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Chronic migraine and chronic daily headache in the Asia-Pacific region: A systematic review

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Abstract

Background: Data on the prevalence and characteristics of chronic migraine (CM) and chronic daily headache (CDH) in the Asia-Pacific region are limited.

Methods: We performed a systematic review on this topic, searching for studies published from 1996 to 2012 that reported the prevalence (population-based studies) or frequency (clinic studies) of CM or CDH. We calculated 95% confidence intervals for the prevalence in population studies. Results were qualitatively described.

Results: Seven population studies and 19 hospital clinic studies from Asia were included. The CDH prevalence in population studies was 1.0–3.9% (median 2.9%). Only two studies from Taiwan reported the population prevalence of CM (1.0% and 1.7%). In addition, we derived a prevalence of 0.6% from a Malaysian study. Eleven clinic studies reported a CM frequency of 4.7–82% (median 52%) as a subset of CDH; classification of medication overuse varied. CM was associated with substantial disability.

Conclusions: The prevalence of CM and CDH in Asia appears lower than the global average, but applying the above prevalence estimates to the Asia-Pacific population would suggest that CM alone affects between 23 and 65 million individuals in the region.

Keywords

Chronic migraine, chronic daily headache, systematic review, prevalence, Asia, Asia-Pacific

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Introduction

Chronic migraine (CM) is a comparatively recent diagnostic entity that describes a disabling complication of migraine in which headaches occur on more days than not (1). An older term, transformed migraine, reflects the fact that most patients with CM have a history of episodic migraine with a gradual increase in the headache frequency (2). The first edition of the International Classification of Headache Disorders (ICHD-I) included neither CM nor transformed migraine (3), leading Silberstein and Lipton to propose a revised classification (4). They described chronic daily headache (CDH) as headache occurring on at least 15 days per month, with subtypes including transformed migraine, chronic tension-type headache (CTTH), new daily persistent headache, and hemicrania continua (4). Transformed migraine was defined as primary CDH linked to migraine, with or without medication overuse.

The ICHD second edition (ICHD-II) incorporated CM as a complication of migraine and introduced

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medication-overuse headache (MOH) as a diagnosis (5). After proving too restrictive, the criteria were revised in 2006 (ICHD-IIR) to define CM as headache on 15 or more days per month, including migraine without aura on at least eight days, with a duration of at least three months, and in the absence of medication overuse (6). Although the revised criteria are increasingly accepted, the role of medication overuse in classifying CM remains controversial, as overuse is common in CM patients but the causal sequence is unclear (7,8).

The evolving nature of CM classification presents a challenge for epidemiological studies. Prevalence estimates vary widely and are affected by the case definition (9), but are typically in the range of 1–3% (1,10). The majority of published studies report data from European populations, whereas much less is known about the epidemiology and burden of CM and CDH in the Asia-Pacific region, an area that includes more than half the world's population. Migraine prevalence may vary by ethnicity and geographic region (10–13). The importance of ethnicity and culture is increasingly recognized in medicine, with differences between (and among) Asian and European populations demonstrated in diverse areas, including the prevalence and subjective experience of pain (14–18).

We performed a literature review to provide insight into the prevalence and characteristics of CM and CDH in the Asia-Pacific region. The primary focus was on CM where data were available, and population as well as clinic-based studies were considered.

Methods

Literature search

A systematic search of the PubMed (incorporating MEDLINE), EMBASE and Cochrane databases was performed to identify studies reporting the prevalence, incidence and/or frequency of CM or CDH among adults in the Asia-Pacific region from 1996 to 2012 inclusive. Searches were last updated on 10 June 2012. The 1996 cut-off date was chosen to capture studies using Silberstein and Lipton's 1996 criteria for CDH and transformed migraine, together with more recent CM criteria. In the absence of a standard definition of the Asia-Pacific region, we included the countries and areas listed in the World Health Organization (WHO) South-East Asia and Western Pacific regions, together with Pakistan. The search included full papers and abstracts and was not restricted by language, provided that an abstract was available in English.

Searches were performed using a combination of headache, country and epidemiology keywords:

1. Migraine and related headache terms included *chronic migraine*, *transformed migraine*, *chronic daily headache*, *chronic headache*, *chronic tension-type headache* and *medication overuse headache*, together with sub-terms and alternatives such as *frequent migraine*, *frequent headache*, *drug-induced headache*, *analgesic overuse headache* and *rebound headache*.
2. Country and area search terms were *Asia*, *Pacific Islands*, *Micronesia*, *China*, *Hong Kong*, *India*, *Indonesia*, *Japan*, *Korea*, *Malaysia*, *Pakistan*, *Philippines*, *Singapore*, *Sri Lanka*, *Taiwan*, *Thailand*, *Vietnam*, *Australia* and *New Zealand*.
3. Epidemiological terms included *prevalence*, *frequency*, *incidence*, *epidemiology*, *morbidity* and *burden*.

PubMed and EMBASE search strings were entered as free text, with no limits other than the date range, then combined. EMBASE searches used the default options of mapping to preferred terminology and inclusion of sub-terms or derivatives, with the free text search option selected and results limited to EMBASE records. These searches were intended to minimize the possibility of omitting relevant records that were not fully or consistently indexed. Consequently, a high proportion of records retrieved in the combined searches (PubMed 898, EMBASE 1194) were clearly irrelevant based only on the record title. These combined searches were subsequently limited to records containing the terms *headache*, *migraine* or their derivatives in the record title, and this subset was screened (Figure 1). Additional searches using fewer and broader search terms were performed to ensure that potentially relevant studies had been identified.

The Cochrane Library was searched for records containing the above country and epidemiological terms in the title, abstract or keywords, together with *headache* or *migraine* in the title.

