

THE BURDEN OF HEADACHE DISORDERS

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THE GLOBAL BURDEN OF DISEASE STUDY

Health priorities must be set in every country around the world. Decision makers need the best available evidence on which to base their decisions. For many years, concerns about quality and comparability of data have been a barrier to providing such evidence. Policy-makers, their public health partners and consumers alike seek rational guides to set priorities for health, to evaluate the outcomes of interventions and health-care reforms, and to monitor changes over time at local, national, regional, or global levels.

An international effort aimed at improving the health of populations, quantifying the burden of disease and injury in terms of risk factors and broader health determinants and the likely burden in the future, became a priority for the World Health Organization (WHO).

In order to begin, it was necessary systematically to identify and assemble all the relevant evidence currently available, assess its quality, limitations and uncertainty and, using the best possible methodology, develop initial estimates to assist decision makers, noting any uncertainty these contain.

Estimation of need for health services, their costs and effectiveness, require indicators that go beyond measures of death rates or diagnosis alone, and include the "functioning" of people. To respond to this, in 1990 the *Global Burden of Disease* (GBD) study was carried out by the World Bank in collaboration with WHO and the Harvard School of Public Health. The GBD study was designed to address three main goals:

- 1 to provide information on non-fatal health outcomes for debates on international health policy which had until then focused on mortality
- 2 to develop unbiased epidemiological assessments for major disorders, and
- 3 to quantify the burden of disease with a measure that could also be used for cost-effectiveness analysis.

As well as generating the most comprehensive and consistent set of estimates of mortality and morbidity by age, sex and region ever produced (Leonardi, 2003), the GBD also introduced a new metric – disability adjusted life year (DALY) – to quantify the burden of disease (Murray *et al*, 2001). The DALY is a health-gap measure, which combines information on the impact of premature death and of disability and other non-fatal health outcomes. One DALY can be thought of as one lost year of "healthy" life and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability. For a review of the development of DALYs and recent advances in the measurement of burden of disease, see Murray and Lopez (1996).

WHO is now undertaking a new assessment of the Global Burden of Disease, the GBD 2000.

The specific objectives for GBD 2000 are similar to the original objectives:

- 1 to develop internally consistent estimates of mortality from 135 major causes of death, disaggregated by age and sex, for the world and major geographic regions;
- 2 to develop internally consistent estimates of the incidence, prevalence, duration and case-fatality for over 500 sequelae resulting from the above causes;
- 3 to describe and value the health states associated with these sequelae of diseases and injuries;
- 4 to quantify the burden of premature mortality and disability by age, sex and region for 135 major causes or groups of causes;
- 5 to analyze the contribution to this burden of major physiological, behavioural, and social risk factors by age, sex and region;
- 6 to develop alternative projection scenarios of mortality and non-fatal health outcomes over the next 30 years, disaggregated by cause, age, sex and region.

One specific variety of burden is the *health* burden. This has traditionally been measured in national and international health statistics only in terms of incidence/prevalence and mortality. While these indicators are well suited to acute diseases that either cause death or result in full recovery, their use for chronic and disabling diseases poses serious limitations. This is particularly true for mental and neurological disorders, which more often cause disability than premature death. In the original estimates, developed for GBD 1990, mental and neurological disorders accounted for 10.5% of the total DALYs lost due to all diseases and injuries. This figure demonstrated for the first time the high burden due to these disorders. The estimate for GBD 2000 is 12.3% of DALYs. From an analysis of trends, it is evident that this burden will increase rapidly in the future. Projections indicate that the burden of neurological and psychiatric conditions it will increase up to 15% in the year 2020 (Murray and Lopez, 1996).

Methodology, and summary measures of population health

Disability Adjusted Life Years and Years of Life Lost

The *Global Burden of Disease* (GBD) study has attracted the attention of policy makers and public health experts alike because it provides a common measure for evaluating and priority-setting across a wide range of health problems. The measure, the Disability Adjusted Life Year (DALY), has added disability to mortality in the evaluation of the burden of disease. Non-communicable diseases, which cause much more disability than mortality, were invisible in traditional estimates of burden that relied on mortality based measures alone. The DALY is a health-gap measure that combines information on the impact of premature death with disability and other non-fatal health outcomes, based on a universal measure of time, *life years*. This provides a trans-professional currency to determine priorities for health and human services and to evaluate their effectiveness (Murray *et al*, 2001; WHO, 2001b; Leonardi, 2003).

