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TENSION-TYPE HEADACHE (KA HENRY, SECTION EDITOR)

Epidemiology and Cultural Differences in Tension-Type Headache

Kristen Sahler

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Abstract Tension-type headache (TTH) is the most prevalent headache worldwide Stovner et al. (Cephalalgia 27:193–210, 2007••); Robbins and Lipton (Semin Neurol 30:107–19, 2010••); Jensen and Stovner (Lancet Neurol 7:354–361, 2008). Despite being the most prevalent primary headache type, there is still a relative lack of epidemiologic data when compared to that for migraine Robbins and Lipton (Semin Neurol 30:107–19, 2010••). Out of the available data, it is apparent that there are wide variations and differences in tension-type headache epidemiology across different cultures Stovner et al. (Cephalalgia 27:193–210, 2007••). This review will focus on reviewing and comparing the epidemiology of episodic and chronic TTH in adult populations across varying continental regions. This will include prevalence, cultural variations and differences in study methodologies, common precipitants and prognosis. Possible explanations for such widely varying prevalence rates among different cultures and regions will also be discussed.

Keywords Tension-type headache · Tension · Headache · Prevalence · Epidemiology · Cultural · Global · Regional

Introduction

Most people in the world have suffered from a tension-type headache (TTH) at some point in their lives. Despite being the most prevalent type of headache in the world, epidemiologic research on tension-type headache is still lacking when compared to that for migraine, especially in underdeveloped countries [3]. Though migraine leads to a highly significant individual level of disease burden, warranting a thorough understanding of its epidemiological patterns, it is important to also analyze patterns of TTH given its higher prevalence [1••].

The burden of TTH on the individual level may be less impactful than that of migraine, though the higher global prevalence leads to a significantly higher socioeconomic burden on the community [1••]. Understandably, individuals who suffer from chronic TTH incur a higher individual disease burden than those with episodic TTH, though they represent a small percentage of the TTH population. Prevalence rates of TTH vary widely across the globe, despite the availability of precise diagnostic criteria created by the International Headache Society (IHS) [4]. This may be related to different methodologies between studies, overlap in diagnosis with probable migraine or probable TTH, cultural differences in headache awareness, or perhaps a yet unknown environmental or genetic factor. If the variation in study results cannot be fully explained as due to varying methods or cultural factors alone, then the question of whether this could be due to an environmental and/or genetic factor remains unanswered.

K. Sahler (✉)
St. Lukes-Roosevelt Hospital Headache Institute,
425 W. 59th St. Ste 4A,
New York, NY 10019, USA
e-mail: kjsahler@gmail.com

Methodology

Literature Search

A comprehensive literature search was performed to identify population-based studies of tension-type headache. Searches were performed with PubMed using variants of the expressions “headache or tension headache epidemiology,” “headache or tension headache prevalence,” and “migraine epidemiology or prevalence.” References in relevant publications have also been examined. Requirements for inclusion were the use of IHS diagnostic criteria in identifying headache types and reporting epidemiologic data on tension

type headache (episodic and/or chronic). In addition, only studies in English were considered. Comparisons between studies are limited by differences in data collection, specifically in that some studies utilize a lifetime prevalence rate, whereas others use a 1-year prevalence rate. The 1-year prevalence figure is preferred, as it indicates the proportion of the population with active disease, which is more relevant for socioeconomic and personal burden. In addition, data on lifetime prevalence is considered less reliable due to recall problems [1••].

Diagnostic Criteria

Articles reviewed include those that utilize the diagnostic criteria for tension-type headache outlined by the Headache Classification Committee of the International Headache Society [4]. A TTH is defined by typically bilateral pain, which is pressing or tightening in quality, and of mild to moderate intensity, which does not worsen with routine physical activity. There is no nausea, but photophobia or phonophobia may be present [4]. The full diagnostic criteria are outlined in Table 1.

The ICHD-2 further describes four main categories for TTH: infrequent episodic, frequent episodic, chronic, and probable. The differentiation between infrequent and frequent episodic was made to distinguish between those who experience TTH so infrequently that it has very little impact on their lives, and those who experience it often enough to warrant treatment or evaluation [4]. Chronic TTH is defined as occurring on greater than, or equal to, fifteen days per month on average for greater than three months. For the purposes of this review, infrequent and frequent episodic TTH will be included together and referred to as episodic TTH. Probable TTH is defined as a headache fulfilling all but one criterion A-D (Table 1), and was excluded from prevalence calculations in most articles, though not mentioned in others. Whenever possible, probable TTH has been excluded from the data reported in this review.