Selection criteria

Population-based as well as other studies were eligible, where population-based here refers to studies that sampled all or part of the general population of community-dwelling individuals in a geographically defined area. Population-based studies were included if they estimated the prevalence or incidence of CM, total CDH, or MOH associated with migraine (or reported information adequate to calculate these), while clinic-based studies were included if they reported the frequency of these headache types within the study sample. Regarding CM, we used an inclusive approach based on the Silberstein-Lipton criteria, accepting all studies that reported CM or its equivalent using a definition that included CDH with migraine, regardless of

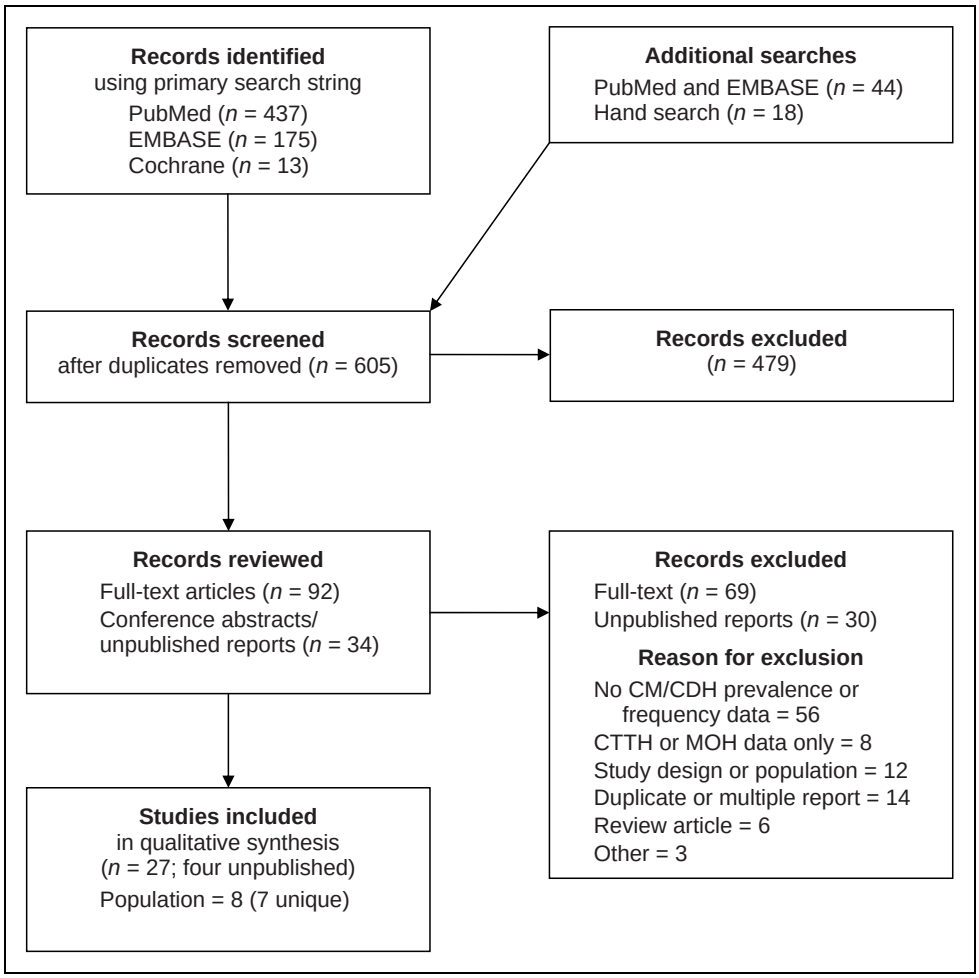

Figure 1. Process of study selection.
CDH: chronic daily headache; CTTH: chronic tension-type headache; CM: chronic migraine; MOH: medication-overuse headache. The literature search identified eight reports of seven population-based studies. An additional report describing the methods and participants for one of these seven studies was published after the literature search was completed and was included in the review (23).

medication overuse. Medication overuse was defined according to the criteria used by the authors of each study. Studies were excluded if no data were provided on the prevalence or frequency of CM or total CDH (e.g. headache or migraine studies not specifying frequency, or reports limited to CTTH), or if only children or adolescents aged <18 years were included (however, studies in adults that included some young people were retained).

Data collection and analysis

Citations and abstracts were reviewed, and full-text articles were obtained for studies with relevant data. The reference lists of the selected studies were examined for additional relevant publications, and each author was responsible for identifying any studies in his or her own country that were not retrieved in the database searches. Due to the complexity and variable reporting of the overlapping diagnostic criteria, potentially eligible papers were reviewed by the authors at a consensus meeting.

Data abstracted from the studies included publication information, methods (sampling and data collection), objectives, headache definition, study population and basic demographic information, and information on medication overuse. Prevalence and/or incidence estimates were extracted for population-based studies, together with data on the persistence of CDH in longitudinal studies. We calculated exact 95% confidence intervals for the prevalence estimates. For non-population-based studies, the headache frequency, characteristics and disease burden were recorded.

Investigators were not routinely contacted for additional information. Study results were not combined, except to calculate the mean frequency of CM and CDH in clinic studies.

Headache diagnostic criteria used in the selected studies included ICHD-I (1988) (3), ICHD-II (2004) (5), ICHD-IIR (2006) (6), Silberstein-Lipton (1994, 1996) (4,19), and Solomon (1992) (20) criteria, and modified criteria as clearly defined by the investigators. Medication overuse was commonly reported, regardless of whether the stated diagnostic criteria allowed the inclusion of patients with medication overuse. Equivalent criteria were combined where appropriate. We recorded the data for CM where the original study used ICHD-IIR Appendix 1.5.1 criteria for CM, Silberstein-Lipton 1994 or 1996 criteria for transformed migraine, or CDH with migraine or migrainous features.

For non-population-based studies, the main findings were tabulated and qualitatively summarized in text.