The appeal of the DALY is that it provides a potentially useful tool for health-policy purposes: the transformation of epidemiological data into quantified burden and its subsequent use in decisions regarding resource allocation for health care. GBD 1990 examined epidemiological and demographic indicators, such as prevalence and incidence rates, life expectancy, probabilities of death in different age groups, disability-adjusted life expectancy, years of life lost (YLLs) because of premature death and years of life lived with disability (YLDs).

Years Lived with Disability

Taking the *disability component* of burden alone, GBD 2000's estimates show that mental and neurological conditions account for 30.8% of all years lived with disability (YLDs) in the world. Six neuropsychiatric conditions figured in the top twenty causes of YLDs in the world: unipolar depressive disorders, alcohol use disorders, schizophrenia, bipolar affective disorder, Alzheimer's and other dementias, and migraine (WHO, 2001b).

However, because of the lack of broad epidemiological studies, some uncertainty exists in GBD 2000 estimates of DALYs and YLDs, particularly in different regions of the world and in variation of severity distributions. Limitations include those of comparing self-report instruments across populations, generalizing from surveys in subpopulations to broader population groups, and classifying severity of disabling symptoms.

Despite this variability and uncertainty in epidemiological data, it has been clearly shown that the disability caused by mental and neurological disorders is high in all regions of the world, even in developing countries with a large burden of communicable, maternal, perinatal and nutritional conditions. For example, neuropsychiatric disorders cause 17.6% of all YLDs in Africa.

These disorders are not the exclusive preserve of any special group; they are truly universal. Mental and neurological disorders are found in people of all regions, all countries and all societies. They are present in women and men at all stages of the life course. They are present among the rich and poor, and among people living in urban and rural areas (WHO, 2001b).

YLD estimation

Estimating YLDs is the most difficult component of burden of disease analysis. Various methods have been developed to reconcile often fragmented and partial estimates available from different studies. A specific software tool, DisMod, has been developed and used to assist in the development of internally consistent estimates (Murray *et al*, 2001).

The basic formula for calculating YLDs is:

$$\mathbf{YLD = I \times DW \times L}$$

where I is the number of incident cases in the reference period, DW is the disability weight (in the range 0-1) and L is the average duration of disability measured in years.

The data used to estimate YLDs include those relating to disability incidence, disability duration, age of onset, and distribution by severity class. All must be disaggregated by age and sex. In turn, further analysis requires estimates of remission, case-fatality rates or relative risks, by age and sex. The key to estimation of YLD is the development of comprehensive and consistent estimates for incidence and point prevalence. A wide range of data sources are used (Murray *et al*, 2001).

(1) Disease registers

Disease registers record new cases of disease based on reports by physicians and/or laboratories. Registers are common in infectious diseases (*eg*, tuberculosis), cancer, congenital anomalies, a number of relatively rare diseases (*eg*, cystic fibrosis and thalassaemia), and sometimes conditions such as diabetes, schizophrenia and epilepsy.

(2) Population surveys

In general, measurement surveys contribute more to YLD calculations than self-reported interview surveys. Interview surveys such as the National Health Interview Survey in the USA provide self-reported information on disabilities, impairments and diseases. The challenges of using self-report data include limited comparability across countries, difficulty attributing impairment to underlying causes, and differences between the disease concept the “general public” has and the “medically” defined disease category.

(3) Epidemiological studies

Some of the most useful sources of information for GBD 2000 are population-based epidemiological studies. Particularly, longitudinal studies of the natural history of a disease can provide a wealth of information on incidence, average duration, levels of severity, remission and case fatality. Unfortunately, such studies are rare because they are very costly to undertake. As they are often conducted in a particular region or town, expertise is required to extrapolate results to a larger population.