Table 1 Tension –type headache diagnostic criteria [4]

Infrequent Episodic	Frequent Episodic	Chronic
<1 day per month	≥1 day per month but <15 days per month	≥15 days per month

A. At least 10 episodes occurring at frequencies shown above

B. Headache lasting from 30 minutes to 7 days

C. Headache has at least two of the following characteristics:

1. Bilateral location

2. Pressing/tightening quality (non-pulsating)

3. Mild or moderate intensity

4. Not aggravated by routine physical activity such as walking or climbing stairs

A. Both of the following:

1. No nausea or vomiting (anorexia may occur)

2. No more than one of photophobia or phonophobia

Not attributed to another disorder

Epidemiology of Tension Type Headache

A previous review in 2007 noted that TTH prevalence varies across continents, being generally most common in European countries (1-year prevalence up to 80 %) and less common in Asia or the Americas (1-year prevalence between 20–30 %) [1••]. Africa and the Middle East demonstrate the lowest prevalence rates of between 3–20 % [1••]. Since 2007, 10 new population-based studies meeting our criteria for inclusion have been added to the literature and will be included in this review.

No epidemiologic studies on TTH have been performed in Australia, leaving a large deficit in our global data. Figure 1 shows a comparison of the average rates across varying continental regions found in our review; reproducing the pattern found by Stovner et al.,with highest rates of episodic TTH in Europe, followed by South and North America, Asia, the Middle East and finally Africa. In this prior review, the global 1-year prevalence of TTH was 38 %, compared to 10 % for migraine [1••]. Our review finds a similar global 1-year prevalence rate of TTH of 32 % (30 % for episodic TTH, 2 % for chronic TTH), though the averages vary widely when separated by continental regions. The following sections will discuss these articles by individual continental regions, as it is apparent the epidemiology of TTH varies among these differing cultures. We will also discuss relevant cultural differences and possible reasons behind the wide variation in TTH prevalence. Table 2 reviews the salient data from each article for comparison purposes.

