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Epidemiology of Tension-type Headache

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Abstract Tension-type headache (TTH) is the most prevalent type of headache across all age groups worldwide. TTH is common, disabling, and associated with medical and psychiatric comorbidities. This review will focus on the epidemiologies of episodic and chronic TTH in various age groups, factors associated with progression and remission, comorbidities, and the burden of TTH.

Keywords Tension-type headache · Epidemiology · Progression · Comorbidity · Chronic daily headache

Introduction

Although there is a relative paucity of research on tension-type headache (TTH) compared to migraine, TTH has the greatest socioeconomic impact of any primary headache type due to its high prevalence. It is the most prevalent type of headache in all age groups across the globe. The disease burden due to TTH is higher in those with the chronic (CTTH) compared to the episodic (ETTH) form, though even ETTH can significantly impact quality of life. Medical and psychiatric comorbidities may contribute to the burden, and confer a worse prognosis. This article will focus on the epidemiologies of ETTH and CTTH in various age groups, factors associated with progression and remission, comorbidities, and the burden of TTH.

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Diagnostic Criteria

TTH is divided into three subtypes based on attack frequency: an *infrequent episodic* form, in which headaches occur 1 day or less per month on average; a *frequent episodic* form, in which headaches occur between 1 to 14 days per month for at least 3 months; and a *chronic form* with 15 or more headache days per month. Frequent ETTH and CTTH are further subdivided based on the presence or absence of pericranial tenderness. Diagnostic criteria for all three subtypes include at least two of the following pain characteristics: bilateral location, nonpulsating quality, mild or moderate intensity, and lack of aggravation with routine physical activity. Infrequent and frequent TTH are both diagnoses of inclusion, because attacks may be accompanied by either photophobia or phonophobia (but not both), and diagnoses of exclusion, because nausea and vomiting must be absent. For CTTH, no more than one of three features of mild nausea, photophobia, and phonophobia may be present, and moderate or severe nausea or vomiting precludes the diagnosis [1].

In addition to being more frequent, CTTH differs from the episodic form in its relative refractoriness to treatment, higher impact on quality of life, and increased prevalence of medication overuse. The pathophysiology of CTTH is thought to be different than that of ETTH [2•].

Epidemiologies of Episodic and Chronic Tension-type Headache

The epidemiology of TTH in different age groups in summarized in Table 1.

In Adults

TTH is the most common primary headache disorder [3], with a lifetime prevalence of 78% [4]. Its prevalence varies by age, sex, and continent [4–6]. In the United States, the 1-year prevalence reported by Schwartz et al. [6] was 38.3% in adults. In both sexes, the prevalence peaks between the ages of 30 and 39 years (42.3% in men and 46.9% in women) and declines with increasing age [6]. The prevalence of TTH is slightly higher in women in all age, race, and education groups, with a female-to-male ratio in various studies ranging from 1.16:1 to 3:1 [6–9].

TTH prevalence varies across continents. In general, it is much more common in Europe, with various studies reporting a 1-year prevalence of up to 80%, than in Asia or the Americas, where prevalence ranges from 20% to 30% [10••]. In a comprehensive review of population-based epidemiological studies of headache, the global prevalence of current headache in all ages was found to be 47% for all headache, 38% for TTH, and 10% for migraine. When studies were restricted to those performed only in adults, the numbers were similar: 46% for all headache, 42% for TTH, and 11% for migraine. As expected, the lifetime prevalences were higher, at 66% for all headaches, 46% for TTH, and 14% for migraine [10••].

Because TTH has a high prevalence, capturing its incidence prospectively requires prolonged longitudinal data, and such studies are sparse. TTH incidence has been addressed in only one study, which examined Danish patients developing frequent TTH across a 12-year follow-up period. The overall incidence was determined to be 14.2 per 1000 person-years, with a female-to-male ratio of 3:1. TTH incidence was highest between the ages of 25 to 34 years for both men and women, declining over subsequent decades. Risk factors for incident frequent TTH included poor self-related health and sleep, and difficulty with relaxation after work [11].