(4) Health facility data

Facility based data – unless the coverage of the health system is universal – tend to be based on biased samples of the disability present in the community. However, examples of conditions that can be accurately estimated from hospital data include: perinatal and maternal conditions, meningitis, stroke, myocardial infarction, surgical conditions and the more serious injuries.

For the evaluation of the **burden of migraine** for GBD 2000, a specific methodology and evaluation of data sources have been made, as reported in Appendix 1. The disability weight for migraine has been calculated for GBD 2000 for the first time.

THE BURDEN OF HEADACHE DISORDERS

The World Health Report 2001 and the burden of migraine

In 2001 WHO published the *World Health Report - Mental Health: New Understanding, New Hope* (WHO, 2001b). The Report, whilst highlighting the burden of neurological and psychiatric disorders on health, identified migraine amongst the world’s top 20 leading causes of YLDs (table 1), with an impact that extends far beyond the suffering individual to the family and community. It did so following the collection of information on migraine from around the world.

Migraine, defined according to IHS criteria (Headache Classification Committee of the International Headache Society, 1988), is estimated to account for 2.0% of YLDs in women of all ages. In both sexes of all ages, migraine is responsible for 1.4% of total years of life lived with a disability (table 1). This result is anticipated to have far-reaching impact: on individual sufferers, their care-givers, family and colleagues, and on society itself. WHO’s recognition of migraine as a major global disorder is a major step forward in relieving the burden of headache world-wide.

Table 1a. Leading causes of years of life lived with disability (YLDs)

Females, all ages	% total
1. Unipolar depressive disorders	14.0
2. Iron-deficiency anaemia	4.9
3. Hearing loss, adult onset	4.2
4. Osteoarthritis	3.5
5. Chronic obstructive pulmonary disease	2.9
6. Schizophrenia	2.7
7. Bipolar affective disorder	2.4
8. Falls	2.3
9. Alzheimer's and other dementias	2.2
10. Obstructed labour	2.1
11. Cataracts	2.0
12. Migraine	2.0
13. Congenital abnormalities	1.9
14. Asthma	1.8
15. Perinatal conditions	1.8
16. Chlamydia	1.8
17. Cerebrovascular disease	1.8
18. Protein-energy malnutrition	1.6
19. Abortion	1.6
20. Panic disorder	1.6

Table 1b. Leading causes of years of life lived with disability (YLDs)

Both sexes, all ages	% total
1. Unipolar depressive disorders	11.9
2. Hearing loss, adult onset	4.6
3. Iron-deficiency anaemia	4.5
4. Chronic obstructive pulmonary disease	3.3
5. Alcohol use disorders	3.1
6. Osteoarthritis	3.0
7. Schizophrenia	2.8
8. Falls	2.8
9. Bipolar affective disorder	2.5
10. Asthma	2.1
11. Congenital abnormalities	2.1
12. Perinatal conditions	2.0
13. Alzheimer's and other dementias	2.0
14. Cataracts	1.9
15. Road traffic accidents	1.8
16. Protein-energy malnutrition	1.7
17. Cerebrovascular disease	1.7
18. HIV/AIDS	1.5
19. Migraine	1.4
20. Diabetes mellitus	1.4

The preparation of materials for GBD 2000 allows a consistent review of available epidemiological studies.

Migraine incidence

There are few studies of migraine incidence. Though cross-sectional data can also be used to derive incidence estimates, the incidence of migraine is best evaluated

in longitudinal studies (Scher *et al*, 1999; Lipton *et al*, 2003). Stewart *et al* (1991) estimated migraine incidence using reported age of onset from a prevalence study, whose limitations are inherent in false recall of age of migraine onset, failure to report real symptoms or the reporting of symptoms not actually experienced. In males, the incidence of migraine with aura peaked around 5 years of age at 6.6/1000 person-years; the peak for migraine without aura was 10/1000 person-years between 10 and 11 years. New cases of migraine were uncommon in men in their twenties. In females, the incidence of migraine with aura peaked between ages 12 and 13 (14.1/1000 person-years); migraine without aura peaked between ages 14 and 17 (18.9/1000 person-years). Thus, migraine begins earlier in males than in females and migraine with aura begins earlier than does migraine without aura.