Results

Literature search and study characteristics

Figure 1 summarizes the search results and article review process. Nine reports of seven population-based studies with prevalence data for CM or CDH were included (21–29). Two studies were conducted in Taiwan and one study each in China, India, Korea, Malaysia and Singapore (Table 1); no eligible studies from Australia, New Zealand or the Pacific Islands were identified. Six reports of population-based studies were excluded because the prevalence was reported for CTTH but not for CM or total CDH (30–35). Additional population-based studies were excluded as subsidiary or multiple reports for CDH (36,37), or because only the total headache or migraine prevalence was presented (12,38–44). However, two excluded reports contained relevant data as discussed below (30,31).

Several community-based studies that reported CM or CDH data were also excluded, either because the study sample was not representative of the general population, or because the sampling method did not allow calculation of the population prevalence. The first category included studies of Korean professional women breath-hold (free) divers (45); female university students in Pakistan who reported experiencing headache (46); and hospital-based nurses in Taiwan (47). The second category included the International Burden of Migraine Study, an Internet survey conducted in 10 countries (including Australia and Taiwan) that was excluded because recruitment targets were set for CM (48,49); a large study of migraine in Kerala, India, that was excluded because of the likelihood that participants were relatives of patients (50); and non-random, age-restricted samples of Hong Kong Chinese women (51) and older Australians (52).

Nineteen clinic-based studies from China, India, Japan, Korea, Malaysia, Pakistan, Taiwan and Thailand are summarized in Table 2 (53–71). Again, there were no eligible reports from outside Asia. Two additional reports of one Chinese study were excluded (72,73), together with three reports from Taiwan of CDH (74) and CM (75,76) in patients with major depression, a study from India that did not state the diagnostic criteria (77), and a Japanese study that reported the frequency of MOH, but not overall CDH (78). Several clinic-based studies reporting non-chronic headache or migraine were also excluded. All selected studies reported the frequency of CDH or its subtypes, but the study populations and outcomes varied.

Prevalence of CM and CDH in population-based studies

Table 1 and Figure 2 present the results from population-based studies.

The total prevalence of CDH was 1.0–3.9% (median 2.9%) in seven studies (21–28). The highest estimate was obtained in Taiwan from the Kinmen Island Neurologic Disorder Survey (KINDS) study, which included only older individuals ($\geq$65 years) (28,29). This was consistent with results from a nationwide Korean study, in which the CDH prevalence was 1.8% overall but increased to 4.3% in individuals aged $\geq$60 years (24). A Singaporean study reported an overall CDH prevalence of 3.3%, with a lower prevalence in Chinese individuals (3.0%), compared with other ethnic groups (4.6%) (26).

Only two studies, both from Taiwan, reported prevalence data for CM (27,28). A study conducted in Greater Taipei estimated the one-year prevalence of migraine (12) and CDH (27). The prevalence of CM (reported as transformed migraine) was 1.7%, representing 55% of individuals with CDH (27). In the KINDS study, the prevalence of CM (reported as CDH with migrainous features) was 1.0%, representing 25% of all individuals with CDH (28). Inclusion of subjects with a history of migraine but no current migraine features would increase the CM prevalence to 1.5% (28). We calculated a CM prevalence of 0.6% in a Malaysian study, based on a 9.0% prevalence of migraine (adjusted for sex), with 7.0% of migraineurs estimating their headache frequency to be more than 180 days in the previous year (25). Two additional studies presented relevant data. A survey of residents in Daisen, Japan, did not report CM, but 0.35% of

Table 1. Population-based studies reporting the prevalence of chronic migraine or chronic daily headache.

Study/first author	Methods (sampling; data collection)	Headache criteria	Sample size (*N* approached; response rate)	Age (years)	F (%)	One-year prevalence (%)			Medication overuse
						Overall	95% CI	F:M	
China									
'Lifting the Burden' Yu 2012 (21)	Random; face-to-face interview	ICHD-II	5041 (5359; 94%)	18–65 (mean 44)	49	CDH: 1.0 (48/5041) MOH: 0.6	0.7, 1.2 0.4, 0.8	1.4:0.5 0.9:0.3	MOH: 60% of CDH subjects
India									
'Lifting the Burden': Karnataka Gururaj 2010; Rao 2012 (22,23)	Random; face-to-face interview	ICHD-II	2329 (2514; 93%)	18–65 (mean 38)	51	CDH: 2.9 (68/2329) MOH: 1.2 (28/2329)	2.2, 3.6 0.8, 1.6	—	MOH: 41% of CDH subjects
Korea									
Korean Headache Survey Chu 2011 (24)	Random; interview	ICHD-II	1506	≥19	—	CDH: 1.8 (27/1506) MOH: 0.5 (7)	1.1, 2.5 0.1, 0.8	2.2:1.5	MOH: 26% of CDH subjects
Malaysia									
Alders 1996 (25)	Not stated; door-to-door survey	ICHD-I	595 (94%)	5–87 (mean 30)	63	CDH: 2.4 CM: 0.6[a] CTTH: 1.5	1.2, 3.6 0.0, 1.3 0.5, 2.5	—	—
Singapore									
Ho 2001[b] (26)	Random; face-to-face interview	ICHD-I	2096 (3000; 70%)	14–74 (mean 36)	53	CDH: 3.3 (70/2096)	2.6, 4.1	—	—
Taiwan									
Greater Taipei[c] Lu 2001 (27)	Random; telephone interview	Silberstein 1996	3377 (4434; 76%)	15–92 (mean 37)	53	CDH: 3.2 (108/3377) CM 1.7 (59/3377) CTTH 1.4 (47/3377) MOH: 1.1 (37/3377)	2.6, 3.8 1.3, 2.2 1.0, 1.8 0.7, 1.4	4.3:1.9 2.8:0.6 1.6:1.2	34% of CDH subjects (37/108)
KINDS[c] Wang 2000; Fuh 2008 (28,29)	Whole population; face-to-face interview	ICHD-I CDH: Silberstein 1996[d] Analgesic overuse: Silberstein 1994	1533 (2003; 77%)	≥65 (mean 74)	56	CDH: 3.9 (60/1533) CM:[e] 1.0 (15/1533) CTTH: 2.7 (42/1533) MOH: 1.0 (15/1533)	2.9, 4.9 0.5, 1.5 1.9, 3.6 0.5, 1.5	5.6:1.8	25% of CDH subjects (15/60)

CDH: chronic daily headache; CI: confidence interval; CM: chronic migraine; CTTH: chronic tension-type headache; F: female; ICHD: International Classification of Headache Disorders; KINDS: Kinmen Neurological Disorder Survey; M: male; MOH: medication-overuse headache.