Chronic daily headache (CDH) is a heterogeneous group of primary headache disorders of long duration that includes CTTH as well as chronic migraine, hemicrania continua, and new daily persistent headache. Most studies across the globe report a prevalence of CDH of 3% to 4% in adults [10••, 12–16]. CDH is most common in Central and South America, affecting up to 5% of each region's population, and least common in Africa (1.7%) [10••]. CTTH represents most CDH diagnoses in the general population, with a prevalence of 2% to 3%, while transformed migraine is the most common type of CDH treated in specialty centers. For CTTH, the overall 1-year prevalence in the United States was 2.2%; the prevalence in females was twice that of males (2.8% vs 1.4%) [6].

In Elderly Adults

Several studies have focused on the epidemiology of TTH in elderly adults. Despite a decline in prevalence with age, TTH continues to be relatively frequent in the elderly population [17]. In a subset of older adults between the ages of 60 and 65 years in the United States, the prevalence of ETTH was 25.6% for men and 27.1% for women [6]. Studies of the elderly (> 65 years old) reported a 1-year prevalence of TTH of 44.5% in Italy and 33.1% in Brazil [16, 18]. Several studies of TTH in elderly adults found a decrease in prevalence with advancing age [16, 19], while others found no significant decrease [7, 18, 20], in contrast to migraine, which decreased significantly. Occasionally, TTH can present for the first time in elderly adults, and it is important to exclude secondary causes because headaches that begin after the age of 65 years are more likely to be due to underlying pathology [17].

Unlike ETTH, which may remit with advancing age, the prevalence of CDH, including CTTH, remains fairly

Table 1 Epidemiology of tension-type headache in various age groups

	Children/Adolescents	Adults	Elderly adults
Prevalence (ETTH/CTTH)	ETTH: 10–25%; increases with age CTTH: 0–1.5%	ETTH: 38%; peak prevalence 30–39 y; decreases with age CTTH: 2–3%	ETTH: 25–45% CTTH: 2–3%
F:M ratio	1:1 until age 12 y; 1.4:1 between 13–15 y	1.16–3:1	1–1.8:1
Factors associated with TTH	Divorced parents, fewer peer relationships, depressive symptoms, neck/shoulder pain, oromandibular dysfunction	Analgesic overuse, depression, anxiety, temporomandibular dysfunction	Analgesic overuse, history of migraine, depression, anxiety, other pain syndromes

ETTH episodic tension-type headache, *CTTH* chronic tension-type headache, *F:M* female-to-male, *TTH* tension-type headache

constant throughout adulthood. CTTH affects 2% to 3% of both the general adult and elderly adult populations [4, 6, 13, 14, 16].

In Children and Adolescents

As in adults, most headache research in children and adolescents addresses migraine rather than TTH. However, TTH is at least as prevalent as migraine in these age groups, ranging from 10% to 25% in population-based studies. Prevalence varies by continent and increases with age. Some studies have found an equal prevalence of TTH in boys and girls [21, 22]; one study found a female preponderance after the age of 12 years [23]. Headache episodes typically begin at the age of 7 years, with an average duration of 2 hours. The duration, frequency, intensity, and medication use associated with TTH episodes typically are all lower on average compared to migraine in children [24•]. Diagnostic criteria for TTH in children and adolescents are the same as for adults [1]. In children, TTH may be difficult to differentiate from migraine as some of the symptoms overlap [22].

The prevalences of CTTH and CDH in general are lower in children than adults. A population-based study of individuals older than 10 years in rural Brazil found that the prevalence of CDH was lowest in children and adolescents between the ages of 10 and 19 years (1.8%) [25••]. One study of 12 year olds in Finland reported a prevalence of CDH of 1.6%, but none were diagnosed with CTTH [21]. Similarly, in a study of Swedish school-children, 1.5% had CDH, but only 0.1% had CTTH [23]. CTTH prevalence in separate studies of schoolchildren in Scotland [26] and Turkey [22] was 0.9% and 1.5%, respectively. In one study of children with CTTH, over 50% experienced predisposing physical or emotional stress [27].