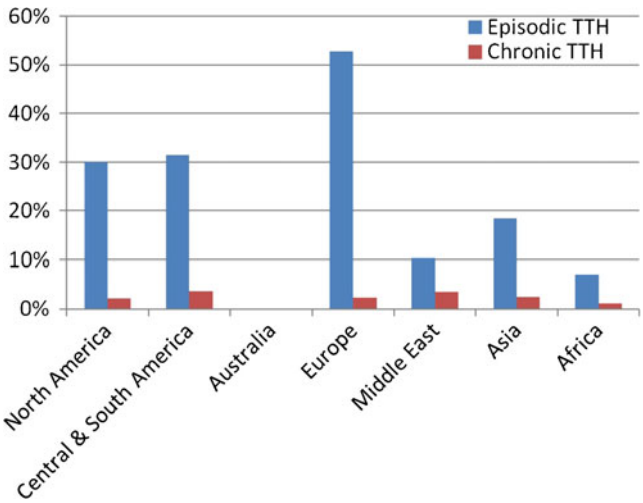

Fig. 1 Mean Prevalence Rates across Continental regions

Table 2 Article methodologies and prevalence rates

Location	Reference	Time Frame	Method	N	Ages	ETTH	CTTH
NORTH AMERICA				16,288		30 %	2.2 %
Canada 1992	Pryse-Phillips	Lifetime	T.I	2737	≥15	20.4	
United States 1998	Schwartz	1-year	T.I.	13345	18-65	38.3	2.2
United States 2002	Reza	2 weeks	Q	206	45-55	31.2	
SOUTH AMERICA				6,407		31.5 %	3.6 %
Chile 1998	Lavados	1-year	Q	1385	≥15	24.3	2.6
Brazil 2002	Wiehe	Lifetime	P.I.	1174	≥18	59	7.25
Brazil 2009	Queiroz	1-year	Q	3848	≥18	11.2	0.8
EUROPE				133,680		52.8 %	2.3 %
Norway 2000	Hagan	1-year	Q	51383	≥20	26	2.4
Norway 2008	Grande	1-year	Q	20598	30-44		2.8
Denmark 1991	Rasmussen	1-year	P.I.	740	25-64	74	3
Denmark 2005	Lyngberg	1-year	P.I.	207	25-36	86.5	4.8
Denmark 2006	Russell	1-year	Q	28195	12-41	86	0.9
Germany 1994	Gobel	Lifetime	Q	4061	≥18	38	3
Germany 2009	Pfaffenrath	6-month	P.I.	7417	≥20	31.5	1.25
Germany 2009	Radke	1-year	T.I.	7341	≥18	60.2	
Germany 2012	Yoon	1-year	Q	9944	18-65	13.3	0.5
Croatia 2003	Zivadinov	Lifetime	P.I.	3794	15-65	34.8	
MIDDLE EAST				14,663		10.3 %	3.5 %
Saudi Arabia 1997	Jabbar	Lifetime	P.I.	5891	≥15	3.1	
Oman 2002	Deleu	1-year	P.I.	1158	≥10	11.2	
Turkey 2012	Ertas	1-year	P.I	5323	18-65	14.6	0.3
Turkey 2003	Koseoglu	1-year	P.I.	1146	45-64	12.5	6.3
Georgia 2009	Katsarava	1-year	P.I.	1145	≥16	10	3.8
ASIA				21,426		18.5 %	2.4 %
Russia 2012	Ayzenberg	1-year	P.I.	2025	18-65	25.4	3.4
China 2012	Yu	1-year	P.I.	5041	18-65	10.8	
Korea 1998	Roh	1-year	T.I.	5556	≥15	15	2.8
Japan 2004	Takeshima	1-year	Q	4795	≥15	21.7	2.1
Taiwan 2001	Lu	1-year	Q	3377	≥15		3.2
Malaysia 1996	Alders	1-year	Q	561	≥5	26.5	1.5
Singapore 2003	Ho	Lifetime	Q	2096	≥12	11.5	1.4
AFRICA				22,912		7 %	1.1 %
Ethiopia 1995	Haimanot	1-year	P.I.	15500	≥20		1.7
Tanzania 2009	Winkler	1-year	Q	7412	≥11	7	0.4

Abbreviations: PI- Personal Interview, TI- Telephone Interview, Q-Questionnaire, ETTH- Episodic tension-type headache, CTTH- Chronic tension type headache

Europe

The ten European studies reviewed in this article (Table 2) have a summative N of 133,680 and a mean prevalence of 52.8 % (13.3–86.5 %) for episodic TTH and 2.3 % (0.5–4.8 %) for Chronic TTH [5–14]. There were two studies with disproportionately lower 1-year prevalence rates of episodic TTH: Yoon et al., in Germany, with 13.3 %, and Hagan et al., in Norway, with 26 %. Both of these studies were questionnaire based, and not conducted via personal interview, which may account for the difference in data. Denmark has the highest rates of TTH anywhere across the globe, with an Episodic TTH prevalence of 74–86.5 % [7–9]. Danish populations are also the best studied out of the countries included in this review, likely because of the availability of population-based health registries. Rates of chronic TTH were largely similar across studies, estimated at 0.9–4.8 % [5–9, 11, 13], and one study in Germany provided lifetime data on chronic TTH showing 3 % prevalence rates [10].

The epidemiologic data from European countries is by far the most extensive of the continental regions, though comparison is still somewhat limited by variations in study method (i.e., questionnaire versus personal interview) and differing time frames. Despite these limitations, it is clear that European

countries have the highest overall average rate of episodic TTH prevalence and are the most thoroughly studied. Interestingly, European countries have lower average rates of chronic TTH, with 2.3 %, when compared to the Middle East and South America (3.5 % and 3.6 %, respectively).

North America

Prevalence rates of TTH in North America have been reported between 20.4–38.3 % [15–17]. The largest study in North America was performed by Schwartz et al., in 1998 [15], and utilized the preferred 1-year prevalence time frame. Telephone interviews of 13,345 participants showed 1-year prevalence rates for episodic TTH and chronic TTH to be 38.3 % and 2.2 %, respectively. Of the ethnic groups identified in the Schwartz et al., study, African-Americans demonstrated the lowest prevalence with 22.8 % of males and 30.9 % of females experiencing a TTH in the last year, compared to 40.1 % of Caucasian males and 46.8 % of Caucasian females.

