

ORIGINAL PAPER

Kathleen Ries Merikangas · Amy E. Whitaker
Hansruedi Isler · Jules Angst

The Zurich Study:

XXIII. Epidemiology of headache syndromes in the Zurich cohort study of young adults

Received: 3. Juni 1993/Accepted: 27 April 1994

Abstract This study examines the 1 year prevalence rates of headache syndromes in an epidemiologic cohort study of young adults ages 29–30 in Zurich, Switzerland. The 1 year prevalence rates of headache subtypes were 3.3% for migraine with aura and 21.3% of migraine without aura as defined by the International Headache Society (IHS) criteria. The demographic distribution, clinical features, sequelae, and treatment patterns of subjects with specific headache subtypes are described. The rates of migraine are compared to those of other community samples that have employed the IHS criteria for headache subtypes. Subjects with migraine reported pervasive impairment in nearly every life role including occupation, leisure, and social relationships. Despite the substantial degree of impairment in occupational and social functioning that was associated with migraine, an extremely low proportion of subjects had received professional treatment for headache. These results suggest that a concerted effort should be directed towards education regarding the classification of headache and the availability of efficacious treatment for migraine.

Key words Epidemiology · Headache · Migraine
Tension-type headache

Introduction

...Migraine is least common in healthy males, restricted to the sexual time of life, occurs after an accumulation of internal or external stimuli, is characterized by periodicity of outbreaks and results from complex aetiology...

Freud, 1895

K. R. Merikangas · A. E. Whitaker
Genetic Epidemiology Research Unit,
Yale University School of Medicine, New Haven, CT 06510, USA

H. Isler
Neurologic Clinic, University Hospital Zurich, Switzerland

J. Angst (✉)
Psychiatric University Hospital, Research Department, P. O. Box,
CH-8029, Zurich, Switzerland

Although the demographic characteristics and associated features of migraine have been well known to clinicians since it was first described in the literature, studies of non-clinical samples have only become available during the latter half of the 20th century. The results of epidemiologic studies have confirmed Freud's observation regarding the age and sex distribution of migraine, but have failed to verify other clinical descriptions that have characterized "migraineurs" as highly intelligent, educated, white, upper-class individuals (Waters 1971). The results of epidemiologic studies have revealed that the above-cited characteristics applied to migraine sufferers who seek treatment, rather than to all subjects with migraine (Linnet and Stewart 1984). Indeed, some recent epidemiologic studies have found that migraine was more common in persons of lower socioeconomic status (Breslau et al. 1991; Henry et al. 1992; Stewart et al. 1992).

Although there is consensus among headache experts regarding the key features of migraine, its protean manifestations and lack of stability of symptom clusters within individuals across episodes preclude specification of a set of pathognomonic symptoms for diagnostic classification. Since the time of the earliest epidemiologic study of migraine (Balyeat and Rinkel 1931) clinicians have been plagued by the lack of systematic diagnostic criteria for migraine and its subtypes. In 1962 the Ad Hoc Committee on Classification of Headache Syndromes developed a series of diagnostic criteria for the classification of major headache syndromes (Ad Hoc Committee 1962). Migraine was described as a syndrome comprising recurrent attacks of unilateral headaches accompanied by a variety of gastrointestinal and neurologic symptoms, including nausea or vomiting and sensory and motor disturbances. The basis for this diagnostic description was the combined experience of a group of headache specialists. Because the Committee recognized the variability in the expression of migraine and tension headache (called Muscle Contraction Headache in the Ad Hoc criteria), and their concern with the lack of reliability in reporting clinical manifestation, vague diagnostic criteria were developed without specification of precise diagnostic thresholds. Therefore,

although the validity of the Ad Hoc criteria may exceed that of highly operationalized diagnostic systems, the compromise in reliability associated with imprecise criteria necessarily diminishes the validity of the classification. Nevertheless, the development of a set of criteria was an important advance in the diagnostic nomenclature of headache.

Systematic samples from patients in general-practice settings are valuable in yielding information on the treatment, course, and complications of migraine, particularly rare syndromes. Studies of patients in clinical samples have revealed that the proportion of headache patients suffering from migraine is approximately 10%, with range-of-prevalence rates from 8 to 17.1% (Linnet and Stewart 1984; Winnem 1992). Substantially greater rates of migraine have been reported in samples from specialty-treatment settings for headache (Linnet and Stewart 1984). However, cases of migraine in specialty settings tend to be composed of a non-representative group of persons with complicated migraine, treatment resistance, and comorbid conditions. Therefore, clinical samples cannot be used to generalize about the total population of persons with migraine due to the small and select proportion of subjects who seek treatment for migraine.

