

# Impact of Migraine on the Employed Labor Force in Taiwan

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**Background:** To estimate the economic impact of migraine on the employed labor force in Taiwan.

**Methods:** The age- and sex-specific migraine prevalence rates, self-reported missed workdays due to migraine, and monthly income were obtained from 3,377 subjects of a community-based headache questionnaire survey in the greater Taipei area. The migraine-related loss was projected to the whole Taiwanese population based on statistics from the Directorate General of Budget, Accounting and Statistics of the Executive Yuan, Taiwan.

**Results:** People suffering from migraines had a median of 2 missed workdays due to migraine in the year prior to the survey. It is estimated that there are about 1.7 million people who have migraines over the course of 1 year in Taiwan. Migraine resulted in 3.7 million estimated missed workdays and an estimated cost of NT\$4.6 billion due to loss of workdays in 2005. Employed migrainous women aged 35–54 years accounted for 56% of the cost.

**Conclusion:** Migraine is related to high work absence rates and causes significant economic loss to the society in Taiwan. [*J Chin Med Assoc* 2008;71(2):74–78]

**Key Words:** burden, cost, migraine, Taiwan

## Introduction

Migraine is a prevalent and incapacitating disease. The 1998 classification system proposed by the International Headache Society (IHS)<sup>1</sup> and revised in 2004<sup>2</sup> improved and harmonized the diagnosis of migraine and its differential diagnosis relative to other headache disorders such as tension-type headache. Despite differences in countries, populations and years in which the studies were conducted, most epidemiologic data regarding 1-year prevalence of migraine using IHS criteria in Asian communities were remarkably consistent and ranged from 8.4% to 12.7%.<sup>3</sup>

It is well known that migraine has a significant effect on the quality of life as well as the work, school, family or social activities of individuals.<sup>4,5</sup> The prevalence of migraine according to IHS criteria was 9.1% in Taiwan from a community survey.<sup>6</sup> In line with other epidemiologic studies,<sup>7,8</sup> prevalence was highest during

the peak productive years—between the ages of 20 and 45 years.<sup>6</sup> Therefore, the consequent impact of migraine on society is substantial. However, migraine does not receive adequate attention as a public health priority in Taiwan because its impact on society has been underestimated due to there being no such study to date.

Although the National Health Insurance in Taiwan provides easy access to medical care, the *Greater Taipei Area Headache Survey* showed that 46% of people suffering from migraines did not seek medical consultation in the year prior to the survey.<sup>9</sup> Therefore, only community-based studies can actually present the disease-related impairment and burden. The purpose of this report was to describe, using data collected from a community study—the *Greater Taipei Area Headache Survey*, the magnitude of the impact caused by migraine on the employed labor force from a Taiwanese societal perspective.



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## Methods

The *Greater Taipei Area Headache Survey* was a population-based questionnaire interview conducted by trained interviewers from August 1997 to June 1998. The target population comprised subjects aged 15 and above in randomly selected households in the greater Taipei area. The methods used for this survey have been previously described.<sup>6,9</sup> A total of 1,211 households (86.5%) responded. Of the 4,434 eligible subjects in the respondent households, 3,377 subjects (76%) (female/male ratio, 1,804/1,573) completed the survey questionnaire.

A diagnosis of migraine was made according to the classification criteria of migraine without aura proposed by the IHS in 1988,<sup>1</sup> except that those attacks with a duration of 2–4 hours were also included.<sup>10</sup> Of the 3,377 participants, 2,082 (62%; 50% men, 72% women) reported that they had had at least 1 headache in the previous year. Among these 2,082 subjects, 328 (256 women, 72 men) had migraine, whereas the others were designated as subjects who had “non-migraine headaches” ( $n = 1,754$ ; 52%).