Stang *et al* (1992) used the linked medical records system in Olmstead County, Minnesota, to identify migraine sufferers who sought medical care for headaches. Their incidence was lower (for people under 30 years of age, about 1.5-2 per 1000 person-years in men and about 3-6 per 1000 person-years in women), probably because many people with migraine do not consult doctors or receive a medical diagnosis (Lipton *et al*, 2003). As well, peaks were later than those identified by Stewart *et al* (1991), because medical diagnosis may occur long after the age of onset.

Migraine prevalence

In the past decade, several epidemiological studies of migraine have published estimates of migraine prevalence with wide variations (Henry *et al*, 1992; Goebel *et al*, 1994; Rasmussen, 1995; Launer *et al*, 1999; Scher *et al*, 1999; Lipton *et al*, 2001a; Lipton *et al*, 2001b; Manzoni and Torelli, 2003; Lipton *et al*, 2003). Migraine prevalence studies pose some methodological challenges. One of the main obstacles has been case definitions, a problem addressed in 1988 by the IHS classification and diagnostic criteria referred to earlier. In 1995, a meta-analysis of 24 studies (Stewart *et al*, 1995) included only five that used IHS diagnostic criteria. This meta-analysis revealed that case definition, along with age and gender distribution of the study samples, explained 70% of the variation in migraine prevalence among studies. In a second meta-analysis confined to studies using the IHS criteria (Scher *et al*, 1999), gender-specific models (females and males were modelled separately) found age and geography accounted for much of the variation in prevalence.

Because case definition so powerfully influences prevalence estimates, we focused on studies that used the IHS 1988 criteria for migraine.

Age, gender and migraine prevalence

The analysis of migraine prevalence in various sociodemographic groups helps to clarify the distribution of the illness. Before puberty, migraine prevalence is higher in boys than in girls; as adolescence approaches, incidence and prevalence increase more rapidly in girls than in boys (Bille, 1962; Bille 1989; Sillanpaa, 1994). A meta-analytical summary of prevalence studies shows prevalence increasing throughout childhood and early adult life until approximately age 40, after which it declines (Rasmussen, 1995; Manzoni and Torelli, 2003). These dramatic age effects account for some of the variation in prevalence estimates seen in different studies. The gap between peak incidence in adolescence and peak prevalence in middle life indicates that migraine is a condition of long duration.

The female to male migraine prevalence ratio also varies with age (Rasmussen, 1995; Manzoni and Torelli, 2003; Lipton *et al*, 2003). The onset of hormonal

changes associated with menses may contribute to this variation (Silberstein and Merriam, 1997). However, hormonal factors cannot be the sole cause; differences persist past age 70, well beyond the time that cyclical hormonal changes can be considered a factor (Stang and Osterhaus, 1993; Lipton *et al*, 2003).

Race, geography and migraine prevalence

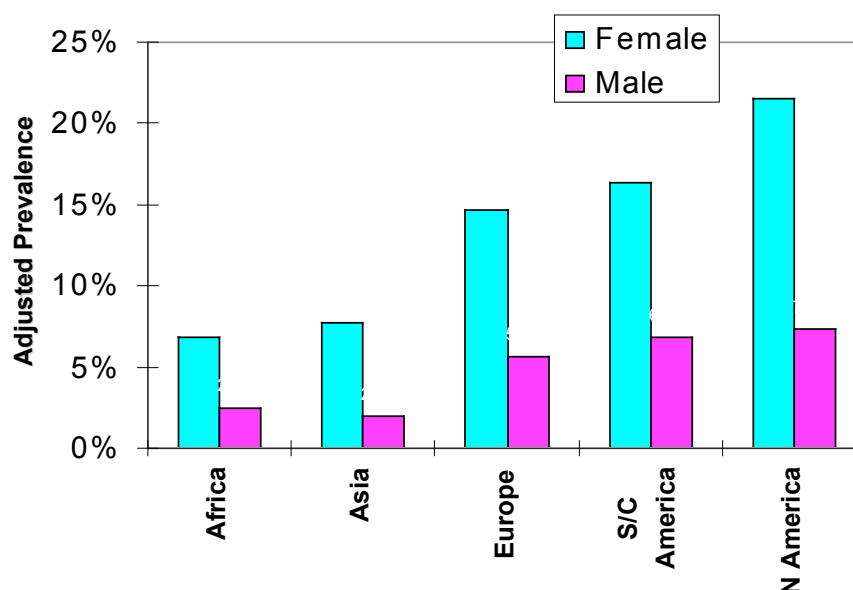
In recent studies in Western Europe and North America, (Rasmussen *et al*, 1991; Stewart *et al*, 1991; Stewart *et al*, 1992; Stang *et al*, 1994; Rasmussen, 1995; Lipton *et al*, 2001a; Rasmussen, 2001; Manzoni and Torelli, 2003; Lipton *et al*, 2003), prevalence rates of IHS-defined migraine are relatively consistent, varying from 4% to 9.5% in men and from 11.2% to 25% in women (Manzoni and Torelli, 2003).