Epidemiologic studies conducted prior to 1988 have generally employed either the Ad Hoc or study-specific criteria for headache syndromes. These results have shown that migraine is a highly prevalent condition in the general population with a median lifetime prevalence of 17.0%, and a range of estimates from 3.8 to 22.9% (Linnet and Stewart 1984). The variation in prevalence rates is attributable not only to the lack of precise inclusion and exclusion criteria, but also to sampling variation and methodologic differences, including the demographic characteristics of the samples, assessment methods, and the time-period of assessment. These studies have also yielded valuable information on the demographic distribution and treatment rates of migraine. The findings are convergent in reporting that migraine is more common in females; it increases with age until the fifth decade, when the incidence rates drop dramatically (Linnet and Stewart 1984). Only a small proportion of migraine sufferers receive treatment for migraine, particularly from clinicians with expertise in this area.

The development of the diagnostic criteria of the International Headache Society (IHS; Headache Classification Committee 1988), shown in Table 1, is the first systematic classification that specifies operational diagnostic criteria for headache syndromes. This classification system, although not completely eliminating ambiguity, has generated a recent series of international epidemiologic studies that provide a standard means of comparison. Currently, there are approximately six studies that have employed the IHS criteria for migraine, or modifications thereof, in samples from the general population (Breslau et al. 1991; Henry et al. 1992; Stewart et al. 1992; Rasmussen et al. 1991; Rasmussen and Olesen 1992; Pryse-Phillips et al. 1992).

In contrast to migraine, there are sparse data on the epidemiology of tension-type headache or its precursor in the Ad Hoc system, muscle contraction headache. Although

Table 1 International Headache Society (IHS) criteria for migraine

Migraine without aura

- A. At least five attacks fulfilling B–D
- B. 4–72 h duration (untreated or unsuccessfully treated)
- C. Two of the following:
 - 1. Unilateral location
 - 2. Pulsating quality
 - 3. Moderate or severe intensity
 - 4. Aggravation by physical activity
- D. One of the following:
 - 1. Nausea or vomiting
 - 2. Photophobia and phonophobia

Migraine with aura

- A. Two attacks fulfilling B
 - B. Three of the four following characteristics:
 - 1. One or more reversible aura symptoms indicating focal or cerebral cortical and/or brain stem dysfunction
 - 2. Aura develops gradually over > 4 min or two or more aura symptoms occur in succession
 - 3. Aura lasts < 60 min
 - 4. Headache follows aura in < 60 min (it may begin before or simultaneously)
-

there are generally numerous community studies of headache, there are few pre-IHS studies that have specifically assessed tension headache (Crisp et al. 1977). In Water's (1986) review of the epidemiology of headache he cites only one previous epidemiologic survey of muscle-contraction headache. In a study by Nigerian University students the rates of muscle-contraction headache were 16.5% in women and 9.9% in men (Oguyemi 1984). There are only two studies that have employed the IHS criteria for tension-type headache in community samples (Rasmussen et al. 1991; Pryse-Phillips et al. 1992).

The goals of this paper are to:

- (1) Present the magnitude of the major headache syndromes defined by IHS criteria in a sample drawn from the general population of Zurich, Switzerland
- (2) Describe the demographic distribution, clinical features, sequelae, and treatment patterns of subjects with specific headache subtypes
- (3) Present an aggregation of the rates of migraine in community samples that have employed the IHS criteria for headache syndromes

Subjects and methods

The subjects in this paper are participants in a longitudinal cohort study of young adults in Zurich, Switzerland. This report is based on the 379 subjects (age 29–30 years) who completed the diagnostic questions for migraine in 1988. The original sample was selected in 1978 from the total population of 18- and 19-year-olds in the canton of Zurich based on the scores on a screening test of current symptoms, the Symptom Checklist 90 (SCL-90R; Derogatis

1977). Random samples were drawn from two-thirds of those who scored ≥ 2 standard deviations above the mean of the general population, and one-third from those who scored <2 standard deviations below the mean of the general population. The weighted rates in this analysis are based on this selection procedure.

The sample was first interviewed in 1979 (at ages 19–20) with three subsequent interviews in 1981, 1986, and 1988. A more detailed description of the methods and procedures of the Zurich study is given by Angst et al. (1984).