[a]Derived estimate (see text); [b]A separate report that presented results for CTTH and migraine was excluded (31); [c]Earlier reports on migraine prevalence were excluded (12,36); [d]Modified CDH criteria: ≥15 days/month for ≥6 months, excluding subjects with a history of migraine but no current migraine features, and without considering the transformation process; [e]CDH with migrainous features (International Headache Society 1.1 or 1.2).

Table 2. Clinic studies reporting the frequency of chronic migraine or chronic daily headache.

Study / first author	Study setting	Population	Methods (data collection; outcomes; HA criteria)	Sample size	Age (years)	F (%)	Headache frequency (%)	Medication overuse	Other findings
China									
Qiu 2008 (53)	Hospital outpatient neurology clinic	Patients with migraine	Retrospective; Clinical features; ICHD-II	309	3–50 (mean 22.9)	76	CM 19.4 (60/309)* MOH 19.1 (59/309)* *Base = all migraine.	Of 59 MOH patients, 90% used combination analgesics	CM frequency was higher in women (22%) than men (12%).
Wang 2011 [a] (54)	Hospital outpatient neurology clinic	Consecutive patients with HA	Interview; Demographic data and clinical features; ICHD-IIR	1683	Mean 46	69	CDH 22.8 (192/843)* Subtypes: CM 4.7 (9/192) CTTH 64.1 (123/192) MOH 23.4 (45/192) NDPH 7.8 (15/192) *Base = primary HA.	Of 45 MOH patients, 20% had migraine and 91% used combination analgesics	HA ≥ 15 days/month: TTH 54% Migraine 35% Compared to TTH, migraine was associated with longer HA history, more intense HA and greater analgesic use.
Yong 2012 (55)	Hospital outpatient headache clinic	Consecutive patients with migraine > 1 year	Interview; Comorbid anxiety/ depression; ICHD-II	176	14–63 (mean 39.1)	82	CM 30.1 (53/176)* *Base = all migraine.	—	CM frequency was similar in men (31%) and women (30%). Of 53 patients with CM, 26% had depression and 49% had anxiety symptoms.
India									
Chakravarty 2003 (56)	Hospital outpatient neurology clinic	Patients with CDH (n = 849) and > 1 year of follow-up	Interview; Clinical profile, treatment outcomes; Modified ICHD-I [b] CDH: Silberstein 1996	205	26–62	83	CDH 49.6 (849/1712)* At ≥ 1-year follow-up: CM 82.4 (169/205) CTTH 16.1 (33/205) NDPH 1.5 (3/205) *Base = primary HA.	Analgesics: [c] 23% of CDH patients (CM 28%, CTTH 0); mean 735 mg aspirin or equivalent per day. Ergotamine: 4% of CM patients	Stress was a common precipitating factor: CM 44% (75/169) CTTH 73% (24/33) Transformation to CM was gradual in 89%. Sleep disturbance: CM 87% CTTH 100% Major depression: CM 21% CTTH 21% Anxiety/mood disorders: CM 44% CTTH 73%

Continued...

Table 2. Continued.

Study / first author	Study setting	Population	Methods (data collection; outcomes; HA criteria)	Sample size	Age (years)	F (%)	Headache frequency (%)	Medication overuse	Other findings
Guruprasad 2012 (57)	Hospital outpatient clinic	Patients with primary HA	Questionnaire; Clinical profile; ICHD-II	284	> 12	74	CM 26.4 (75/284)* CTTH 20.4 (58/284)* Migraine subtype: CM 41.2 (75/182) *Base = primary HA.	—	In migraineurs, the CM frequency was 45% in men and 40% in women.
Joshi 2009 (58)	Hospital, referral clinic and neurology ward	All outpatients or inpatients with CDH over a 14-month period	Clinical and neurological exam; Clinical profile; ICHD-II	626	16–65	66	CDH subtypes:* CM 61.7 (374/606) CTTH 36.6 (222/606) NDPH 1.7 (10/606) *Base = CDH.	Medication overuse: CM 75% CTTH 60%	HA duration 1–20 years. 20 patients had secondary HA.
Ravishankar 2008 (59)	Hospital HA clinic	Presenting patients (n = 6000) with MOH or probable MOH	Retrospective; Clinical profile, medication use; ICHD-II	184	≥ 20	71	MOH 3.1 (184/6000)* [d] Subtypes: CM 84.8 (156/184) CTTH 6.5 (12/184) NDPH 8.7 (16/184) *Base = all HA.	Drug class: ergotamine 57%, combination analgesics 38%, triptans 5%	Depression: moderate 78% severe 2.7%
Japan									
Imai 2007 (60)	Hospital outpatient clinic	Consecutive patients diagnosed with probable MOH at first consultation	Retrospective; Clinical profile, treatment outcome; ICHD-II	47	20–75 (mean 42)	87	MOH subtypes: CM 80.9 (38/47) CTTH 4.3 (2/47) Both 14.9 (7/47)	All patients had probable MOH. Drug class: combination analgesics 85%, analgesic 9%, other 6%	Outcome: withdrawal 77% (36/47), failure (11%), drop-out (11%), reclassified without MOH (2%)
Takase 2004 (61)	Hospital outpatient clinic	Patients with chronic HA (n = 2241) diagnosed with CDH	Interview; Clinical profile, medication overuse; ICHD-II	508	15–70 (mean 42)	73	CDH: 22.7 (508/2241)* Subtypes: CM 45.7 (232/508) CTTH 43.9 (223/508) NDPH 10.4 (53/508) *Base = chronic HA.	CDH 48%: analgesics (230), ergotamine (8), triptans (7)	69% (159/230) of analgesic overusers had CM

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Table 2. Continued.

