headache was significantly more frequent among those with than those without self-reported migraine, with the exception of chronic tension-type in women (*frequent episodic*, men, $p < 0.0005$ and women, $p < 0.0005$ and *chronic*, men, $p < 0.0005$ and women, $p = 0.08$). Women are more prone to tension-type headache than men and they have it more frequently than men. Self-reported migraine increases the risk for frequent episodic and chronic tension-type headache.

Keywords Tension-type headache • Epidemiology • Prevalence

Introduction

The classification of the International Headache Society has recently been revised to be the International Classification of Headache Disorders [1, 2]. The former classification distinguished between episodic and chronic

tension-type headache. The International Classification of Headache Disorders classifies episodic tension-type headache into an infrequent and a frequent type, depending on a frequency of less than 12 days per year and between 12 and 179 days per year.

The epidemiology of tension-type headache has received little attention; despite it being the most common

form of headache. This is probably due to the often mild symptoms and the fact that most people rarely consult their physician due to tension-type headache [3, 4]. However, the high prevalence and the considerable socioeconomic impact render tension-type headache to be a type of headache which should not be ignored [3, 4]. For instance tension-type headache causes 3 times more work absence than migraine, as tension-type headache causes 820 days of work absence per year per 1000 people from the general population, while migraine only causes 270 days of work absence [3]. Furthermore, about 2%–3% of the general population suffers from daily or nearly daily tension-type headache, which causes a high burden for those affected, their families and friends as well as society [5–7].

The aim of this study is to provide epidemiological data on self-reported tension-type headache and self-reported migraine among 40-year-old people from the general population.

Subjects and methods

Sampling and representativeness

A random sample of 3000 men and 1000 women, 40 years old and residing in 11 municipalities around the Copenhagen County Hospital in Glostrup was drawn from the Danish Central Person Registry. The sample size was chosen to ensure adequate numbers for accurate descriptive statistics. The sample size was reduced to 3985 owing to death ($n=2$) and errors in the address list ($n=13$). The total population of the sampling area was 328 070, which is 54% of the Copenhagen County population and 6% of the total Danish population. Using data from the National Statistics, the study population was representative of the total Danish population regarding age, sex and marital status [8, 9]. Regarding vocational categories and employment status, farming and fishing were under-represented both in the sampling area and in Copenhagen County (0.5% vs. 5.4% in Denmark), and hence there were fewer self-employed. Compared to all of Denmark, trades and services were over-represented, as were salaried employees. Data were collected from March 1993 to June 1994.

Questionnaire

The questionnaire included questions about migraine and tension-type headache. Have you ever had migraine? Yes or no. Have you ever had tension-type headache? Yes or no. Those that replied yes to tension-type headache also answered the question: How many days did you have tension-type headache within the last year? 0, 1–7, 8–14, 15–30, 31–179 or ≥ 180 days. The second revised version of the International Classification of Headache Disorders defines infrequent episodic tension-type headache to be less than 12 days per year and frequent episodic tension-type

headache to be between 12 and 179 days per year [2]. The present study delineated infrequent episodic tension-type headache to be less than 15 days per year and frequent episodic tension-type headache to be 15 days or more but less than 180 days per year.

Statistical analyses

All data were processed using SPSS Data Entry II. Statistical analyses were performed using SPSS 12.01 for Windows. Chi square test and Kappa statistic with 5% level of significance were used.

Results

Questionnaire response rate

The overall response rate was 87.1% (3471/3985), and it was higher among women than men (895/1000 vs. 2576/2985; $p<0.005$). Complete information was received by 2541 men and 879 women on self-reported tension-type headache and self-reported migraine. Thus, missing values occurred in 1.3% (35/2576) of men and in 1.8% (16/895) of women, respectively.

Participants

A total of 2546 men and 879 women aged 40 years were included in the epidemiological data on tension-type headache, while the number was reduced to 2541 men regarding self-reported migraine. Table 1 shows the one-year prevalence of tension-type headache.