Procedure

A direct interview, the Structured Psychopathological Interview and Rating of the Social Consequences for Epidemiology (SPIKE), was administered by psychiatric residents and clinical psychologists with extensive clinical training (Angst et al. 1984). This interview schedule assesses a number of somatic syndromes, including headache, gastrointestinal, cardiovascular, and respiratory syndromes, as well as psychological syndromes including depression, phobia, obsessive-compulsive, anxiety, and substance abuse. Screening probes were administered for each section, and symptoms, duration, frequency, severity, and treatment and impairment history were assessed for every positive answer. Personal and family history of the syndromes were also assessed for all subjects, irrespective of their response to the diagnostic screening question for each section.

Diagnostic assessment of migraine and tension-type headache

The diagnostic criteria for migraine and tension-type headache were derived from a section of the interview that was devoted to the assessment of headache syndromes (Merikangas et al. 1990; Merikangas et al. 1993a). The headache sections were developed with consultation from a neurologist (H.I.) with extensive experience in the treatment and diagnosis of headaches.

The 1988 interview was modified extensively to incorporate the IHS criteria as well as comprehensive and detailed information regarding the symptoms, duration, and timing with regard to headache severity, impairment, family history, and treatment patterns. In the present report the IHS criteria were applied to the data from the most recent interview, yielding 1 year prevalence rates of migraine and tension-type headache.

Assessment of impairment

Occupational and social/leisure impairment were assessed in two ways:

- (1) As an analog rating (continuous variable) from 0–100, with 0 representing no impairment (i.e., no interference with daily activities or the absence of suffering or distress from the symptoms) and a score of 100 representing complete incapacitation or extreme suffering or distress from the symptoms
- (2) As a dichotomous variable, with a positive response indicating subjective impairment or disruption from routine work or social activities.

Marital/partner conflicts were measured as a dichotomous variable, with an affirmative response indicating a significant degree of disruption in the relationship. Treatment was defined using three levels: professional (if a physician, psychologist, psychiatrist, or any inpatient facility was consulted), self (if nonprescribed medications were taken), or none at all.

Statistical analysis

Continuity-corrected χ^2 tests were used to test significance of group differences for categorical variables. The continuous variables were analyzed via analyses of variance using the general linear-models procedure of the Statistical Analysis System (Rheinhardt

1980). Group mean differences were compared with the Duncan Multiple Range Test (Duncan 1975), which reduces the chance of not rejecting the joint hypotheses relative to the group means.

The two major independent variables in the analyses were the following four-level classifications of headache syndromes: (1) migraine with aura, migraine without aura, tension-type or unclassified headache, or no headache ($n = 379$), and (2) migraine with aura, migraine without aura, tension-type headache, or unclassified headache ($n = 221$).

Results

Table 2 presents the weighted 1-year prevalence rates of the major IHS subtypes in 1988. Migraine with aura was rare (3.2%), whereas migraine without aura was quite common (21.3%). Of this young cohort 43% reported no severe or recurrent headaches during the past year.

Tension-type headache was less common than migraine (16%). In fact only two subjects met criteria for chronic tension-type headache, with a 1-year prevalence rate of 0.1%. In contrast, the 1-year prevalence rate of episodic tension-type headache was 15.7%. Only 17% of the subjects with headache failed to meet the IHS criteria for either migraine or tension-type headache. The unweighted rates of headache subtypes were only slightly greater than the unweighted rates (i.e., migraine with aura = 3%; migraine without aura 24%; chronic tension-type = 0.5%; episodic tension-type = 16.1%). Differences in the sex ratio were greatest for migraine with aura, which was three times more frequent among females than males, and migraine without aura, which was two times greater in females. In contrast, there were no gender differences in the rates of tension-type headaches for either the chronic or episodic subtypes.

Table 3 shows the social and demographic characteristics of the subjects according to headache subtype. No significant differences emerged between the headache subtypes for marital status, social class, education level, or number of children. However, employment status was found to differ between migraine subjects and controls. Stratification by sex revealed that the difference in employment rates by headache subtype was restricted to males. Fewer male migraineurs reported full-time employment than those men without migraine. Whereas only 69% of male migraineurs reported full-time employment,

Table 2 Weighted 1 year prevalence rates of IHS headache subtypes in 1988 by gender ($n = 379$)

Gender	Migraine with aura ($n = 11$)	Migraine without aura ($n = 91$)	Tension headache ($n = 63$)	Other headache ($n = 56$)	None ($n = 158$)
Male ($n = 175$)	1.7	14.4	13.5	13.7	55.7
Female ($n = 204$)	4.7	28.0	18.0	19.5	29.8
Total	3.2	21.3	15.8	16.7	43.0

Table 3 Sociodemographic characteristics of subjects with headache in 1988 ($n = 379$)