The survey questionnaire was composed of 3 parts. The first part investigated demographic characteristics. The second part was a clinically validated headache questionnaire, which was designed to comply with the operational criteria of the headache classification of the IHS 1988.<sup>1</sup> The third part of the questionnaire included days of work lost in the past year and personal monthly income. The number of missed workdays in the year prior to the survey was reported by the subjects themselves. For subjects who reported missed workdays due to migraine at a frequency of 0, 1–3 days, 4–7 days or 8–29 days over a 1-year period, we used the median value for each category. For subjects who reported missed workdays that numbered  $\geq 30$  days, we assumed that it was 30 days. Personal monthly income was categorized into the following groups: < NT\$20,000, NT\$20,000–29,999, NT\$30,000–39,999, NT\$40,000–49,999, NT\$50,000–59,999, NT\$60,000–69,999 and  $\geq$  NT\$70,000; the median value for each category was used. For subjects who reported income < NT\$20,000 or  $\geq$  NT\$70,000, we assumed that it was NT\$15,000 or NT\$80,000, respectively.

### Statistical analysis

Statistical analyses were performed using SPSS version 11 (SPSS Inc., Chicago, IL, USA). Nonparametric Mann-Whitney test was used for comparison between 2 groups. Two-tailed tests were used throughout, and a  $p$  value of less than 0.05 was considered statistically

significant. The 1-year prevalence of migraine by type of employment was reported as the number of cases per 100 persons with 95% confidence intervals. Self-reported earnings data were applied to the number of missed workdays over a 1-year period to estimate the costs associated with missed workdays due to migraine. We estimated the number of migraine sufferers based on the projected Taiwan population distribution in 2005 by the Directorate General of Budget, Accounting and Statistics of the Executive Yuan, Taiwan,<sup>11</sup> and the age- and sex-specific prevalence rates of migraine as reported from the *Greater Taipei Area Headache Survey*.<sup>6</sup> We also estimated the total cost of lost workdays due to migraine by multiplying the estimated annual number of missed workdays attributable to migraine attacks by the projected number of employed migraine sufferers and by the stratified sex- and age-specific 2005 average earnings released by the Directorate General of Budget, Accounting and Statistics of the Executive Yuan.<sup>11</sup>

## Results

### Prevalence of migraine, missed workdays and income

Information on occupation was missing for 22 subjects. A total of 1,813 subjects (54%; 784 females, 1,029 males) had a paid job, while 1,809 were not in the employed labor force. Tables 1 and 2 show the 1-year prevalence of migraine by type and position of occupation. The prevalence of migraine was different between males and females. The retired and unemployed populations had lower migraine prevalence.

A total of 592 missed workdays in the year prior to the survey was reported by employed subjects who suffered from migraine, and 896 days by subjects with non-migraine headache. Employed subjects with migraine had a higher number of missed workdays compared to those with non-migraine headache (median: 2 days *vs.* 0 days,  $p < 0.001$ ). The number of missed workdays did not differ between male and female employed migraine sufferers (median: males 2 days *vs.* females 2 days,  $p = 0.55$ ). The estimated cost due to missed workdays per person in the year prior to the survey was also higher in subjects with migraine than in those with non-migraine headache (median: NT\$1,667 *vs.* NT\$0,  $p < 0.001$ ).

### National data projection

Table 3 shows the projected number of migraine sufferers aged  $\geq 15$  years in Taiwan in 2005. Migraine-related missed workdays and economic losses are presented in Table 4. Using the 2005 average earnings cost

**Table 1.** Prevalence of migraine by type of occupation based on the 1998 Greater Taipei Area Headache Survey

Type of occupation	n	Prevalence of migraine (%)		
		Total	Males	Females
Government employee	212	7.5 (4–11)	2.7 (0–5.7)	13.0 (6.8–19.2)
Teacher	87	6.9 (1.6–12.2)	3.4 (0–10)	8.6 (1.4–15.8)
Manufacturing	236	8.5 (4.9–12.1)	4.1 (0.9–7.3)	15.9 (8.3–23.5)
Service industry	820	10.9 (8.8–13.0)	6.5 (4.2–8.8)	16.4 (12.6–20.2)
Others	458	10.3 (7.5–13.1)	3.6 (1.4–5.8)	20.8 (14.8–26.8)
Student	657	8.2 (6.1–10.3)	5.3 (2.8–7.8)	11.0 (7.7–14.3)
Homemaker	572	14.5 (11.6–17.4)	NA	14.5 (11.6–17.4)
Retired	162	4.3 (1.2–7.4)	2.4 (0–5.1)	11.4 (0.9–21.9)
Unemployed	153	2.0 (0–6.6)	0	4.2 (0–8.8)