Progression/Prognosis

Several studies have focused on the prognosis of TTH and risk factors for progression from ETTH to CTTH (Table 2). While rates of remission to less than 180 headaches per year are fairly high in several studies, ranging between 1/3 and 2/3 [14, 15, 28], improvement to a "normal" frequency of less than 1 headache per week is uncommon. In a study of 62 patients with TTH, at 10-year follow-up, 75% with ETTH continued to experience episodic headache while 25% had progressed to the chronic form. In those with CTTH at the beginning of the study, 31% remained chronic, 21% developed medication overuse, and the remaining 48% remitted to the episodic form, with or without the use of prophylactic treatments. Predictors of poor outcome in

Table 2 Factors associated with chronic daily headache progression and remission

Study	Population	CDH/CTTH prevalence (at baseline)	Period of follow-up	Rate of progression	Rate of remission	Risk factors for progression/ persistence	Factors associated with remission
Wang et al. [14]	China, elderly adults, population based	3.9%/2.7%	4 y	N/A	1/3 to <15/mo; 13–16% to <1/wk	Analgesic overuse	N/A
Fuh et al. [50]	China, elderly adults with CDH, population based	All with CDH at baseline	13 y	N/A	73% to <15/mo	None identified	N/A
Lu et al. [15]	Taiwan, population based; ages 15 y and older	3.2%/1.4%	2 y	N/A	65% to <15/mo	Age 40 y or older; CDH onset after 32 y; CDH duration of 6 years or more; medication overuse; daily HA	N/A
Hagen et al. [30]	Norway, population based; ages 20 y and older	HA free at baseline	11 y	2% to CDH	N/A	Low SES	N/A
Scher et al. [28]	United States, population based	N/A (potential CDH and control patients selected for comparison)	11 mo	3% to CDH, 6% to 105–179 HAs/yr	57% (43% with intermediate frequency; 14% to <1/mo)	Baseline frequency of>2 HA/mo; BMI≥30	Increased educational level; older age(females only); elapsed time between interviews
Lyngberg et al. [51]	Denmark, population based	All had baseline frequent or chronic TTH	12 y	N/A; 39% frequent ETTH, 16% CTTH	45% to infrequent or no TTH	Baseline CTTH; coexisting migraine; not being married; sleeping problems	Older age
Mørk and Jensen [29]	Denmark, clinic based	N/A (ETTH, CTTH, and control patients studied)	10 y	25% progressed from ETTH to CTTH	44%	Depression; anxiety; medication overuse	N/A

BMI body mass index, *CDH* chronic daily headache, *CTTH* chronic tension-type headache, *ETTH* episodic tension-type headache, *HA* headache, *N/A* not available, *SES* socioeconomic status, *TTH* tension-type headache

this study included depression, anxiety, and medication overuse [29]. Hagen et al. [30] found that low socioeconomic status predicted the development of CDH at 11-year follow-up in an adult population without headache at baseline. Risk factors for the development of CDH in elderly adults are similar to those in the adult population, and include analgesic overuse, depression, history of migraine, and other pain syndromes [14].

In a population-based study, Scher et al. [28] described factors that predict both the onset and remission of CDH and found that CDH prevalence decreased slightly with age and was more common in women and in previously married individuals. CDH was inversely associated with educational level: individuals with less than a high school education had more than a threefold risk of CDH compared to those with a graduate school education. At a follow-up survey 11 months later, 3% of control patients, described as having less than 104 headaches per year, met criteria for CDH, and 6% had progressed to an intermediate frequency of 105 to 179 headaches per year. Risk factors associated with the new onset of CDH included baseline headache frequency of more than two headaches per month and obesity (body mass index of 30 or more). Of patients with CDH at baseline, 44% continued to report 180 or more headaches per year, 43% improved to an intermediate frequency, and 14% remitted to less than 52 headaches per year. Remission to less than one headache per week was associated with increased educational level, elapsed time between interviews, and increasing age in women, but not in men [28].

TTH in children also is related to psychosocial factors. One study found that children with TTH were more likely to have divorced parents and had fewer peer relationships compared to children with migraine and headache-free control patients [31]. Depressive symptoms, neck and shoulder pain with daily activities, and oromandibular dysfunction also are more frequent in children with TTH compared to control patients [21]. Predictably, depressive symptoms are more common in children with frequent ETTH than those with less frequent attacks [32]. In one study of children with CTTH, over 50% experienced predisposing physical or emotional stress [27].