	Migraine with aura ($n = 11$)	Migraine without aura ($n = 91$)	Tension headache ($n = 63$)	Other headache ($n = 56$)	No headache ($n = 158$)	χ^2	P
Education (%)							
< 12 years	54.4	69.2	50.8	62.5	70.3	9.03 (4 <i>df</i>)	n.s.
≥ 12 years	45.5	30.8	49.2	37.5	29.7		
Marital status (%)							
Single	54.6	42.9	52.4	51.8	55.7	10.59 (8 <i>df</i>)	n.s.
Married	36.4	49.5	38.1	37.5	41.8		
Divorced/separated	9.1	7.7	9.5	10.7	2.5		
Employment (%)							
Full-time	54.5	37.4	61.9	57.1	60.1	16.40 (8 <i>df</i>)	< 0.05
Part-time	18.2	37.4	27.0	26.8	22.8		
None	27.3	25.2	11.1	16.1	17.1		

Table 4 Impairment by headache subtype ($n = 221$)

	Migraine with aura ($n = 11$)	Migraine without aura ($n = 91$)	Tension headache ($n = 63$)	Other headache ($n = 56$)	Significance	P
Occupational impairment (%)	72.7	75.8	52.4	67.9	χ^2 (3 <i>df</i>) = 9.47	< 0.05
Occupational impairment (mean SD)	39.1 (33.90)	37.3 (31.17)	17.5 (21.34)	30.1 (30.07)	$F_{(3220)} = 6.38$	< 0.001
Social/leisure impairment (%)	90.9	78.0	55.6	64.3	χ^2 (3 <i>df</i>) = 11.78	< 0.01
Partner conflicts (%)	18.2	24.2	9.5	7.1	χ^2 (3 <i>df</i>) = 10.03	< 0.05
Suffering/distress (mean SD)	74.6 (25.83)	55.4 (25.70)	33.4 (22.80)	30.1 (30.07)	$F_{(3220)} = 13.28$	< 0.001

Table 5 Treatment history by headache subtypes ($n = 221$)

	Migraine with aura ($n = 11$)	Migraine without aura ($n = 91$)	Tension headache ($n = 63$)	Other headache ($n = 56$)	Significance	P
Treatment (%)						
Professional	9.1	7.7	4.7	8.9	χ^2 (6 <i>df</i>) = 10.33	n.s.
Self	72.7	69.2	52.4	50.0		
None	18.2	23.1	42.9	41.1		
History of Treatment (mean SD)						
Age of first treatment ^a	17.8 (5.98)	16.1 (7.06)	16.8 (9.75)	19.6 (5.62)	$F_{(3220)} = 0.54$	n.s.
Years of treatment ^a	1.5 (1.37)	0.8 (1.15)	0.4 (0.75)	0.5 (1.10)	$F_{(3220)} = 3.82$	< 0.05
Medications (%)						
Self	81.8	72.5	56.5	55.4	χ^2 (3 <i>df</i>) = 7.75	< 0.01
Prescribed ^a	100.0	33.3	33.3	40.0	χ^2 (3 <i>df</i>) = 1.73	n.s.

^a Among subjects who sought professional treatment ($n = 18$)

88% of the controls were engaged in a full-time occupation. There was a three-fold difference in the rates of unemployment or part-time employment among men with migraine when compared to males without headache (i.e., 30.8 vs. 11.6%, respectively; χ^2 (4 *df*) = 5.6; $P < 0.05$). The rates of employment among men with tension-type or unclassified headache were intermediate between those with migraine and no headache.

Table 4 shows the degree of occupational and social impairment according to the subtypes of headache. According to both dimensional and dichotomous assessments of severity and impairment associated with migraine, persons with migraine reported significantly more impairment than those with either tension-type or unclassified headache. There was evidence of pervasive impairment in nearly every life role, including occupation, leisure, and

Table 6 Prevalence of migraine using IHS criteria in community surveys

Study	No. of subjects	Instrument/ rater	Age group (years)	Lifetime prevalence (%)			1-year prevalence (%)			Comparable age group (years)
				M	F	Total	M	F	Total	
Denmark (Rasmussen et al. 1991; Rasmussen and Olesen 1992)	740	Clinical interview/ neurologist	25–64	8	25	16	6	15	10	11 (25–34)
Detroit (USA) (Breslau et al. 1991)	1007	Structured interview/ lay interviewer	21–30	7	16	13	3	13	10	10 (21–30)
American national ^a (Stewart et al. 1992)	20468	Mailed questionnaire	12–80	–	–	–	6	18	12	20 (30)
Canada ^a (Pryse-Phillips et al. 1992)	2737	Telephone questionnaire/ lay interviewer	≥ 15	9.5	22	16	–	–	–	24 (25–34)
France (Henry et al. 1992)	4204	Structured interview/ lay interviewer	≥ 15	4	12	8	–	–	–	18 (30–39)
Switzerland (present study)	457	Clinical interview/clinician	27–28	–	–	–	16	32	21	21 (29–30)

^a Modified IHS criteria

social relationships. Although an earlier age of onset of headache was reported by persons with migraine and tension-type headache when compared to subjects with unclassified headache disorders, the difference was not significant. However, the mean number of years since the first attack was greater among subjects with migraine with aura ($F_{[3220]} = 6.77$; $P < 0.001$).