In the greater Copenhagen study, the lifetime prevalence of migraine in men was 8% (against 93% for any kind of headache and 69% for tension-type headache (Rasmussen *et al*, 1991). For women, the lifetime prevalence of migraine was 25% (99% for all headache, 88% for tension-type headache. The 1-year period-prevalences of migraine were 6% in men and 16% in women.

In the United States, the first American Migraine Study in 1989 used questionnaires mailed to 15,000 households selected to be representative of the US population (Stewart *et al*, 1992). Migraine diagnoses were based on the IHS criteria but headache duration and the lifetime number of previous migraine attacks were not considered. Migraine prevalence was 6% for men and 17.6% for women, in the same range as the estimates of Rasmussen *et al* (1991). A follow-up study, the American Migraine Study II, used virtually identical methodology 10 years later and demonstrated very similar prevalence estimates (Lipton *et al*, 2001a).

In France, Henry *et al* (1992) reported that the prevalence of IHS-defined migraine was 4.0% in men and 11.9% in women. In this study, diagnoses were based on lay interviews using a validated algorithm. For the group that included "borderline migraine" along with more definite cases, prevalence estimates were 6.1% for men and 17.6% for women, remarkably close to the findings of Stewart *et al* (1991).

Adjusted Prevalence of Migraine by Geographic Area



Migraine prevalence varies by race and geography. In the US it is highest in Caucasians, intermediate in African Americans and lowest in Asian Americans (Stang *et al*, 1994). A meta-analysis of prevalence studies suggests that migraine is most common in North and South America, similar in Europe, but lower in Africa and often lowest in studies from Asia (Rasmussen, 1995) (see [figure](#), from Lipton *et al*, 2003). Whilst the possibility of reporting bias in these findings cannot be excluded, the data suggest that race-related differences in genetic risk may contribute.

Tekle Haimanot (2003) reported that "literature on prevalence and health burden in Africa is scanty". The clinical features of migraine in the African are similar to those described among Caucasian, although Tekle Haimanot concluded that migraine with aura is relatively rare in the African. All studies report female preponderance ranging from 1.3:1 to 2.8:1. However, epidemiological surveys in Nigeria, Ethiopia, Tanzania and Zimbabwe produced prevalence rates of 3-6.9% among adults. Because of the shorter life expectancy in African countries, prevalence studies may be skewed by comparatively young populations.

Studies conducted in Asian countries – Hong Kong, Malaysia and Japan – also show lower prevalences than European or North American studies (Wong *et al*, 1995; Alders *et al*, 1996; Sakai and Igarashi, 1997).

In Latin America, the magnitude of the disease is difficult to assess because there are few high quality studies. The problem is compounded in areas where large segments of the population do not have access to doctors and where facilities for diagnosis are not available. Nevertheless, recent studies from Brazil, Chile and Ecuador show that headache is highly prevalent in these countries and imposes a large economic burden on health-care systems which are already stretched to their limits. Low socioeconomic status of large segments of the population, genetic susceptibility, dietary habits and environmental conditions may all

contribute. The last may be an important risk factor for headache, particularly for people living at high altitudes in the Andean region (Jaillard *et al*, 1997). As in developed countries, migraine and tension-type headache are the most common subtypes of headache disorder in South America (Cruz *et al*, 1985; Bigal *et al*, 2000), although some studies have shown that parasitic diseases of the nervous system such as neurocysticercosis and Chagas' disease also contribute to the high prevalence of chronic headache in these areas (Cruz *et al*, 1995; Dos Santos *et al*, 1999).