Prevalence was shown to increase as the level of education increased in both sexes, with peak prevalence in those who completed graduate school level education [15]. A similar relationship to higher education was shown in a population study in Brazil, where individuals who had completed more than 11 years of education were 1.54 times more likely to have experienced a TTH in the last year [18]. Though there was a correlation to higher levels of education, there was no correlation to socioeconomic status [18]. It is often inferred that higher education is a marker for higher socioeconomic status, but these findings lead us to believe that though education may be correlated to a resultant higher socioeconomic status, they may differ in their association with TTH and should be separated in the analysis of future epidemiologic data. Despite the positive correlation to level of education in the above-mentioned studies, many other studies have demonstrated no relation between prevalence rates and the level of education or socioeconomic status [10, 19, 20] or have shown an inverse relationship [21, 22•]. It should be noted that these studies with contrasting results were not performed on populations in North America, thus comparison between them may be limited. However, Pryse-Phillips et al., in 1992 did analyze a North American population in their survey of 1,573 Canadian adults, and found no significant correlation between rates of TTH and socioeconomic status, but did not specifically mention level of education [16].

South America

Three studies in South America have looked at TTH prevalence rates, the largest and most recent study having been done on 3,848 Brazilian Adults in 2009 [18]. Out of all studies in both North and South America, Queiroz et al., found the lowest 1-year prevalence rate of episodic TTH at 11.2 %. Rates of chronic TTH were also the lowest among the American studies, with only 0.8 % of the population meeting these criteria [18]. Lavados et al., in 1998 administered questionnaires to 1,385 Chilean adults, and found similarly low 1-year prevalence rates of episodic and chronic TTH, at 24.3 % and 2.6 %, respectively [19]. Of note, both of these studies collected data via Questionnaire, which is generally considered inferior to collection via personal interview. Wiehe et al., in 2002 performed personal interviews of 1,174 Brazilians and found much higher rates of TTH (59 % for ETTH and 7.25 % for CTTH), though these rates were lifetime-prevalence rates, thus not allowing for an adequate comparison with the data from the other two South American studies [23]. Out of the South American studies, there was no significant correlation between episodic TTH and socioeconomic status, household income or job status [18, 19, 23]. Queiroz et al., however, did find a significant correlation between episodic TTH and 11 or more years of education; similar to the findings in the Schwartz et al., study [15, 18].

Asia

The 1-year prevalence rates of episodic TTH in Asia are overall much lower than those found in European populations, with estimates of between 10.8–26.5 % [22•, 24–26, 27•, 28, 29]. The 1-year prevalence rates of chronic TTH in Asian populations are similar to those seen in Europe as well as in all other continents, at 1.5–3.2 % [22•, 24–26]. Only one study used lifetime rates instead of 1-year and found similarly low values of 11.5 % and 1.4 % for episodic TTH and chronic TTH, respectively [28]. The methods of these studies were split between questionnaire based [25, 26, 28, 29] and telephone or personal interviews [22•, 24, 27•]. Despite methodology, the prevalence rates were found to be very similar across all the Asian populations studied.

Population studies in Asian countries allow for an interesting comparison between the urban city centers and the remote rural villages. Alders et al., in their analysis of the Malaysian population, found no significant correlation between rates of TTH between urban or rural areas [26]. The same was not found to be true for the significantly larger 2012 population study in China, where TTH was significantly more prevalent in urban areas, a finding reproduced in a population study in Turkey [21, 22•]. Yu et al., also noted a correlation between TTH and lower levels of education, similar to findings in some studies [10, 19] but also in contrast to others [3, 16, 18]. Yu et al., also reported a correlation between TTH and specific occupations (unemployment or not having a steady job, office workers, farmers), though interestingly there was no correlation between

TTH and income [22•]. The other epidemiologic studies reviewed for this article did not specifically analyze populations by occupation (though many mention income or socioeconomic status), and these findings raise an interesting question for future study. Takeshima et al., in their 2004 population study in Japan paid special attention to lifestyle habits, and found no relationship between TTH and alchohol consumption or cigarette smoking [25], consistent with the findings of another study [30]. It should be noted though that alcohol or cigarette smoking can be an individual precipitant of a headache and this may lead to avoidance behavior, resulting in the lack of an association [30].