The treatment patterns among subjects with specific headache subtypes are shown in Table 5. Only 9.1% of subjects with migraine with aura, and 7.7% of those with migraine without aura had sought professional help. Similarly, the treatment rates for tension-type and unclassified headache were low. Although the subjects with tension-type headache and those with migraine without aura entered treatment somewhat earlier than those with migraine with aura, the difference was not significant. Despite the low rates of professional treatment, the majority of headache subjects had medicated their own headaches during the previous year. As expected, self-medication of headaches was significantly greater among persons with migraine than other subtypes of headache ($\chi^2 [3df] = 7.75$).

Discussion

The weighted 1-year prevalence rates of headache subtypes among 29- and 30-year-olds selected from the general population of Zurich were 21.3% for migraine without aura and 3.3% for migraine with aura when defined according to the IHS criteria. These rates closely approximate the median of the pre-IHS studies, which employed similar methodology.

Table 6 compares the prevalence rates of migraine derived from the present study with those of other epidemiologic studies that have applied the IHS criteria (Breslau et al. 1991; Henry et al. 1992; Stewart et al. 1992; Rasmussen et al. 1991; Rasmussen and Olesen 1992; Pryse-Phillips et al. 1992). The lifetime prevalence rates of migraine were very similar across studies with a range of 8–16%. The 1-year prevalence rates of migraine were slightly lower than lifetime rates, and also exhibited similarity across studies (i.e. 10–12%), with the exception of the present study, which yielded substantially greater rates.

Because of differences in age composition in the various studies (i.e., young adults in the Zurich and Detroit (USA; Breslau et al. 1991) studies vs a broad age range in the Danish (Rasmussen et al. 1991), French (Henry et al. 1992), American national (Stewart et al. 1992), and Canadian (Pryse-Phillips et al. 1992) studies, we extracted the rates of migraine in comparable age groups of young adults from each sample. This comparison of rates of migraine among subjects of comparable age to those in the present study revealed substantially greater rates among younger adults than those in the total samples in the French, American, and Canadian studies (i.e., 18, 20, and 24%, respectively). The rates in the latter studies were very similar to those obtained in the present study. However, the 1-year prevalence rates among younger persons were still substantially lower than those from the Zurich cohort in Detroit and Danish studies, with rates of 11 and 10% respectively.

The well-known preponderance of females with migraine was observed in all of the community studies that employed IHS criteria. However, the magnitude of the gender ratio was somewhat variable, with female-to-male ratios ranging from two to four for both the lifetime and 1-

year assessments (Breslau et al. 1991; Henry et al. 1992; Stewart et al. 1992; Rasmussen and Olesen 1992; Pryse-Phillips et al. 1992). Caution should be exercised in the interpretation of differences in the unweighted rates, because the sampling ratios also differed by gender across studies, with a range of 0.9 female-to-male ratio in the Danish study to 2.4 in the French Survey.

Inconsistent findings emerged across the studies with regard to the social and economic status of subjects with migraine. Migraine was associated with higher educational levels in the Canadian study, lower educational levels in the Detroit study, and lower income categories in the American national study, whereas no differences were found in occupational status in the French study, or in educational level in the present study. However, cultural differences in the degree of variation of social class, and the lack of consistent assessments of indicators of socioeconomic status, preclude comparisons across studies.

Aside from differences in the demographic features of the studies, divergent findings may also be attributed to variation in the following methodologic characteristics across the studies:

- (1) *The method of assessment:* a semistructured clinical interview with comprehensive assessment of headache characteristics in the Zurich study, a structured interview in the Danish study, structured interviews limited to specific criteria for migraine in the Detroit and French studies, telephone interviews in the Canadian survey, and a mailed questionnaire in the American national study
- (2) *Level of experience of the interviewer:* neurologists in the Danish study, experienced nonneurologic clinicians trained to assess headache in the Zurich study, and direct interviews by lay interviewers in the Detroit, French, and Canadian studies
- (3) *The basic goal of the studies:* assessment of migraine as part of a comprehensive investigation of a variety of psychologic and somatic conditions in the Zurich and Detroit studies as opposed to the assessment of headache syndromes as the major focus of the interviews in the Danish, American national, Canadian, and French studies.