Study / first author	Study setting	Population	Methods (data collection; outcomes; HA criteria)	Sample size	Age (years)	F (%)	Headache frequency (%)	Medication overuse	Other findings
Takeshima 2009 (62)	Hospital outpatient clinic	Patients presenting with HA (n = 680) and diagnosed with CDH	Retrospective; Clinical profile, medication overuse, patient outcomes; ICHD-IIR	192	14–80 [e]	72 [f]	CDH: 28.2 (192/680)* Subtypes: CM 12.5 (24/192) CTTH 34.9 (67/192) MOH 41.7 (80/192) NDPH 4.2 (8/192) *Base = all HA.	CDH 42%: analgesics (76), triptans (9), both (5)	94% (75/80) of MOH cases had migraine
Korea									
Seok 2006 (63)	Hospital HA clinic	Consecutive HA patients (n = 1142) who had CM [g] and >1 year of follow-up	Interview; Reversion of CM to EM; ICHD-II [g]	136	Mean 46	90	CM with 1 year follow-up: 11.9 (136/1142)* *Base = all HA.	CM 69%: combination analgesics (63), ergotamine or triptans (9), simple analgesics (4), > 1 class (18)	70% (95/136) converted from CM to EM, with recurrence in 7/95 (7%). Adherence to preventive medication and stopping overused medication predicted reversion (p < 0.001). Six patients with recurrence had discontinued preventive medication.
Malaysia									
Tai 2012 (64)	Hospital neurology (90%) and primary care clinics	Consecutive patients with primary HA	Interview; Clinical profile; Comparison of younger (< 55) and older (≥ 55) patients; ICHD-II	165	≥ 18–84 Younger: mean 30; Older: mean 65	69	CDH:* Total 36.4 (60/165) Young 28.4 (27/95) Older 47.1 (33/70) CM:* Total 9.7 (16/165) Young 12.6 (12/95) Older 5.7 (4/70) CTTH:* Total 12.7 (21/165) Young 5.3 (5/95) Older 22.9 (16/70) *Base = primary HA.	No patients fulfilled criteria for MOH.	HA every day was reported by 41% of older and 15% of younger patients (p < 0.0001).

Continued...

Table 2. Continued.

Study / first author	Study setting	Population	Methods (data collection; outcomes; HA criteria)	Sample size	Age (years)	F (%)	Headache frequency (%)	Medication overuse	Other findings
Pakistan									
Gupta 2007 (65)	Hospital HA clinic (psychiatric outpatient dept.)	Patients with primary HA (*n* = 245) diagnosed with CDH	History, clinical exam; Clinical profile, medication overuse, psychiatric morbidity; ICHD-II	91	13–65 (mean 34)	60	CDH: 37.1 (91/245)* Subtypes: CM[h] 47.3 (43/91) CTTH 52.7 (48/91) *Base = primary HA.	CDH 100%	Psychiatric morbidity: CM 60% CTTH 79% Depression: CM 51% CTTH 54% Anxiety disorders: CM 9% CTTH 25%
Murtaza 2009 (66)	Hospital HA clinic	Consecutive patients presenting with HA	Retrospective; Clinical profile; ICHD-II CDH: Silberstein 2000	255	Mean 32	66	CDH: 38.8 (99/255)* CDH subtypes: CM 57 CTTH 22 Both 13 MOH 5 *Base = all HA.	CDH 5%	HA frequency was significantly higher in patients with TTH versus migraine ($p < 0.001$). Migraine duration and symptoms were higher in women vs. men.
Taiwan									
Fuh 2005 (67)	Hospital HA clinic	Consecutive outpatients (*n* = 2983) diagnosed with CDH	Questionnaire; Frequency of substance dependence; CDH: Silberstein 1994 MOH: ICHD-II	1861	> 18 (mean 50)	74	CDH: 62.4 (1861/2983)* CDH subtypes: Probable MOH 48.0 (893/1861) CM 51.5 (958/1861): with MOH 29.6 (551) no MOH 21.9 (407) *Base = all HA.	MOH: combination analgesics 79%, simple analgesics 26%, ergotamine 7%	MOH vs. no MOH: migraine 62% vs. 42%; mean CDH duration 91.0 vs. 63.1 months Substance dependence (modified DSM-IV): MOH 68% no MOH 20%

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Table 2. Continued.

Study / first author	Study setting	Population	Methods (data collection; outcomes; HA criteria)	Sample size	Age (years)	F (%)	Headache frequency (%)	Medication overuse	Other findings
Juang 2000 (68)	Hospital HA clinic	Consecutive eligible[i] outpatients (n = 331) with CDH	Questionnaire, clinical exam; Psychiatric comorbidity; Silberstein 1996	261	13–81 (mean 46)	80	CDH: 78.9 (261/331)* Subtypes: CM 58.2 (152/261) CTTH 35.2 (92/261) NDPH 2.7 (7/261) *Base = all HA.	—	Mean HA duration (years): CM 4.9 CTTH 3.6 Anxiety/depressive disorder: 73% Major depression: CM 57% CTTH 51% Anxiety disorder: CM 43% CTTH 25%
Wang 2001 (69)	Hospital HA clinic	Consecutive eligible[i] outpatients	Questionnaires, clinical exam; QOL; Silberstein 1996	901	≥ 17 (mean 45)	77	CDH: 65.8 (593/901)* Subtypes: CM 52.3 (310/593) CTTH 39.0 (231/593) Other 8.8 (52/593) *Base = all HA.	Analgesics: CM 51% CTTH 30%	CM patients had the highest mean HA frequency and intensity. Women: 90% CM, 70% CTTH CM patients had the highest HADS scores and the greatest decline in QOL (SF-36 scores).
Wang 2004 (70)	Hospital HA clinic	Consecutive HA patients (n = 1965) who reported migraine (n = 1088) and met ICHD-I criteria for migraine (1.1 or 1.2)	Interview, clinical exam; Frequency of CM, clinical profile of CM vs. EM; ICHD-I CDH: Silberstein 2001	536	5–81 (mean 41)	84	CM: 9.9 (194/1965)* Migraine subtype: CM 36.2 (194/536) *Base = all HA.	Analgesics >3 days/month: CM 69%	CM frequency increased with HA duration. 76% of patients had disturbed sleep.