In a study of lifetime-prevalence rates of TTH in Singapore, episodic TTH rates were close to the 1-year prevalence rates reported in the other Asian studies [28]. In general, it is assumed that lifetime prevalence rates would be higher overall when compared to 1-year prevalence, given the ability to include individuals who had experienced infrequent episodic TTH in prior years, but we do not see this pattern when comparing these results to the other Asian studies. It is interesting that in this particular population study, 39 % of those who had experienced a headache in their lifetime were unclassifiable by ICHD-2 criteria [28]. This raises the question of whether many of these were in fact TTH, which would lead to a higher actual lifetime prevalence rate. This high rate of unclassifiable headaches may be due to difficulty in translating an ICHD focused questionnaire for a foreign population, perhaps due to cultural differences, differences in language, or the description and experience of pain among Singapore populations.

Middle East

The reported 1-year prevalence rates of TTH in Middle Eastern countries are significantly lower than those found in European countries, and are more comparable to the rates in Africa and Asia. Given the significant cultural differences between the majority of European countries and countries in the Middle East, the data was analyzed separately in this review. Four population studies (1 in Oman, 2 in Turkey, 1 in Georgia) , all using IHS criteria, have estimated 1-year prevalence rates between 11.2–37.3 % with a mean of 20.5 % [20, 21, 31, 32]. A fifth study, Jabbar et al., in Saudi Arabia showed lifetime prevalence rates of episodic TTH of 3.1 %, significantly lower than expected given the 1-year prevalence rates of neighboring Middle Eastern countries and the much higher lifetime prevalence rates in other continental regions [33]. Though it is typically expected that lifetime prevalence should be higher than 1-year prevalence, it is subject to recall bias and individuals who may have suffered a mild, non-disabling, infrequent tension-type headache may not report this in an interview [1••].

In the most recent study, Ertas et al., in 2012, trained physicians performed a face-to-face interview with 5,323 Turkish citizens in a mostly urban population. There were no differences in prevalence rates when analyzed by age groups, income or gender. Out of those who had experienced a TTH of any kind in the last year, only 1/3 of them had consulted a physician. In those who had sought medical evaluation for their headache, 1/3 had been initially misdiagnosed. The most frequent misdiagnosis was sinusitis, followed by hypertensive or cervicogenic headache [32].

Africa

Unique limitations exist for epidemiological studies in Africa, in that over 90 % of Africa's population is estimated to live in rural areas with limited access to healthcare [34]. With great distances between rural locations and higher rates of illiteracy in the general population, epidemiologic studies are more cumbersome and time consuming to perform. Perhaps due to this, as well as due to an overall lower academic interest in TTH given the more pressing issues of infectious diseases, Africa has a significantly lower number of TTH epidemiological studies overall and only two studies utilize the IHS diagnostic criteria required so that they are to be included in this review [34, 35]. However, despite the paucity of studies, it is clear from these two large studies that the prevalence rates are the lowest in Africa when compared to other locales in the world [1••]. Winkler et al., in a door-to-door screening of 7,412 participants in rural Tanzania, demonstrated a 1-year total TTH prevalence rate of 7 % for episodic TTH, and 0.4 % for chronic TTH [34]. Haimanot et al., studied 15,500 adults in a similarly designed door-to-door survey in rural Ethiopia, though they only reported on the rate of chronic TTH, at 1.7 % [35].

Precipitants of and Lifestyle Factors in Tension-Type Headache

Precipitants are factors that alone or in combination with other exogenous or endogenous exposures induce headache attacks in susceptible individuals. Despite wide variation in reported prevalence rates across varying regions, the most common reported precipitants remain largely the same across cultures. The most frequently and commonly reported precipitant for a TTH was stress or mental tension [14, 17, 21, 25, 26, 28, 30, 36]. The next most common precipitant was poor sleep or fatigue [21, 25, 26, 28, 31]. These two primary precipitants were followed by a variety of less commonly reported precipitants such as weather changes or sun exposure [26, 31, 36], poor rated self health [8], excessive or long hours of work [31], menstruation [21, 26] and frequent traveling [14]. In general, different types of food was not reported as a TTH precipitant though in one

study participants did identify eating fast food as a trigger for their headaches [21].