The most compelling explanations for the high annual prevalence rates in the present sample compared to those of other epidemiologic studies are: (1) the age of the sample, which is at the peak period of incidence of migraine, (2) administration of a semistructured interview that assesses a broad scope of information about headache, rather than being limited solely to the IHS criteria, and (3) the use of clinically experienced interviewers. These rates would be expected to decline as the sample passes through adulthood. In psychiatry the use of instruments designed specifically to collect diagnostic criteria, particularly those administered by lay interviewers, has been shown to yield lower rates of most diagnoses than instruments that assess broader information about syndromes in a semistructured format administered by clinical interviewers (Thompson 1987).

Although the annual incidence rates of migraine defined according to the IHS criteria in community samples are not yet available, the recent studies have yielded estimates of the incidence rates of migraine. Stewart et al. (1991) derived incidence rates of migraine, defined by modified Ad Hoc criteria (Ad Hoc Committee 1962) from retrospective data in their survey of young adults in Washington County, Maryland, USA. After correcting for the tendency to overestimate the age of onset with increasing age (i.e., a bias which they referred to as "telescoping"), they found that the estimated average age-specific incidence of migraine without aura was substantially earlier than that reported in previous studies (i.e. 10–11 for males and 14–17 for females). However, because the oldest subjects in the sample were only 30 years, these estimates would be expected to be lower than those obtained in a sample with a broader age range.

Another recent study presented incidence rates of IHS-defined migraine in a population-based survey of all residents of an entire county in Rochester, Minnesota, USA, who had received a clinical diagnosis of migraine (Stang et al. 1992). It was found that the incidence rates of migraine were 1.4/1000 for men and 2.9/1000 for women over a 3-year interval. Consistent with this data the peak incidence of migraine was earlier in men than in women (i.e., at ages 10–14 for men and 20–24 for women).

There were also substantial differences across studies in the proportion of migraine subjects with and without aura. Although only a small proportion (11%) of the subjects with migraine in the present study met the IHS criteria for migraine with aura, larger proportions were reported in the studies of samples in Canada, Detroit, and Denmark (i.e., 50, 46, and 30%, respectively). The major explanations for these differences were the lack of consistent information on the manifestations of aura and the use of variable interpretations of the IHS criteria for aura.

Retrospective estimates of the age of onset of migraine were obtained in three of the studies described in Table 5. Identical mean ages of onset of migraine were reported by subjects in the present study and the Detroit study (16 years), both of which were composed of samples of young adults. Estimates of the age of onset derived retrospectively across a broader distribution of ages revealed that the majority of subjects with migraine reported an age of onset in the early 20's (Rasmussen and Olesen 1992).

The present study also assessed the prevalence of tension-type headache in the community. Whereas the 1-year prevalence of chronic tension-type headache was extremely rare, episodic tension-type headache was quite common. In contrast to migraine, the gender ratio did not differ for tension-type headache. Moreover, there was little overlap between the 1-year prevalence of migraine and tension-type headache, as would be expected by the mutually exclusive diagnostic criteria for these syndromes within episodes. These findings contrast with those of Rasmussen et al. (1992), who reported a remarkably high 1-year prevalence rate of episodic tension-type headache (63%), and significantly greater rates among females (71%) than males (56%). This divergence is most likely attribut-

able to differential degrees of restrictiveness of the initial probe for headache in the two studies. Because the section on headache in the present study was part of a broader inquiry into numerous other somatic conditions, the initial probes for each condition were intended to restrict the remainder of the section to those subjects with clinically significant phenomena. Thus, subjects who considered their headaches to be inconsequential in terms of frequency or severity would have skipped out of the remainder of the section.

In contrast, the initial probe in the Danish Study was so broad that it was endorsed by 97% of the people sampled (Rasmussen and Olesen 1992). However, the findings of the latter two studies were concordant with regard to the 1-year prevalence of chronic tension-type headache, which was extremely rare in both studies. The use of this more restrictive probe may also explain why such a large proportion of subjects in the present study (43%) reported the absence of headaches.

The rate of professional treatment in the Zurich sample was exceedingly small, with only 8% of the subjects with migraine reporting contact with a professional for the diagnosis and treatment of headache during the past year. The infrequent use of professional treatment confirmed the findings of previous epidemiologic studies regarding the extremely low proportion of people seeking professional treatment specifically for headache. Although previous community studies of IHS-defined migraine have revealed that between one-third and one-half of those persons with migraine had consulted a physician, less than 15% of migraine subjects ever consult a specialist engaged in the treatment of migraine or its manifestations (Celantano et al. 1992; Rasmussen et al. 1992).