Continued...

Table 2. Continued.

Study / first author	Study setting	Population	Methods (data collection; outcomes; HA criteria)	Sample size	Age (years)	F (%)	Headache frequency (%)	Medication overuse	Other findings
Thailand									
Srikiatkhachorn 1997 (71)	Hospital HA clinic	HA patients (n = 220) diagnosed with CDH over an 18-month period	Interview and clinical exam; Frequency, clinical profile; ICHD-I CDH: Solomon 1992 [j]	60	17–63 (mean 33)	85	CDH: 27.3 (60/220)* Subtypes: CM 30.0 (18/60) CTTH 36.7 (22/60) Other 33.3 (20/60) *Base = all HA.	Analgesics (daily use): CDH 58%	Severe HA: 20% (12/60) Continuous HA: 47% (28/60) Pulsating pain: 47% (28/60) Irritability (62%), initial insomnia (58%), sleep fragmentation (33%)

CDH, chronic daily headache; CM, chronic migraine; CTTH, chronic tension-type headache; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, 4th ed.; EM, episodic migraine; F, female; HA, headache; HADS, Hospital Anxiety and Depression Scale; ICHD, International Classification of Headache Disorders; MOH, medication-overuse headache; NDPH, new daily persistent headache; QOL, quality of life; SF-36, Medical Outcome Study–Short Form; TTH, tension-type headache.
[a] Separate analyses that reported the clinical characteristics of tension-type headache and migraine were excluded (72,73); [b] Requirement for chronic headache duration changed from 6 months to 3 months; [c] Analgesic overuse was defined as a daily intake of ≥ 600 mg aspirin or equivalent on ≥ 5 days/week, or daily ergotamine intake of ≥ 1 mg for > 3 days/week; [d] Patients overusing multiple drugs were excluded; [e] Age range reported for patients with MOH; [f] Based on 181 patients (excludes unclassified CDH); [g] ICHD-II criteria specified, but reported as transformed migraine (frequency > 15/month for > 6 months); [h] Reported as 'migraine without aura with probable chronic migraine without aura with probable MOH' and 'migraine with aura with probable chronic migraine with aura with probable MOH'; [i] Veterans were excluded as their demographic profile differed from the non-veteran patient population; [j] Headache ≥ 6 days/week for ≥ 6 months.

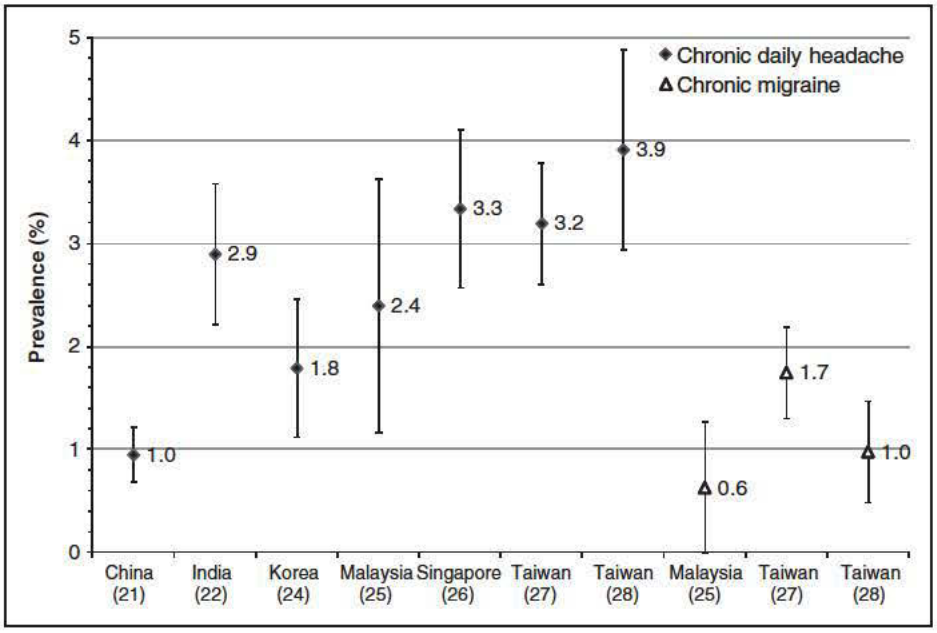

Figure 2. Prevalence of chronic daily headache and chronic migraine in population studies. Bars represent 95% confidence intervals.

participants had migraine without aura together with a headache frequency of three to four times per week or higher (30). In Singapore, 1% of individuals surveyed had migraine without aura or migrainous headache (International Headache Society codes 1.2 and 1.7) and a headache frequency of several times a week (31).

The outcome of CDH over time was assessed in the two studies from Taiwan. After two years, persistent CDH was reported in 35% of individuals in the Greater Taipei study (27). In the KINDS study, approximately two-thirds of evaluable subjects fulfilled CDH criteria during four years of follow-up; about 60% considered their headaches to be unchanged or worsened during this period (28). Only half the original cohort remained alive after 13 years, at which time seven of 26 evaluable patients (27%) had CDH (29).

Frequency of CM and CDH in clinic-based studies

Table 2 presents data from 19 clinic studies, all of which were hospital based. Eleven studies reported the frequency of CDH, which ranged from 23% (54,61) to 79% (68) of patients with headache. The CDH frequency was below 30% in four studies (54,61,62,71), one of which used alternative criteria (20,71), 36–39% in three studies from Malaysia (64) and Pakistan (65,66), and 50–79% in four studies from India and Taiwan (56,67–69).