Tension-type headache

As WHO (2000) reported in its publication *Headache disorders and public health*, tension-type headache is the most widespread of headache disorders.

Episodic tension-type headache (ETTH) – “normal” or “ordinary” headache – is less disabling but much more prevalent (up to 80%) than migraine (Rasmussen *et al*, 1991; Steiner and Fontebasso, 2002). Like migraine, ETTH occurs in attack-like episodes, mostly lasting a few hours, with variable frequency. Overall, one-year prevalence may exceed 60% although it is apparently lower in some countries, so that prevalence estimates vary over a wide range: from 1.3% to 65% in men and 2.7% to 86% in women. Nine studies have used IHS 1988 diagnostic criteria but, even among these studies, prevalence estimates vary widely (Schwartz *et al*, 1998). This may reflect reporting bias: most of those with tension-type headache have mild and infrequent attacks (once monthly or less), whilst a minority experience headache episodes more often (Steiner and Fontebasso, 2002). Of this latter group, a small but significant number, at least in Western populations, have daily or near-daily attacks (*chronic tension-type headache* [CTTH]). These people may be substantially disabled as a result.

Prevalence studies

There are very few. In the Danish Glostrup population studies (Rasmussen *et al*, 1993), one of the most detailed epidemiological studies of headache, the 1-year prevalence of episodic tension-type headache was 63% (56% in men and 71% in women). The prevalence of chronic tension-type headache was 3% (2% in men and 5% in women). The gender difference (male-to-female ratio of 4:5) was statistically significant. Prevalence decreased with advancing age (Rasmussen *et al*, 1993).

A large population survey in the United States (Schwartz *et al*, 1998) of ETTH and CTTH defined by IHS 1988 criteria provided useful methodological and epidemiological information. The aims of this study included describing the demographic factors associated with prevalence and estimating the societal impact of ETTH and CTTH by assessing attack frequency, pain intensity and resultant disability. The 1-year period prevalences were 38.3% for ETTH and 2.2% for CTTH. The prevalence of ETTH peaked in the fourth decade of life in both men and women, and then declined thereafter. A substantial majority of people with ETTH (over 70%) experienced headaches 30 or fewer times per year. These data are consistent with other studies, suggesting that ETTH most often occurs once or twice monthly (Sachs *et al*, 1985; Srikiatkhachorn, 1991; Pryse-Phillips *et al*, 1992; Merikangas *et al*, 1993; Pereira Monteiro *et al*, 1994; Mitsikostas *et al*, 1994; Abu-Arefeh and Russell, 1994; Wong *et al*, 1995; Schwartz *et al*, 1998) whilst 3% or fewer of the general population have CTTH (table 2).

Table 2. Prevalence of chronic tension-type headache

Author	Country	Sample size	Prevalence%
Rasmussen <i>et al</i> , 1991	Denmark	740	3
Göbel <i>et al</i> , 1994	Germany	4061	1
Wong <i>et al</i> , 1995	Hong Kong	7356	0.1
Tekle Haimanot, 1995	Ethiopia	15000	1.7
Scher <i>et al</i> , 1998	USA	13343	2.2
Castillo <i>et al</i> , 1999	Spain	1883	2.2

With a significant but modest impact on most individuals, the aggregate societal impact of ETTH is high because of its prevalence. CTTH, although much less common, produces high individual burden and, through that, contributes perhaps an equal impact on society. Overall, tension-type headache has a very significant impact on individuals and society, accounting for many lost workdays and an even larger number of days at work, home or school with reduced working effectiveness (Rasmussen *et al*, 1993; Göbel *et al*, 1994; Schwartz *et al*, 1998; WHO, 2000; Steiner and Fontebasso, 2002).