Our finding regarding the frequent use of nonprescribed medications was consistent with the results of previous studies, which revealed that approximately 50% of persons with migraine use over-the-counter agents to treat headache. However, there is considerable variation across studies in the proportion of migraineurs who receive prescription medications. In Denmark it was found that approximately 17% of migraineurs had used prescription medications for migraine, but only 7% had received prophylactic medications (Rasmussen et al. 1992). In contrast, the rates of prescription medication in the American national sample were much greater than those found in the European studies, with 28% of males and 40% of females with migraine reporting a history of prescription medication use (Celantano et al. 1992). However, the latter findings are based on a lifetime rather than annual assessment.

The differences in the rates of treatment and medication use across studies are likely to derive from the differences in the age composition of the samples. Because of the youthful age of the subjects in the Zurich study cohort, they may not have suffered the severe consequences of migraine for a sufficient period of time to lead them to seek professional assistance. Alternatively, cultural differences in treatment and prescription patterns may explain the divergent findings. Irrespective of the reasons for different treatment and medication patterns, this finding again high-

lights the bias that characterizes samples of speciality-treatment clinics for headache, which represent an extremely small proportion of subjects with headache syndromes from the general population.

Impairment in occupational functioning has often served as a meaningful indicator of the severity of migraine (Merikangas et al. 1993b). Indeed, a greater than moderate level of interference with daily activities is one of the diagnostic criteria for migraine in the IHS classification. Although other unrelated factors such as job characteristics, social class, and personality may mediate the degree to which migraine attacks may impede routine occupational tasks, there is remarkable clinical and research consensus regarding the importance of assessment of occupational disability associated with migraine. Several recent studies have even attempted to estimate the consequences of migraine in terms of its economic burden (Chicoye et al. 1992).

In the present study more than 75% of the subjects with migraine reported that their attacks were associated with a significant degree of interference with their occupational activities. Indeed, nearly one-third of the men with migraine reported an inability to maintain full-time employment as a consequence of migraine. This confirms the significant degree of disability associated with migraine in other recent studies (Pryse-Phillips et al. 1992; Celantano et al. 1992; Rasmussen et al. 1992b; Linet et al. 1989). Although these findings may be partially attributable to inclusion of impairment as a diagnostic criterion for migraine, the magnitude of disability is far in excess of that which would be expected on this basis alone.

The Zurich Study also assessed whether impairment extended to other spheres, including social and leisure activities. Migraine was associated with even greater impairment in social relationships and recreational activities than that reported for occupational activities. Nearly one-quarter of subjects with migraine reported that migraine was associated with impairment in their relationships with their mates. In contrast, tension headache was not associated with significant degrees of impairment in occupational, social, or marital functioning.

The findings of the present study have demonstrated the high prevalence of migraine as defined by the IHS criteria among young adults selected from the general population of Zurich. The substantial degree of impairment specifically associated with migraine in nearly every domain of life, including occupational, social, and marital functioning was striking. If one considers the youthful age of this cohort these findings are even more remarkable. Despite the pervasive degree of impairment from migraine, only 8% of subjects had consulted a professional for treatment of migraine. These results suggest that a concerted effort should be directed toward education regarding the classification of headache and the availability of efficacious treatment for migraine. The prospective design of this study will enable identification of the longitudinal stability of the IHS headache syndromes and incidence rates over a 5-year interval.

Acknowledgements This work was supported in part by Research Scientist Development Award MH00499 from the United States Public Health Service to Dr. Merikangas and the John D. and Catherine T. MacArthur Foundation Mental Health Research Network I on the Psychobiology of Depression and Other Affective Disorders (Dr. Merikangas), and by grant 32-33580.92 from the Swiss National Science Foundation.