The frequency of CM as a subset of total CDH was reported in 11 studies (Table 2). The median CM frequency was 52% (mean 46%), but values ranged from 4.7% (54) to 82% (56). This may reflect variation in whether MOH was included in the estimate. Four studies reported the frequency of CM as a proportion of total migraine (19–41%) (53,55,57,70).

MOH

Five population studies provided information on medication overuse (Table 1). In China, 60% of respondents with CDH had MOH, based on the relative prevalence of each condition (21). The frequency of medication overuse in four other population studies was 25–41% as a proportion of individuals with CDH (22,24,27,28). MOH and CM were non-exclusive categories in the two studies from Taiwan, but the frequency of medication overuse in participants with CM was not stated (27,28).

Eight clinic studies reported the frequency of MOH or medication overuse as a subset of CDH, with values ranging from 5% to 100% (mean 43%) (54,56,61,62,65–67,71) (Table 2). MOH and CM were exclusive categories in some of these studies and overlapped in others. Two studies reported a CM frequency of 81–85% as a subset of MOH (59,60). Six clinic studies reported the frequency of MOH or medication overuse as a proportion of patients with CM;

the mean frequency was 54% (range, 28–75%) (56,58,63,67,69,70). Lastly, one study reported a 19% frequency for MOH as a proportion of total migraine; the CM frequency was also 19% (53). Two studies from Taiwan reported positive associations between CM frequency, medication overuse and increasing headache duration (67,70).

Discussion

The prevalence of CM and CDH in Asia ranged from 0.6% to 1.7% and 1.0% to 3.9%, respectively, for population-based studies. Applying these values to the Asia-Pacific population (approximately 3.85 billion, based on 2010 United Nations (UN) data for the region as defined in this paper) would suggest that CM affects between 23 million and 65 million individuals in the region. For any form of CDH, the estimated number of affected individuals is 38 million–150 million, with the median prevalence of 2.9% yielding an estimate of 111 million. However, these descriptive estimates were based on only three studies for CM and seven for CDH, all of which were from Asia (Table 1). The highest CDH prevalence was reported in a study limited to adults aged $\geq$65 years (28); exclusion of this study would give a median CDH prevalence of 2.7%. No eligible studies from Australia or New Zealand were identified.

The absence of studies from some Asian countries was not unexpected, as the lack of headache research in low- and middle-income countries has been documented (79). This regional knowledge gap has been recognized by the 'Lifting The Burden' global campaign against headache coordinated by the WHO (80). Results from global campaign studies in China and India (unpublished) reported CDH but not CM (Table 1), and a study has been initiated in Pakistan. The prevalence of migraine in the Chinese study was 9.3%, similar to the global average (21). However, China had the lowest population prevalence estimate for CDH, at 1.0% (21,37), compared to 3.2–3.9% in Singapore and Taiwan (26–28).

Although the 19 clinic-based studies used varying diagnostic criteria and reported heterogeneous outcomes (Table 2), all were from hospital-based clinics where it may be assumed that the diagnosing physician was a neurologist. The frequency of CDH as a percentage of all headache patients ranged from 23% to 79% (mean 43%). The mean frequency of CM as a percentage of CDH cases was 46%, with the lowest value (4.7%) again from a Chinese study (54). In patients with CM, the frequency of MOH or medication overuse was 28–75% (mean 54%) (Table 2).

Limitations that should be considered when interpreting the above findings primarily relate to classification issues, including the evolving criteria for CM, inconsistent application of these criteria by researchers, and variation in the inclusion of medication overuse within the CM classification. Publication bias based on the reported prevalence is unlikely, but incomplete retrieval of records is possible, including for studies published in languages other than English. In addition, limited details were available for some studies that have been published only as abstracts. We excluded studies with obvious sources of bias, but women tended to be over-represented in population-based studies, while the frequency of headache subtypes in specialist clinics is likely to differ from that in general practice. Regarding classification, we included studies that reported CM with or without medication overuse, including studies conducted using earlier diagnostic criteria and terminology where these could be appropriately reclassified as CM. A similar approach was used by Natoli et al. in their systematic review of global CM prevalence (10). The exclusion of patients with medication overuse is likely to underestimate the CM prevalence as CM is commonly associated with medication overuse, which may also change the treatment approach (1,9,81,82). These factors have led to proposals for simplified CM diagnostic criteria that do not preclude medication overuse (1), an approach already used by many specialists. Several studies in the current review included CM patients with medication overuse, regardless of the stated diagnostic criteria.

Methodological issues notwithstanding, our findings suggest that Asia may have a lower prevalence of CM and CDH than the international average. Stovner et al. estimated the global prevalence of CDH to be 3.4%, although with regional variation (83). This estimate is consistent with the CDH prevalence in Singapore and Taiwan (3.2–3.9%) but higher than estimates for China, Korea and Malaysia (1.0–2.4%); the prevalence in India was intermediate (2.9%). The prevalence of CM in two studies from Taiwan using Silberstein-Lipton criteria was 1.0% and 1.7%, which is consistent with United States (US) studies that reported a prevalence of 0.9% to 1.3% using similar criteria (84–86), while higher estimates have been obtained in Germany (2.0%), Spain (2.4%) and Brazil (5.0%) (9,87,88). We also derived an estimate of 0.6% for the CM prevalence in a Malaysian study (25). The systematic review by Natoli et al. found that the global prevalence of CM ranged from 0.9% to 5.1% using Silberstein-Lipton criteria, but from 0 to 0.7% using ICHD-II criteria (10). Using strictly applied ICHD-II criteria, the German DMKG study reported a six-month CM prevalence of 0.09%, increasing to 0.28% if patients with medication overuse were included (81).

