ABSTRACT

The development of the diagnostic and classification criteria for headache disorders from the International Headache Society has benefited not only practicing headache specialists but also epidemiologists. We now have a wealth of data from international epidemiological studies on the prevalence and cost of migraine and other headache disorders. The data reveal the significant impact these disorders have on society in terms of direct and indirect costs. Given the extremely high prevalence of migraine and tension-type headache, research efforts should focus on these 2 headache disorders; greater emphasis should be placed on diagnosis during medical training, and neurological pain treatment centers should be established. This paper reviews the results of many international studies to offer a global perspective on migraine and headache disorders.

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Epidemiological studies are the basis for understanding diverse syndromes such as headache disorders and for developing new and effective treatments. The prerequisite for the reliability and validity of epidemiological studies is an exact classification of headache syndromes. The first classification that has been accepted worldwide was initiated by the International Headache Society (IHS) and published in 1988. The World Health Organization has published a separate manual as a headache classification supplement to the Tenth Revision of the International Classification of Diseases (ICD-10). The IHS classification criteria are of inestimable value for research into headache syndromes and represent a crucial milestone in the scientific history of headache research. Interestingly, there is no other group of neurological disorders that can be diagnosed with the same degree of precision. Without these criteria for classification, the advances in headache therapy in recent years would not have been possible.

Epidemiological studies are based on different population sources. These sources may be defined sections of the population, such as a certain city or rural area. The patients may come from general practice or from a specialized headache clinic. Ideally, however, a sample that is representative of the population as a whole will be selected so conclusions that are valid for the entire population can be drawn.

HEADACHE PREVALENCE WORLDWIDE

Some of the early headache epidemiology studies in
Denmark in which the IHS classification method was used have emerged as the “gold standard” for other studies worldwide.\textsuperscript{4,5} Several international studies have ascertained the lifetime prevalence of headache, and the results show that in men, the prevalence ranges from 60% to 93%. In women, the lifetime prevalence is higher, ranging from 82% to 99% (Table 1).\textsuperscript{4,5} These data clearly show that headache is a fact of life, with the vast majority of people experiencing headaches at least once in their lifetime.

The 1-year prevalence rates are more varied among several countries, ranging from 40% to 91% for women and 19% to 84% for men. However, the data reveal that the vast majority of people suffer from headache at some time within a 1-year period.\textsuperscript{7,10-15}

**HEADACHE AND MIGRAINE PREVALENCE IN CHILDREN**

Numerous studies have investigated the prevalence of headache and migraine in children. In one study, headache occurred in 4% of 3-year-olds. By the age of 5, as many as 20% of children had headaches, and 47% of children between the ages of 6 and 7 reported that they had suffered from headaches. In the 6- to 7-year-old group, the prevalence of migraine was 3.2%. Headaches occurred in 57% of children between the ages of 7 and 15, by which time migraine prevalence almost reached the adult rate of around 10%.\textsuperscript{16}

It is interesting to note that the studies have shown a marked increase in migraine prevalence during the last several decades. In 1974, migraine attacks occurred in 2% of boys and 2% of girls aged 6 or younger. In 1992, migraine prevalence in this age group rose to 6.3% in boys and 5% in girls—a threefold increase.\textsuperscript{16}

We investigated the 1-year prevalence of headache among children in various school classes in Germany and found an interesting correlation between headache prevalence and the type of school. Headaches were observed to be most frequent in remedial and elementary schools, the lowest school levels in Germany (42% and 45%, respectively) but the prevalence declined to 24% by grammar school, the highest school level in Germany.\textsuperscript{17}

**MIGRAINE PREVALENCE WORLDWIDE**

The lifetime prevalence of migraine has been shown to be consistent across countries (Table 1), ranging from 6% to 12% in men and 15% to 25% in women.\textsuperscript{4,5,7,9,11,18-20} Studies of 1-year prevalence by age have shown that the maximum prevalence occurs between the ages of 30 and 50 in both men and women, and that the 1-year prevalence in this age range is distinctly higher in women than in men. It is often assumed that migraine prevalence decreases after the age of 50 or 60. Instead, the data show that it can persist to the age of 70 or 80.\textsuperscript{21} So, although migraine is not fatal, it is a chronic, debilitating disease.

![Table 1. Worldwide Lifetime Prevalence of Headache Disorders (%)](image)
Migraine patients often suffer not only from their primary pain syndrome but also from associated disorders that frequently make treatment especially complicated and expensive. A recent study showed that migraine is very strongly associated with other disabling and potentially life-threatening disorders, including epilepsy, depression, anxiety states, myocardial infarction, and stroke.

EPIDEMIOLOGY OF OTHER HEADACHE DISORDERS

As with migraine and general headache, there is a consistent lifetime prevalence of tension-type headache (TTH) across several countries. In men the lifetime prevalence of TTH ranges from 14% to 69% and in women from 26% to 88% (Table 1). Thus, TTH is considerably more common than migraine but unlike migraine, no significant gender-related differences have been observed.

The data for cluster headache are not as current as they are for other primary headache disorders. However, various studies have indicated that the lifetime prevalence of cluster headache is between 0.005% and 2.4% (Table 1). It may therefore be assumed that 1 person in 1000 suffers from cluster headache.

Regarding secondary headaches, the most frequent type is “hangover headache,” with a lifetime prevalence of 72%. This is followed by fever-related headache (63%), especially in cases of colds, followed by headache accompanying metabolic disorders (22%), and headache associated with diseases of the nose and sinuses (15%). Substance-induced, vascular, and nonvascular intracranial headaches, as well as headache associated with disorders of the eye, neck, and ear have a lifetime prevalence of 1% to 3%. Thus, compared with the primary headache types, secondary headache has considerably less impact.