Lifestyle factors more often identified in TTH populations include sedentary lifestyle, poor self-rated health, an inability to relax after work, and sleeping only a few hours per night [8, 31]. Smoking and alcohol use have not been shown to be associated with TTH [25, 30].

Prognosis

In general, the prognosis for episodic TTH is much better overall than that for migraine headaches [37]. In particular, individuals who experience infrequent episodic TTH may have only a handful of mild lifetime episodes and may not ever consult a healthcare professional [38]. Even individuals experiencing more frequent episodic TTH are less likely to consult a physician than those with migraine [38]. Though this difference may indicate an overall better prognosis for TTH than for migraine, it also raises the question of whether TTH is underreported in epidemiologic studies for the same reasons.

In the subset of the TTH population that does experience a poor prognosis and develops a chronic TTH or a chronic daily headache, there are specific factors associated with this chronification. In a clinic based 10-year follow up of 62 patients with episodic TTH, 25 % of the study population progressed to chronic TTH [39]. Predictors of poor prognosis in this population included comorbid depression or anxiety, as well as medication overuse [39]. At the next scheduled follow up for this study, nearly half of this population had reverted back to episodic TTH, likely due to use of preventive medications, cessation of medication overuse and modification of lifestyle factors. Similarly low rates of chronification were seen in another prospective cohort study, with only 9.5 % of the study population experiencing a poor outcome (i.e., development of chronic TTH) [40]. Factors associated with poor outcomes in this study included a unilateral headache and attack duration greater than 72 hours. The vast majority of the study population initially diagnosed with episodic TTH was in remission at the follow up evaluation (43 %) [40]. In addition, out of the eight study subjects initially enrolled with chronic TTH, 75 % had reverted to the episodic form at follow up [40]. A third prospective cohort study of individuals diagnosed with episodic or chronic TTH showed that 45 % went into remission, 39 % had an unchanged frequency of episodic TTH, and 16 % had either unchanged or newly diagnosed chronic TTH [37]. Poor outcomes were associated with chronic TTH diagnosis at initial evaluation, coexisting migraines, not being married, and sleeping problems [37].

Conclusions

Prior reviews have established TTH as the most prevalent primary headache type worldwide [1••, 2••, 3], with previous estimates of 38 % of the global population experiencing a tension-type headache within the last year [1••]. We update this figure to include more recent epidemiologic data, finding the 1-year prevalence of TTH to be 32 % of the global population. This average prevalence rate, however, does not adequately describe the extreme variations in prevalence across varying cultures and regions. European countries demonstrate averages of 53 %, followed by South America with 31.5 %, North America with 30 %, Asia with 18.5 %, the Middle East with 10.3 % and finally Africa with a 7 % 1-year prevalence rate. This pattern was reproduced in prior reviews [1••, 2••, 3]. Despite a reoccurring pattern, the data is still incomplete as only two studies in Africa fit criteria to be included in this article, and only one of these looked at episodic TTH rates [34, 35]. There is also a large gap in our global data, in that there are no available studies for review in Australia. Further epidemiologic research should focus on under evaluated regions such as Australia, Africa, the Middle East, Central and South America.

Despite having precise diagnostic criteria provided by the International Headache Society, it is still possible that the diagnostic criteria itself has a part in limiting our prevalence data when comparing across such different cultures. Headaches are a subjective symptom, and the expression or description will vary from individual to individual. It may not be possible to definitively say whether a TTH in a rural Tanzanian citizen will be described in the same way, and fit the same criteria, as a TTH experienced in an urban Danish citizen. However, the use of standardized diagnostic criteria remains crucial in our ability to collect and compare the epidemiologic data across cultures, despite possible translational limitations for a given culture or language. Another concern is that TTH may go unreported in those with comorbid migraine, as TTH is a much milder and less distressing headache. Given the high rates of comorbidity between the two, with an estimated 94 % of migraine patients also experiencing TTH, the reported prevalence rates of TTH are likely to be underestimated [37].