References

- Ad Hoc Committee on Classification of Headache (1962) Classification of headache. *Arch Neurol* 6: 173-176
- Angst J, Dobler-Mikola A, Binder J (1984) The Zurich Study - a prospective epidemiological study of depressive, neurotic and psychosomatic syndromes. I. Problem, methodology. *Eur Arch Psych Neurol Sci* 234: 13-20
- Balyeat RM, Rinkel JH (1931) Further studies in allergic migraine. *Ann Intern Med* 5: 713-728
- Breslau N, Davis GC, Andreski P (1991) Migraine, psychiatric disorders, and suicide attempts: an epidemiologic study of young adults. *Psychiatry Res* 37: 11-23
- Celantano DD, Stewart WF, Lipton RB, Reed ML (1992) Medication use and disability among migraineurs: a national probability sample survey. *Headache* 32: 223-228
- Chicoye A, Auray JP, Duru G, Lamure M, Michel P, Milan JJ, the Grim (1992) The burden of migraine in France. In: Chytil MK, Duru G, Eimeren W, Flagle CD (eds) Fifth International Conference on System Science in Health Care. Omnipress, Prague, 1554-1559
- Crisp AH, Kalucy RS, McGuinness B, Ralph PC, Harris G (1977) Some clinical social and psychological characteristics of migraine subjects in the general population. *Postgrad Med J* 53: 691-697
- Derogatis RL (1977) Symptom checklist 90, R-version manual I: scoring, administration and procedures for the SCL-90. Johns Hopkins University Press, Baltimore, Md
- Duncan DB (1975) T-tests and intervals for comparisons suggested by the data. *Biometrics* 31: 339-359
- Freud S (1957) The origins of psychoanalysis: letters, drafts, and notes to Wilhelm Fliess, 1887-1902. In: Bonaparte M, Freud A, Kris E (eds) Doubleday, Garden City, NY
- Headache Classification Committee of the International Headache Society (1988) Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. *Cephalalgia* 8 (Suppl) 7: 1-96
- Henry P, Michel P, Brochet B, Dartigues JF, Tison S, Salamon R, the GRIM (1992) A nationwide survey of migraine in France: prevalence and clinical features in adults. *Cephalalgia* 12: 22-37
- Linnet MS, Stewart WF (1984) Migraine headache: epidemiologic perspectives. *Epidemiol Rev* 6: 107-139
- Linnet MS, Stewart WF, Celentano DD, Ziegler D, Sprecher M (1989) An epidemiologic study of headache among adolescents and young adults. *JAMA* 261: 2211-2216
- Merikangas KR, Angst J and Isler H (1990) Migraine and psychopathology: results of the Zurich cohort study of young adults. *Arch Gen Psychiatry* 47: 849-853
- Merikangas KR, Merikangas JR, Angst J (1993 a) Headache syndromes and psychiatric disorders: association and familial transmission. *J Psychiatr Res* 27: 187-196
- Merikangas KR, Whitaker A, Angst J (1993 b) Validation of diagnostic criteria for migraine in the Zurich longitudinal cohort study. *Cephalalgia* 13 (Suppl 12): 47-53
- Ogunyemi AO (1984) Prevalence of headache among Nigerian University students. *Headache* 24: 127-130
- Pryse-Phillips W, Findlay H, Tugwell P, Edmeads J, Murray TJ, Nelson RF (1992) A Canadian population survey on the clinical, epidemiologic and societal impact of migraine and tension-type headache. *Can J Neurol Sci* 19: 333-339
- Rasmussen BK, Olesen J (1992) Migraine with aura and migraine without aura: an epidemiological study. *Cephalalgia* 12: 221-228
- Rasmussen BK, Jensen R, Schroll M, Olesen J (1991) Epidemiology of headache in a general population: a prevalence study. *J Clin Epidemiol* 44: 1147-1157
- Rasmussen BK, Jensen R, Olesen J (1992) Impact of headache on sickness absence and utilization of medical services: a Danish population study. *J Epidemiol Community Health* 46: 443-446
- Reinhardt P (ed) (1980) SAS supplemental library user's guide. SAS Institute, Cary, NC
- Stang PE, Yanagihara T, Swanson JW, Beard CM, O'Fallon WM, Guess HA, Melton LJ (1992) Incidence of migraine headache: a population-based study in Olmsted County, Minnesota. *Neurology* 42: 1657-1662
- Stewart WF, Linnet MS, Celantano DD, Van Natta M, Ziegler D (1991) Age- and sex-specific incidence rates of migraine with and without visual aura. *Am J Epidemiol* 134: 1111-1120
- Stewart WF, Lipton RB, Celantano DD, Reed ML (1992) Prevalence of migraine headache in the United States. Relation to age, income, race, and other sociodemographic factors. *JAMA* 267: 64-69
- Thompson WD (1987) Lifetime psychiatric diagnoses. In: Last CG, Hersen M (eds) Issues in diagnostic research. Plenum, New York, pp 143-160
- Waters WE (1971) Migraine: intelligence, social class and familial prevalence. *Br Med J* 2: 77-81
- Waters WE (1986) Headache. Littleton, Mass.
- Winnem J (1992) Prevalence of adult migraine in general practice. *Cephalalgia* 12: 300-303