Our epidemiological study in Germany has shown that TTH is the most frequent headache, comprising 54% of all headache syndromes, and that migraine is responsible for 38% of all headache complaints. In other words, 92% of all headaches are attributable to only 2 types of headache disorders. Conversely, more than 163 types of headaches in the IHS classification account for only 8% of all headaches. Thus, the main research effort for the future should be devoted to TTH and migraine.

PATTERNS OF HEALTHCARE UTILIZATION BY MIGRAINEURS

Representative studies have shown that 16% of all migraineurs had consulted specialists in the previous year, and that 56% had frequently consulted general practitioners (GPs)/primary care physicians (PCPs). Forty-nine percent of migraineurs had taken medication in the previous year to treat their migraine. More than three times as many over-the-counter drugs as prescription medicines were taken. Emergency treatments were necessary for 19% of migraine patients, and 8% of migraine patients had undergone inpatient treatment for their headaches.

In a nationwide survey of migraine in Germany, we found that migraine is underdiagnosed. Nearly two thirds of patients who satisfied the IHS diagnostic criteria for migraine were not identified as migraine patients. Migraine was most often diagnosed by neurologists (35%), followed by internists (32%), GPs/PCPs (27%), anesthesiologists (18%), and orthopedists (16%). These findings suggest that training in headache diagnosis and therapy is deficient.

Additional surveys have shown that migraine is also undertreated. Data from western European countries on triptan use in migraine show that even in the countries with the highest consumption of triptans (Norway, Denmark, and Sweden), the dosage/capita/year is less than 0.5. By contrast, supplies for patients in Germany, Spain, Belgium, Austria, Italy, Greece, Ireland, and Portugal are below 0.1 dosage units/capita/year, despite comparable prevalence data. The European average is 0.12 dosage units/capita/year. So, we assume that many migraine patients who could...
benefit from treatment are not identified as migraine patients and are not receiving the level of pharmacotherapy that could benefit them. This leads to unnecessary individual suffering and substantial costs for affected individuals and society as a whole.

A Canadian study has shown that only one third of headache patients return after the first consultation, whereas 65% never return. Of these, 45% were satisfied with the treatment first recommended and did not require any further consultation. However, 17% said they did not come back because they could not tolerate the medicine. Thirty-eight percent indicated that they did not feel they were being taken seriously. Together, these data clearly indicate that migraine patients are not receiving adequate care under the existing healthcare systems in various countries around the world.

**Costs of Headaches**

Direct costs of migraine and headache disorders include those associated with diagnosis and direct medical treatment. Indirect costs arise from the inability to work and from premature death. Intangible costs stem from disease-related suffering and reduction in quality of life.

For migraine, in particular, the direct costs have been thoroughly investigated. Of each country’s respective total health service budget, England spent 0.1%, France spent 1%, and the Netherlands spent 0.3% on migraine. In France, that figure translates into an average of 150 Euro ($133) spent per migraine patient. Interestingly, only 10% of migraine patients are responsible for 70% of the total cost of migraine in France. The direct costs of migraine treatment are much higher in the United States, where $817 per migraineur per year is spent on direct treatment.

Inpatient treatments incur significant cost. Health insurance data from Germany show that of all chronic diseases, chronic pain disorders are the third most frequent reason for emergency treatment. Since 1995, the number of cases of inpatient treatment for chronic pain disorders has increased by 11% a year, reinforcing the urgent need to establish inpatient treatment facilities that can concentrate on the treatment of such neurological pain syndromes.

Using the same data source, the average cost per patient for chronic pain disorders was determined (Table 2). The most expensive disorder is chronic TTH, which accounts for about 15 000 Euro ($13,300), followed by basilar migraine and central pain syndromes. Specialized treatment strategies must therefore be devised to avoid unnecessary costs. Primary headache syndromes are a major factor in the cost of chronic pain disorders, yet standard care in acute hospitals includes no specialized treatment strategies.

In Germany every year, approximately 350,000 patients receive acute inpatient treatment for headaches at a cost of 670 million Euro ($590 million). Extrapolating these figures for Europe, this figure swells to 3.1 billion Euro ($2.75 billion) per year. As a rule, these patients are given unspecialized treatment without specific therapeutic strategies, and they are treated outside neurological facilities. The cost data underscore the urgent need to establish specialized academic headache centers and neurological centers as a standard of care, just as has been done for stroke.

Indirect costs of migraine and headache-related disorders pose an enormous economic burden. For every 1000 employees with migraine, roughly 270 working days per year are lost through inability to work. For TTH, 920 working days per year are lost in every 1000 employees. The cost of work time lost per migraine patient is about 4000 Euro ($3540) a year, and the cost of reduced productivity is even higher (around 5000 Euro or $4430). It must be assumed.

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<tr>
<th>Table 2. Inpatient Treatment of Chronic Pain Disorders in Nonspecialized Hospitals in Germany</th>
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<td>Average costs per patient</td>
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therefore, that in the European Union, headache disorders account for the loss of some 20 billion Euro ($35 billion) every year, making headaches the third most expensive neurological disease after dementia and stroke. The indirect costs of other neurological diseases, including multiple sclerosis and Parkinson’s disease, are far less than those associated with TTH, migraine, and related headache disorders.40

CONCLUSION

The results of epidemiological studies show that the prevalence of migraine and other headache disorders is consistently high in countries throughout the world, and that the impact of these disorders on society is significant in terms of direct and indirect costs. Because headache disorders present a major international health problem, research into the pathogenesis of headache disorders should be given clear priority. In addition, specialized neurological headache facilities need to be created and education in the diagnosis and management of headache disorders must be improved.

REFERENCES