This review also demonstrates that prevalence rates are generally lower in less urbanized communities. Given that the most commonly reported precipitant of TTH is mental stress or tension; one could argue that a rural lifestyle leads to possibly lower exposure to stressors. Alternatively, perhaps rural communities are less accepting or less aware of mild and non life-threatening ailments such as TTH, leading to lower rates of reporting. Additionally, another pattern in prevalence has been identified when comparing prevalence rates to latitude (lower prevalence rates exist in regions neighboring the equator), raising the question of whether an environmental factor such as Vitamin D could be involved [41].

Multiple factors are likely responsible for the widely varying prevalence rates across different cultures including a yet-unknown genetic factor, an yet-unknown environmental factor,

limited data and differences in data collection, underreporting due to cultural unacceptability or unawareness, or differing pain thresholds. Future research should focus on providing more epidemiologic data in underreported areas, as well as identifying possible factors in a given population that may predispose to, or protect against, the experience of a tension-type headache.

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References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance
- •• Of major importance

1. •• Stovner LJ, Hagen K, Jensen R, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. Cephalalgia. 2007;27:193–210. *This is an important review of studies documenting headache burden around the globe*.
2. •• Robbins MS, Lipton RB. The epidemiology of primary headache disorders. Semin Neurol. 2010;30(2):107–19. *This is an excellent review of the epidemiology of all primary headache disorders*.
3. Jensen R, Stovner LJ. Epidemiology and comorbidity of headache. Lancet Neurol. 2008;7:354–61.
4. Headache Classification Subcommittee of the International Headache Society. The International Classification of Headache Disorders: 2nd edition. Cephalalgia. 2004;24(1):9–160.
5. Hagen K, Zwart JA, Vatten L, et al. Prevalence of migraine and non-migrainous headache–head-HUNT, a large population-based study. Cephalalgia. 2000;20(10):900–6.
6. Grande RB, Aaseth K, Gulbrandsen P, et al. Prevalence of primary chronic headache in a population based sample of 30- to 44-year-old persons. The Akershus study of chronic headache. Neuroepidemiology. 2008;30(2):76–83.
7. Rasmussen BK, Jensen R, Schroll M, Olesen J. Epidemiology of headache in a general population – a prevalence study. J Clin Epidemiol. 1991;44:1147–57.
8. Lyngberg AC, Rasmussen BK, Jørgensen T, Jensen R. Incidence of primary headache: a Danish epidemiologic follow-up study. Am J Epidemiol. 2005;161:1066–73.
9. Russell MB, Levi N, Saltyte-Benth J, Fenger K. Tension type headache in adolescents and adults: a population based study of 33,764 twins. Eur J Epidemiol. 2006;21(2):153–60.
10. Gobel H, Petersen-Braun M, Soyka D. The epidemiology of headache in Germany: a nationwide survey of a representative sample on the basis of the headache classification of the International Headache Society. Cephalalgia. 1994;14:97–106.
11. Pfaffenrath V, Fendrich K, Vennemann M, et al. Regional variations in the prevalence of migraine and tension-type headache applying the new IHS criteria: the German DMKG Headache Study. Cephalalgia. 2009;29(1):48–57.
12. Radtke A, Lempert T, Gresty MA, et al. Migraine and Meniere's disease: is there a link? Neurology. 2002;59(11):1700–4.
13. Yoon MS, Katsarava Z, Obermann M, et al. Prevalence of primary headaches in Germany: results of the German Headache Consortium Study. J Headache Pain. 2012;13(3):215–23.
14. Zivadinov R, Willheim K, Sepic-Grahovac D, et al. Migraine and tension-type headache in Croatia: a population-based survey of precipitating factors. Cephalalgia. 2003;23(5):336–43.
15. Schwartz BS, Stewart WF, Simon D, Lipton RB. Epidemiology of tension-type headache. JAMA. 1998;279:381–3.
16. Pryse-Phillips W, Findlay H, Tugwell P, et al. A Canadian population survey on the clinical, epidemiologic and societal impact of migraine and tension type headache. Can J Neurol Sci. 1992;19:333–9.