No tension-type headache

No tension-type headache was significantly more frequent in men than women (586/2546 vs. 75/879, $p<0.0005$). Table 2 shows the one-year prevalence of tension-type headache in relation to self-reported migraine. No tension-type headache was significantly more frequent in those without than those with self-reported migraine analysed separately by gender (men 548/2128 vs. 37/413, $p<0.0005$ and women 65/623 vs. 10/246, $p=0.002$). Table 3 shows one-year prevalence of tension-type headache in relation to self-reported migraine within the last year or previously migraine but not within the last year. Men with migraine within the last year had significantly more fre-

Table 1 The one-year prevalence of self-reported tension-type headache in the general population

	Men (<i>n</i> =2546)		Women (<i>n</i> =879)	
	%	<i>n</i>	%	<i>n</i>
No tension-type headache	23.0	586	8.5	75
Infrequent episodic tension-type headache	51.0	1298	45.3	398
Frequent episodic tension-type headache	24.8	632	42.8	376
Chronic tension-type headache	1.2	30	3.4	30

Table 2 The one-year prevalence of self-reported tension-type headache in relation to self-reported migraine

Men	Self-reported migraine (<i>n</i> =413)		No self-reported migraine (<i>n</i> =2128)	
	%	<i>n</i>	%	<i>n</i>
No tension-type headache	9.0	37	25.8	548
Infrequent episodic tension-type headache	38.0	157	53.5	1,139
Frequent episodic tension-type headache	49.6	205	20.0	426
Chronic tension-type headache	3.4	14	0.7	15
Women	Self-reported migraine (<i>n</i> =256)		No self-reported migraine (<i>n</i> =623)	
	%	<i>n</i>	%	<i>n</i>
No tension-type headache	3.9	10	10.4	65
Infrequent episodic tension-type headache	34.4	88	49.8	310
Frequent episodic tension-type headache	56.6	145	37.1	231
Chronic tension-type headache	5.1	13	2.7	17

Table 3 The one-year prevalence of self-reported tension-type headache in relation to self-reported migraine

Self-reported	Migraine within last year		Previous migraine, but not within last year	
	Men (<i>n</i> =211)		Men (<i>n</i> =188)	
	%	<i>n</i>	%	<i>n</i>
No tension-type headache	7.6	16	11.2	21
Infrequent episodic tension-type headache	28.0	59	50.5	95
Frequent episodic tension-type headache	60.2	127	37.2	70
Chronic tension-type headache	4.3	9	1.1	2
	Women (<i>n</i> =154)		Women (<i>n</i> =98)	
	%	<i>n</i>	%	<i>n</i>
No tension-type headache	5.2	8	2.0	2
Infrequent episodic tension-type headache	30.5	47	40.8	40
Frequent episodic tension-type headache	59.1	91	52.0	51
Chronic tension-type headache	5.2	8	5.1	5

quent tension-type headache than those with previous migraine but not within the last year ($p < 0.0005$). Women tended to have a similar tendency, but this was not statistically significant ($p < 0.27$).

Tension-type headache

The overall one-year prevalence of tension-type headache in both genders was 84.3%; it was 77.0% in men and 92.5% in women.

Infrequent episodic tension-type headache

Infrequent episodic tension-type headache is the most prevalent type of tension-type headache. It occurred in 51.0% of the men and in 45.3% of the women. Infrequent episodic tension-type headache was significantly more frequent in men than women (1298/2546 vs. 398/879, $p = 0.004$) and it was significantly more frequent in those without than those with self-reported migraine analysed separately by gender (men 1139/2128 vs. 157/413, $p < 0.0005$ and women 310/623 vs. 88/246, $p < 0.0005$). Among men with self-reported migraine, those without migraine within the last year were significantly more prone to infrequent episodic tension-type headache than those with migraine within the last year ($p < 0.0005$), while women had a non-significant tendency in the same direction ($p = 0.094$).