Variation between countries in the prevalence of CM and CDH may reflect genuine epidemiological differences or factors such as race-related genetic differences, socioeconomic status, diet, and symptom reporting (11,26). In the US, the migraine prevalence in Asian-Americans was 50–60% that of Caucasians (11). Ethnic differences in pain perception and response have been identified in clinical trials, although physiological pain thresholds do not show consistent variation (89). In India, various environmental and social factors that may contribute to a high prevalence of migraine have been identified (90). Healthcare system factors, such as access to medication and specialist consultations, are also relevant. The potential contribution of these factors to the low CDH prevalence reported by Yu et al. in mainland China is unclear (21). In Singapore, a lower proportion of Chinese versus non-Chinese individuals had CDH, and Chinese respondents were significantly less likely to seek medical attention for headache (26). Furthermore, it has been proposed that headache is considered an emotional problem or weakness in Chinese culture, which could lead to under-reporting of symptoms by men in particular (21,28). However, these factors do not explain the three-fold lower prevalence of CDH in mainland China (21) compared with Taiwan and with Chinese individuals in Singapore (26–28). The sociodemographic setting of the mainland China study may differ considerably from that of Singapore or Taipei (e.g. 69% of subjects in China lived in rural areas and one-third had no more than a primary school education); nevertheless, female gender and age >50 were the only factors independently associated with CDH in mainland China (21). Variation in the recognition of, or willingness to report, headache symptoms may be another factor. In Taiwan, 62% of participants reported any headache during the previous year (27), whereas 28% of those in mainland China reported headache "not related to flu, hangover, cold, or head injury" at initial screening (21); for comparison, 75% of respondents in Georgia reported headache at least once in the previous year and 58% had headache "not related to flu, hangover, cold, or head injury" (91). In contrast, the migraine prevalence was very similar in Taiwan (9.7%) and mainland China (9.3%), and the Chinese study reported a high frequency of MOH as a percentage of CDH (60%) (12,21), raising the possibility that mild headaches were under-reported in China. Alternatively, we note the suggestion by Yu et al. that the low CDH prevalence in China, compared to Taiwan, may reflect low usage of analgesics and triptans, with a consequent reduction in MOH (21). The MOH prevalence was indeed lower in China than Taiwan (0.6% versus 1.1%), whereas the MOH frequency as a percentage of CDH was higher in China (60% versus 34%) (21,27). These explanations may be compatible, as the low CDH prevalence could reflect both an overall reduction in MOH and under-reporting of mild headaches, with the latter tending to increase the apparent MOH frequency.

The disability associated with chronic headache disorders, especially migraine, is increasingly well documented. Although disease burden was not the focus of the current review, population-based studies from China, Korea and Taiwan identified severe functional impairment in about 30% to 45% of individuals with CDH (21,24,28). CDH was associated with depression in older individuals from Taiwan (28,92), and both CM and CTTH were associated with psychiatric comorbidity in clinic studies (Table 2). A recent Taiwanese study found that CM patients had significantly greater migraine-related disability, worse quality of life, higher healthcare resource use and greater productivity loss than those with episodic migraine (93), which is consistent with international findings (48,94–97). Lack of awareness among healthcare providers and patients remains a barrier to the effective management of headache disorders. In the KINDS study, more than 70% of participants with CDH had moderate or severe functional impairment, but only 23% had sought treatment for headache in the previous year (28). Only 33% of respondents with CM were using preventive medications in a US study (94), despite evidence of efficacy from placebo-controlled trials for topiramate and onabotulinumtoxinA (98–101), together with limited data for other drugs (102–105).

This systematic review highlights both the limited population-based prevalence data on CM and CDH in the Asia-Pacific region and the positive steps being taken to remedy this situation, with studies incorporating CDH completed or ongoing in China, India and Pakistan. The available data suggest that the regional prevalence of CDH may be lower than the global average, with the exception of Singapore and Taiwan. The CM prevalence in Taiwan was consistent with international estimates. Given the population of Asia, even conservative prevalence estimates for CM imply that tens of millions of individuals are affected by this disabling condition. The total annual cost of CDH in China was estimated to be USD 9.3 billion (21), while the economic and societal burden of CM in Asia remains to be established. Internationally, economic studies have documented high costs associated with CM and MOH, indicating a need to improve headache management and prevent migraine progression (106,107).

Clinical implications

- The prevalence of chronic daily headache (CDH) in Asia may be lower than the global average; however, population-based data for chronic migraine (CM) remain scarce and classification criteria vary.
- In population studies, the CDH prevalence ranged from 1.0% to 3.9% and the CM prevalence from 0.6% to 1.7%.
- In clinic studies, CDH accounted for a median 37% of headache patients, while the median proportion of CDH patients who had CM was 52%.
- Applying the lowest prevalence estimates to the Asia-Pacific population suggests that CDH and CM affect at least 38 million and 23 million individuals, respectively, in the region.
- Regional variation in the prevalence of CDH may be influenced by cultural, environmental or healthcare system factors.

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Conflict of interest

The following apply to the previous three years.

SJW is a member of the governing board of the Taiwan Headache Society. He has received consulting fees from Allergan, Eli Lilly and Company (Taiwan), Merck Sharp & Dohme (Taiwan) and Pfizer; payments for lectures or for serving as a moderator from Allergan, Eli Lilly and Company (Taiwan), Pfizer (Taiwan), Merck Sharp & Dohme (Taiwan), Boehringer Ingelheim (Taiwan) and GlaxoSmithKline (Taiwan); and has been awarded grants from Allergan and Wyeth.

RJS has received consulting fees or honoraria from Allergan, and Allergan provided support for travel to meetings. He has also served as a consultant to Janssen-Cilag and Pfizer, and provided expert testimony for Allergan in Australia. In addition, he has received payments for lectures or service on speaker bureaus from Allergan, Janssen-Cilag, Merck Sharp & Dohme and Pfizer.

KR has received consulting fees or honoraria from Allergan, along with support for travel to meetings. He has also received payments for lectures from Janssen-Cilag, Merck Sharp & Dohme (India) and Cipla.

HCS has received fees or honoraria from Allergan and Moleac, travel support from Allergan, and payment for lectures from Janssen-Cilag and Pfizer.

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