17. Reza A, Sievert LL, Rahberg N, et al. Prevalence and determinants of headaches in Hawaii: The Hilo Women's Health Study. Ann Hum Biol. 2012;39(4):305–14.
18. Queiroz LP, Peres MF, Piovesan EJ, et al. A nationwide population-based study of tension-type headache in Brazil. Headache. 2009;49(1):71–8.
19. Lavados PM, Tenhamm E. Consulting behaviour in migraine and tension-type headache sufferers: a population survey in Santiago, Chile. Cephalalgia. 2001;21(7):733–7.
20. Katsarava Z, Dzagnidze A, Kukava M, et al. Primary headache disorders in the Republic of Georgia: prevalence and risk factors. Neurology. 2009;73(21):1796–803.
21. Koseoglu E, Nacar M, Talaslioglu A, Cetinkaya F. Epidemiological and clinical characteristics of migraine and tension type headache in 1146 females in Kayseri, Turkey. Cephalalgia. 2003;23(5):381–8.
22. • Yu S, Liu R, Zhao G, Yang X, et al. The prevalence and burden of primary headaches in China: a population-based door-to-door survey. Headache. 2012;52(4):582–91. *An important study in a previously unreported population*.
23. Wiehe M, Fuchs SC, Moreira LB, et al. Migraine is more frequent in individuals with optimal and normal blood pressure: a population-based study. J Hypertens. 2002;20(7):1303–6.
24. Roh JK, Kim JS, Ahn YO. Epidemiologic and clinical characteristics of migraine and tension type headache in Korea. Headache. 1998;38:356–65.
25. Takeshima T, Ishizaki K, Fukuhara Y, et al. Population-based door-to-door survey of migraine in Japan: the Daisen study. Headache. 2004;44(1):8–19.
26. Alders EE, Hentzen A, Tan CT. A community-based prevalence study on headache in Malaysia. Headache. 1996;36:379–84.
27. • Ayzenberg I, Katsarava Z, Sborowski A, et al. Lifting the Burden: The prevalence of primary headache disorders in Russia: a countrywide survey. Cephalalgia. 2012;32(5):373–81. *An important study in a previously unreported population*.
28. Ho K-H, Ong BK-C. A Community-Based Study of Headache Diagnosis and Prevalence in Singapore. Cephalalgia. 2003;23:6.
29. Lu SR, Fuh JL, Chen WT, Juang KD, Wang SJ. Chronic daily headache in Taipei, Taiwan: prevalence, follow-up and outcome predictors. Cephalalgia. 2001;10:980–6.
30. Rasmussen BK. Migraine and tension-type headache in a general population: Precipitating factors, female hormones, sleep pattern and relation to lifestyle. Pain. 1993;53:65–72.
31. Deleu D, Khan MA. Al Shehab TA: Prevalence and clinical characteristics of headache in a rural community in Oman. Headache. 2002;42:963–73.
32. Ertas M, Baykan B, Orhan EK, et al. One-year prevalence and the impact of migraine and tension-type headache in Turkey: a nationwide home-based study in adults. J Headache Pain. 2012;13(2):147–57.
33. Jabbar MA, Ogunniyi A. Sociodemographic factors and primary headache syndromes in a Saudi community. Neuroepidemiology. 1997;16:48–52.
34. Winkler A, Stelzhammer B, Kerschbaumsteiner K, et al. The prevalence of headache with emphasis on tension-type headache in rural Tanzania: a community-based study. Cephalalgia. 2009;29(12):1317–25.

35. Haimanot RT, Seraw B, Forsgren L, et al. Migraine, chronic tension-type headache, and cluster headache in an Ethiopian rural community. Cephalalgia. 1995;15:482–8.
36. Benamer D. Grosset: Epidemiology of headache in Arab countries. J Headache Pain. 2010;11:1–3.
37. Lyngberg AC, Rasmussen BK, Jørgensen T, Jensen R. Prognosis of migraine and tension-type headache. Neurology. 2005;65:580–5.
38. Lavados PM, Tenhamm E. Epidemiology of tension-type headache in Santiago, Chile: a prevalence study. Cephalalgia. 1998;18 (8):552–8.
39. Mørk H, Jensen R. Prognosis of tension-type headache: a 10-year follow-up study of patients with frequent tension-type headache. Cephalalgia. 2000;20:434.
40. Ashina S, Lyngberg A, Jensen R. Headache characteristics and chronification of migraine and tension-type headache: A population-based study. Cephalalgia. 2010;30(8):943–52.
41. Prakash S, Mehta N, Dabhi A, et al. The prevalence of headache may be related with the latitude: a possible role of Vitamin D insufficiency? J Headache Pain. 2010;11:301–7.