Other chronic daily headaches including medication-overuse headache

In Western populations, daily or near-daily headache is at epidemic levels, affecting up to 5% of some populations. Whilst CTTH may account for many cases (see above), chronic overuse of headache drugs may be the cause of half of this phenomenon (Castillo *et al*, 1999; Steiner and Fontebasso, 2002). So-called *medication-overuse headache* (MOH) has become a major public-health problem.

All simple analgesics as well as non-steroidal anti-inflammatory drugs, ergotamine and triptans are implicated. What constitutes medication overuse in individual cases is not clear, but regular frequent intake of low doses, especially on a daily basis, carries greater risk than larger doses less frequently. In fact many people with MOH use large quantities of drug: 35 doses a week on average in one study, and up to six different agents.

MOH does not develop when analgesics are regularly taken for another indication, such as chronic backache or rheumatic disease. Headache (migraine or tension-type) must be there to begin with as the underlying disorder for which medication is taken with a frequency that, typically, increases over time (Steiner and Fontebasso, 2002). MOH should, therefore, be regarded as an avoidable consequence of headache mistreatment. The headache is oppressive, and because it is usually daily it is a disabling condition, contributing significantly to societal burden as well as being heavily burdensome on those affected.

With a prevalence of 2-3% of adult populations in Western Europe and North America, MOH affects more women than men (up to 5:1) and some children. MOH has not been well investigated in developing countries, but it may be prevalent where people self-medicate for common diseases and analgesics can be obtained without prescription.

CONCLUSIONS

Headache disorders are common and in many cases lifelong conditions associated

with recognisable burdens that include personal suffering, disability and impaired quality of life. It is right to consider the impact of these disorders from the humanistic perspective of suffering rather than limit the discussion to one focused on cost. With the publication of its *World Health Report 2001*, WHO (2001b) recognises them as a high-priority public health problem. As such they deserve attention, but everywhere receive low priority in the queue for health care.

Using WHO's methodology for measuring burden of disease in Disability-Adjusted Life Years (DALYs), headache disorders can be evaluated and placed correctly in context with other neurological disorders and chronic illnesses. Migraine has been placed 19th amongst all causes of years lived with disability (YLDs), but accounts for only part of the burden attributable to headache disorders and probably contributes less than half of the total. In order to know the full impact of headache disorders, further work must be conducted around the world to establish their epidemiology and the clinical, economic and humanistic burdens they impose. It is hoped that further collaboration with scientific and lay NGOs such as World Headache Alliance and International Headache Society will assist WHO to reduce the burden of headache world-wide.

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APPENDIX 1

Methodology: the systematic review protocol

Objectives

To make a systematic review of all published and available non-published papers describing valid population studies on headache disorders (migraine and tension-type headache¹) so as to provide the most complete data set on epidemiology and burden of migraine, tension-type headache and other headache disorders world-wide.

Criteria for inclusion

- Population-based studies (usually >1000 people) that used IHS 1988 diagnostic criteria or reasonable modifications thereof)
- Hospital-based studies if the sample is large
- Methodology of the study is explicit and the sampling method is random or nationally/regionally representative
- If data available: incidence, prevalence, remission rate, case fatality rate, natural history, age, sex, region, country.

Search strategy and data sources

- Databases: Medline, Pre-medline, Embase, Cinhal
- All published articles from all regions of the world, in English, that matched the above criteria; MESH² and key words³ were defined
- From these articles, selection according to our set criteria to ensure that we were conducting our inquiry not driven by the data
- Unpublished papers on the subject from IHS journals, WHA materials and bulletin, paper from the WHO/IHS working group
- Clinical expert advice
- Expert advice from Italian National Neurological Institute and WHO library: to verify if data are missing in the research.

¹ The IHS 1988 criteria for chronic tension-type headache (CTTH) do not exclude medication-overuse headache. The selected papers on TTH do not clearly identify or separate those headaches caused by medication overuse (MOH), resulting in uncertainties in attributing prevalence and burden to one rather than the other of CTTH and MOH.

² MESH: expand headache, migraine, tension-type headache, chronic daily headache (mortality/epidemiology); expand Africa, China, India, Europe, Eastern Europe, Japan, America; focus studies, epidemiological studies, burden of disease.

³ Key words: migraine, tension-type headache, epidemiology, mortality, disability, burden of disease.