Comorbidity

Tension-type headache, especially CTTH, is associated with several medical and psychiatric conditions. Temporomandibular disorders (TMD) have been found to be associated with headache in several studies [25••, 33, 34], though the relationship may be confounded by the fact that headache is a symptom of TMD. In a recent study, Goncalves et al. [33] explored the presence of migraine, ETTH, CDH, and TMD in an adult population and found that as reported symptoms of TMD on a validated five-question survey increased, headache prevalence increased. When three or more symptoms of TMD were present, the prevalence of headache was 73%, compared to 38% in those with no TMD symptoms. TMD symptoms were more common in people with all three headache types relative to individuals without headache, with the association strongest for migraine. In one study, da Silva et al. [25••] reported a prevalence of TMD in 58% of patients with CDH. Individuals with CTTH were more likely to have TMD than were those with chronic migraine, but this difference did not reach statistical significance. Another study found that headache was almost twice as prevalent in patients with TMD symptoms compared to those without, but it did not specify headache frequency or subtype [34].

A possible mechanism linking headache and TMD may be involvement of the pericranial musculature [24•]. Deviations from normal temporomandibular function may activate pain receptors in the masticatory muscles, leading to sensitization of pericranial and central nociceptors, converging in the trigeminal nucleus caudalis. The development of central sensitization may contribute to the progression from episodic to chronic headache [2•, 35].

Many studies have found a relationship between psychiatric disease and CDH, including CTTH [25••, 36–40]. A population-based study in Brazil found that psychiatric disorders were observed in over two thirds of subjects with CDH [25••]. Generalized anxiety was found to be the most frequent comorbid psychiatric disorder, present in 38.5% of patients, followed by major depression (32.7%). Perhaps most concerning was the high frequency of suicidal ideation, reported by 17.3% of subjects.

Depression, anxiety, and panic disorder [40] are more common in patients with CTTH than those with ETTH. Some studies investigating psychiatric comorbidity by CDH subtype report a higher prevalence in chronic migraine versus CTTH [25••, 40], while others suggest that headache frequency, but not severity, has a more significant impact on psychological well being [41, 42]. One study suggests that psychiatric comorbidity, rather than headache type or frequency, is more strictly associated with an increased burden of accompanying headache symptoms [43].

Possible mechanisms proposed to explain the link between headache and psychiatric comorbidity are that CDH causes depression and anxiety, that depression and anxiety cause CDH, or that the relationship is bidirectional, with psychiatric disease leading to the development of CDH and with the presence of CDH increasing depression and anxiety. One study suggested that the relationship may be bidirectional for migraine, but unidirectional for other severe nonmigraine headaches, in that they predict, but are

not caused by, depression [44]. It also has been proposed that depression and CDH share a common pathophysiology.

It is important to identify and treat comorbid psychiatric disease in patients with CDH for several reasons. First, many studies suggest that psychiatric comorbidity may confer a worse prognosis [14, 15, 45]. Second, comorbid psychiatric disorders are associated with higher medical service–seeking behavior [36]. Third, the presence of psychiatric disease may provide therapeutic opportunities, such as the ability to treat both headache and depression with a single medication, or with nonpharmacologic approaches that have been found to be helpful for both conditions, such as stress management, biofeedback, and cognitive behavioral therapy.

Burden of Tension-type Headache

While more studies have explored the impact of migraine, the disability attributable to TTH is larger worldwide than that due to migraine [10••]. TTH has a greater socioeconomic impact due to its higher prevalence [2, 46]. While the absence rate among migraine sufferers is higher than in patients with TTH, those with TTH account for a greater total loss of workdays per year and a higher percentage of decreased work effectiveness [47, 48]. In Denmark, TTH, especially CTTH, accounts for more than 10% of total disease absenteeism caused by any disease [46].

The disease burden of TTH is higher in those with CTTH compared to ETTH as measured by several scales of disability, including the Migraine Disability Assessment (MIDAS) scale, the Beck Depression Inventory, and the General Health Questionnaire. Frequency, rather than severity of headache, may have a greater impact on disability and quality of life [41].

Even ETTH, which is considered to cause little disability, can significantly impact quality of life. One third of university students in Brazil with ETTH reported that headaches interfered with their ability to study and impacted the final grades they earned. Even between headaches, almost one quarter of students reported changes in their affective relationships [49].

Conclusions

TTH is prevalent in children, adults, and elderly adults across the globe. It causes significant burden both to the individual and to society, accounting for a significant loss of productivity. Psychiatric and physical comorbidities may contribute to the burden, conferring a worse prognosis. Treatment needs to address both headache and associated diagnoses to be effective.

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