**Table 2.** Prevalence of migraine by position of occupation based on the 1998 Greater Taipei Area Headache Survey

Position of occupation	n	Prevalence of migraine (%)		
		Total	Males	Females
Executive administrative	405	8.4 (5.7–11.1)	5.3 (2.8–7.8)	19.5 (11.2–27.8)
Administrative support	143	13.3 (7.7–18.9)	6.1 (0.3–11.9)	19.5 (10.7–28.3)
Technician	99	8.1 (2.7–13.5)	3.7 (0–8.7)	13.3 (3.4–23)
Clerk	394	10.4 (7.3–13.4)	3.4 (0.5–6.3)	14.6 (10.2–19.0)
Sales	107	10.3 (4.5–11.5)	3.2 (2.0–9.2)	20.5 (8.6–32.4)
Service employee	214	12.1 (7.7–16.5)	5.5 (1.2–9.8)	19.0 (11.5–26.5)
Handler, laborer	237	8.0 (4.5–11.5)	5.6 (2.0–9.2)	13.2 (5.6–20.8)
Other	214	9.5 (5.5–13.5)	5.5 (1.2–9.8)	14.0 (7.2–20.8)
Not in labor force	1,544	9.6 (8.1–11.1)	3.2 (1.8–4.6)	12.6 (10.4–14.8)

**Table 3.** Projected number of migraine sufferers aged  $\geq 15$  years in Taiwan in 2005

Age (yr)	Taiwan population (1,000s)	Prevalence of migraine (%)	Projected no. of migraine sufferers (1,000s)
<b>Males</b>			
15–24	1,560	5.3	83
25–34	1,817	6.0	109
35–44	1,878	3.9	73
45–54	1,669	4.3	72
55–64	879	4.5	40
$\geq 65$	1,088	1.6	17
Subtotal	8,890		394
<b>Females</b>			
15–24	1,677	11.8	198
25–34	1,847	17.8	329
35–44	1,868	15.4	288
45–54	1,673	13.2	221
55–64	909	11.9	108
$\geq 65$	1,083	12.1	131
Subtotal	9,058		1,275
<b>Total</b>	<b>17,949</b>		<b>1,669</b>

stratified by age and sex released by the Directorate General of Budget, Accounting and Statistics of the Executive Yuan, the estimated annual cost of migraine was NT\$4,873 per person. In Taiwan, there were about 1.7 million people who suffered from migraine in 2005. Migraine resulted in an estimated 3.7 million missed workdays per year and a cost of NT\$4.6 billion per year due to lost workdays. Female subjects accounted for about 80% of this total cost, and about 56% of the total cost was attributed to female subjects aged 35–54 years.

## Discussion

This is the first report of migraine impact from the societal aspect in Asia. Our study showed that migraine affects as many as 941,000 Taiwanese of working age, and the economic consequences were substantial. These burdens fall on the migraine sufferers themselves and their employers.

The estimated median annual number of missed workdays (2 days) for both sexes of migraine sufferers