Frequent episodic and chronic tension-type headache

Frequent episodic and chronic tension-type headache were significantly more frequent in women than men (*frequent episodic* 376/879 vs. 632/2546, $p < 0.0005$ and *chronic* 30/879 vs. 30/2546, $p < 0.0005$). Both types were significantly more frequent in those with than those without self-reported migraine analysed separately by gender with the exception of chronic tension-type headache in women (*frequent episodic*, men 426/2128 vs. 205/413, $p < 0.0005$ and women 145/623 vs. 231/246, $p < 0.0005$; and *chronic*, men 15/2128 vs. 14/413, $p < 0.0005$ and women 17/623 vs. 13/246, $p = 0.08$). Among men with self-reported migraine, those with migraine within the last year were significantly more prone to frequent episodic tension-type headache than those without migraine within the last year ($p < 0.0005$), and chronic tension-type headache showed a similar tendency ($p = 0.051$). Self-reported migraine within

the last year did not influence the prevalence of frequent episodic and chronic tension-type headache in women.

Discussion

Methodological considerations

The study included 3471 persons, providing sufficient data for gender-specific prevalence of tension-type headache among those with and without self-reported migraine. The unequal sampling of men and women was chosen in order to have equal numbers of men and women with migraine. As age at onset of migraine is relatively rare after age 40 this age was chosen in order to provide precise data [10]. Participation was restricted to those responding to the questionnaire. The high response rate was achieved by 2nd and 3rd mailings to non-responders of the questionnaire. The questionnaire had few missing values. The single question self-reported tension-type headache has previously been evaluated against a clinical interview by a physician in a Danish population-based survey conducted in the same geographical area [11]. The observed agreement rate was 0.91 and the chance corrected agreement rate Kappa was 0.74, i.e., a good strength of agreement. Self-reported frequency of tension-type headache among 475 persons from the general population, i.e., none, infrequent, frequent and chronic tension-type headache was also evaluated against a clinical interview by a physician on the same day in those with self-reported tension-type headache. The observed agreement rate was 0.87 and the chance corrected agreement rate Kappa was 0.77, again a good strength of agreement (previously unpublished data). The evaluation of tension-type headache involved 25–64-year-olds, while the current study included 40-year-olds. This is not likely to affect the validity of self-reported tension-type headache in the present study, as self-reported migraine is similar among 25–64 and 40 years olds [10, 11]. The single question self-reported migraine has previously been validated against a clinical interview and examination. The observed agreement rate was 0.92 and Kappa was 0.77 [10]. Another study conducted in the same geographical area found that the observed agreement rate was 0.95 and Kappa was 0.81 [11]. The observed agreement rate is 0.94 and Kappa is 0.87 (95% confidence limits: 0.85, 0.90), if the results from the two studies are combined [10, 11]. The present and the previous survey were conducted in the same geographical area [10–12]. However, the validity of this method may change when applied to different populations. It is important to emphasise that it is the single questions “How many days did you have tension-type headache within the last year?” and “Have you ever had migraine”

that have the high validity, while a more extensive questionnaire, i.e., based on the clinical characteristics of tension-type headache and migraine, is less valid [11]. This is not surprising, as a series of questions can be combined in numerous ways in contrast to a single question with only two answers. The prevalence was based on tension-type headache within the last year. This was chosen in order to reduce recall bias. As tension-type headache is usually not a disabling or life-threatening disorder, recall bias is likely to occur if one asks about tension-type headache years ago. Actually, the use of the last year prevalence is likely to secure more precise data on tension-type headache. The deviation from the International Classification of Headache Disorders defining infrequent and frequent episodic tension-type headache is minor, as the cut-off point is changed from 12 to 15 days per year [2]. This is not likely to cause a major difference and it is important to remember that the frequency cut-off point is not based on scientific evidence, but is set arbitrarily. Thus, the methodological precautions should secure that the data are both representative and generalisable.

Prevalence and sex ratio

Table 4 shows recent prevalence studies of tension-type headache in the general population from industrialised countries [5–7, 12–19]. The prevalence of tension-type headache was high compared to other studies not conducted in Denmark. The difference may partly be explained by

different methodology. Questionnaires are biased by those with mild and infrequent headache, who are less likely to fill in questions about tension-type headache, which may also apply to interviews by physicians [11]. Thus, one shall be meticulous sampling data on those with infrequent episodic tension-type headache. The high prevalence of tension-type headache in the present study is not likely to be explained by migraine filled in as tension-type headache, as the participants reported accurately on both tension-type headache and migraine [10–12].