**Table 4.** Projected annual number of missed workdays and economic loss attributed to migraine in 2005

Age (yr)	Total working population (1,000s)	No. of migraine sufferers (1,000s)	Average no. of missed workdays	Total no. of missed workdays (1,000s)	Average costs per day (NT\$)*	Total annual costs due to missed workdays (1,000s NT\$)
<b>Males</b>						
15–24	463	25	2.3	57.5	1,028	59,110
25–34	1,668	100	1.1	110	1,126	134,860
35–44	1,775	69	2.8	193.2	1,641	317,041
45–54	1,467	63	3.1	195.3	1,750	341,775
55–64	524	24	3.6	86.4	1,000	86,400
Subtotal	5,896	281		642.4		939,186
<b>Females</b>						
15–24	593	70	2.4	168	833	139,944
25–34	1,380	256	2.8	716.8	1,134	812,851
35–44	1,245	192	4.6	883.2	1,421	1,255,027
45–54	882	116	9.5	1,102	1,178	1,298,156
55–64	218	26	7.2	187.2	750	140,400
Subtotal	4,317	660		3,057.2		3,646,378
<b>Total</b>	<b>10,213</b>	<b>941</b>		<b>3,699.6</b>		<b>4,585,565</b>

\*2005 average earnings released by the Directorate General of Budget, Accounting and Statistics of the Executive Yuan, Taiwan.

in Taiwan was in the middle range of results from studies conducted in the West, which showed 1.0–6.7 days for men and 2.1–8.3 days for women.<sup>12–14</sup> The different methodologies and cultures might explain the discrepancy among studies. A clinic-based study showed that work and productivity loss due to migraine was consistent among 25 countries, but the study did not include any countries in Asia.<sup>15</sup> Our study strengthens this point.

The estimated annual cost due to missed workdays attributable to migraine varied widely across different countries and ranged from €29 (about NT\$1,160 with an exchange rate of 1 Euro to NT\$40) per patient in Sweden to €493 (about NT\$19,720) in Germany, with an average of €263 (about NT\$10,520).<sup>13</sup> The estimated annual indirect costs, including missed workdays and reduced productivity during work, due to migraine were US\$690 (about NT\$22,800 with an exchange rate of US\$1 to NT\$32.8) for males and US\$1,127 (about NT\$36,064) for females in the USA.<sup>12</sup> The estimated annual cost due to missed workdays in Taiwan (NT\$4,873) was in the lower range of that in developed European countries. The gross domestic product per capita in Taiwan was US\$14,271 in 2004, about 40% of that in developed countries.<sup>11</sup> Since the number of missed workdays attributable to migraine per patient did not differ greatly between Taiwan and European countries,<sup>13</sup> the lower wage in Taiwan may explain the differences.

Some limitations of this study are noted. First, our study only used the number of missed workdays to

reflect the burden of migraine on the employed labor force. Previous studies showed that the economic burden of migraine was predominantly due to indirect costs rather than direct medical costs.<sup>12,13,16</sup> The indirect cost of migraine in the employed labor force is caused by both the number of missed workdays (absenteeism) and decreased productivity. The number of missed workdays was more reliably reported compared with decreased productivity, but by only taking the first factor into account most likely led to an underestimation of the total cost. The second limitation was that we surveyed the subjects in 1997 and projected the information to 2005 national data, so the results might not reflect the real, recent, economic burden. We used 2 different ways to estimate the average cost per migraine patient: by self-reported income in 1997 and by the official report of the average earnings per employed person in 2005. The results did not differ significantly. Another limitation of our study is that unemployment was left unmeasured. Therefore, the study only reported the minimal impact of migraine on the employed labor force, and we considerably underestimated the true burden of the disease. Other limitations include the estimate of missed workdays attributable to migraine being based on subjects' self-report and not validated, and the recall period being relatively long (1 year). Therefore, there may be some recall bias in subjects' responses. Missed workdays and income in our questionnaire were originally designed as ordinal variables and, therefore, the estimations from transformation might have introduced bias.

The strengths of our study are that: the data were derived from a survey of the general population rather than a clinic population or subjects enrolled in a clinical trial; the diagnosis of migraine was made according to standard IHS criteria; migraine cases were not limited to those previously diagnosed by a physician. Moreover, our calculation of the number of migraine sufferers and cost due to missed employed labor force earnings stratified by both gender and age made our estimation more accurate since those variables disproportionately affected the prevalence rate and salaries.

In conclusion, migraine affects a significantly large proportion of the total population and is related to high work absence rates in Taiwan. Our study highlights the importance of understanding the impact of headache from a societal perspective.

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