The different studies consistently showed a higher prevalence of tension-type headache among women than men [5–7, 12–17]. The peak prevalence of tension-type headache seems to be age 30–39 years and it then declines with age [5, 7, 13, 15, 17]. The restriction of the present data to 40 years old most likely causes the last-year prevalence of tension-type headache to be or be near peak values. The prevalence of frequent episodic and chronic tension-type headache was higher than in a previous Danish survey on twins [12]. The twins were from all of Denmark, while the present study was conducted in Copenhagen County, so it may reflect differences in rural and urban areas, but more likely it reflects a different age composition, i.e., the twins were age 12–41 years old. The prevalence of chronic tension-type headache was quite similar to that of a Norwegian and American survey [7, 15]. All presented studies are cross-sectional and, for that reason, they do not support rigorous conclusions about how tension-type headache evolve over time. Thus, the lower prevalence in the older groups compared with the younger groups may be a function of remission of tension-

Table 4 Recent prevalence studies of tension-type headache in the general population from industrialised countries

Country	Study method	Number of participants	Age (years)	Time period prevalence	Tension-type headache		
					Men (%)	Women (%)	All (%)
Canada [13]	Telephone interview	2737	>15	Lifetime	21	37	29
Chile [18]	Questionnaire	1385	>14	Lifetime	18	35	27
Denmark [5]	Clinical interview and examination	740	25–64	Lifetime	69	88	78
				One year	63	86	74
				Point	9	16	12
Denmark [12]	Questionnaire	28 195	12–41	One year	79	93	86
Finland [14]	Clinical interview	200	>15	One year	37	42	40
Germany [6]	Questionnaire	4061	>18	Lifetime	36	39	38
Norway [15]	Questionnaire	51 383	≥20	One year			
Sweden [19]	Telephone lay interview	1284	17–82	Lifetime	11	16	14
United Kingdom [16]	Questionnaire	727	Adults	Lifetime	29	35	32
United Kingdom [17]	Questionnaire	882	35–54	One year	42	61	52
USA [7]	Telephone interview	13 345	18–65	One year	38	45	41

type headache with advancing age or an increased incidence in the younger age group (cohort effect) or a combination of the two explanations. Distinguishing a real effect of ageing for cohort or period effects requires longitudinal follow-up studies.

Co-occurrence of tension-type and migraine

No tension-type headache was significantly more frequent among those without than those with self-reported migraine. This effect could not be demonstrated in a subset of the data based on clinical interviews by a physician including 197 men and 145 women with migraine without aura, 95 men and 68 women with migraine with aura and 68 men and 54 women whom had never had migraine [20]. Although the present study is based on a questionnaire, which is less precise than a clinical interview by a physician, the different evaluations showed that the questionnaire is sufficiently precise. The high number of participants in the present study combined with the validity of the questionnaire makes the data robust. Thus, it seems that migraine makes it more likely for a person to experience tension-type headache. Infrequent episodic tension-type headache was significantly more frequent among those without than those with self-reported migraine,

while the opposite effect was observed regarding frequent episodic and chronic tension-type headache. These effects were further strengthened in men with self-reported migraine within the last year, while a similar tendency was observed in women with infrequent and frequent episodic tension-type headache. Two other studies also report that those with migraine have more frequent tension-type headache [20, 21]. The higher frequency of tension-type headache among those with than those without self-reported migraine is not likely to be explained by the continuum theory, i.e., tension-type headache → migraine without aura → migraine with aura. The higher frequency of tension-type headache in those with self-reported migraine is not likely to be explained by abortive attacks of migraine with aura, because the aura is easily recognised [22]. Some attacks of tension-type headache might be abortive attacks of migraine without aura, but it is presumably more important that painful input from blood vessels and muscles convergence upon the same neurons in the trigeminal nucleus. Thereby the migraine attacks may themselves induce tension-type headache [23]. The higher percentage of chronic tension-type headache in those with self-reported migraine supports this. However, firm conclusions on the inter-relations of tension-type headache and migraine require longitudinal follow-up studies. Such studies are important, and, hopefully, future results will enlighten us.

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