Lifetime Migraine Incidence: Results from the American Migraine Prevalence and Prevention (AMPP) Study

Walter F. Stewart[1], Craig Wood[1], Michael L. Reed[2], Marcelo E. Bigal[3], Richard B. Lipton[3]

[1]Geisinger Clinic, Danville, PA; [2]Vedanta Research, Chapel Hill, NC; [3]Department of Neurology, Albert Einstein College of Medicine, Bronx, NY

INTRODUCTION

Evidence on the age-specific incidence of disease offers important clues to etiology. While migraine prevalence has been extensively described[1], relatively little is known about its incidence and considerably less about variation in incidence by age. Prospective studies of migraine incidence are uncommon and usually confined to selected age groups[2,3,4], with no single study describing variation across all ages. Moreover, because the number of new onset cases tends to be small, estimates of age-specific incidence are highly unstable.

As an alternative to longitudinal studies, cross-sectional data on the reported age of onset among active prevalent cases has been used to estimate incidence. In these cross-sectional studies, inactive cases have not been ascertained while active cases over-represent those with a longer duration of illness. Cross-sectional studies have also been used to obtain a lifetime history of migraine (i.e., age of onset, current status, etc)[5]. Ascertainment of inactive cases is likely to be related to respondent age, duration of illness, and time since last attack. Underascertainment is apparent, for example, if the cumulative risk does not vary by age or the cumulative risk estimate for an older age group is lower than that of a younger age group[6].

We previously developed methods[7,8] to estimate age-specific incidence estimates from cross-sectional survey data that adjust for ascertainment (i.e., under-representation of short duration cases) and recall bias. We applied this incidence estimating methodology to a population sample representative of a broader age range over which new cases of migraine might continue to emerge[4].

METHODS

Population Survey: Data for estimating incidence rates were obtained from a U.S. nationwide mailed survey of 193,477 individuals 12 years of age and older participating in the American Migraine Prevalence and Prevention (AMPP) study. Methodology followed the previous American Migraine Studies[9,10]. Each household member with severe headaches was asked to complete a validated screening survey which obtained data on headache features and disease onset.

Migraine Case Definition: Migraine diagnosis was limited to past year headache sufferers who met the migraine case definition using ICHD-2 criteria[11].

Recall Errors: Ascertainment bias and temporal reporting bias are two major sources of error regarding past events. In prevalence surveys of active migraine cases, ascertainment bias occurs implicitly; as individuals who have had migraine in the past, but whose condition remitted, are not represented in the numerator of the prevalence estimate but are included in the denominator. The most common form of temporal reporting bias is telescoping[12], the tendency to report that the event occurred closer to the present than it had actually occurred.

Estimating Methods: Separate estimates were derived for males and females since the incidence of migraine is known to be different by sex. Based on previous work[7], three methods for calculating incidence were used.

The "naïve" method assumes that there are no reporting or ascertainment errors.

The "diagonal" method minimizes recall and ascertainment errors by only considering cases who reported the onset of migraine in the 36 months prior to the survey.

The "model" method uses regression-based modeling to adjust the incidence rate for potential recall and ascertainment errors.

Cumulative incidence (for lifetime risk) was estimated using the product-limit formula[13,14] applied to the "model" method above, and median age at onset was defined as age at which cumulative incidence reached 50% of all onset ages.

RESULTS

Survey participants were aged 12 to 100 and 55% were female. Of the 106,762 females in the study, 14,604 (14%) had current migraine; and for the 86,715 males in the study, 4,364 (5%) had current migraine.

Figures 1a and 1b provide age-specific incidence rates for males and females using the three methods for calculating incidence. The naïve method yields peak incidence between 15 and 19 years of age. The diagonal and model-based methods consistently yields higher estimates, particularly among females.

Figures 2a and 2b provide cumulative incidence rates for males and females using the naïve and modeled methods. Cumulative incidence could not be calculated for the diagonal method because age-specific incidence for the youngest age group could not be estimated.

Figure 1a: Male five-year age-specific incidence rates of current migraine headache comparing the model method, the diagonal method, and the naive method.

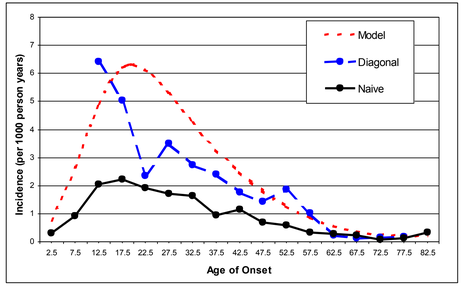

Figure 2a: Male five-year age-specific cumulative incidence rates of current migraine headache comparing the model method and the naive method.

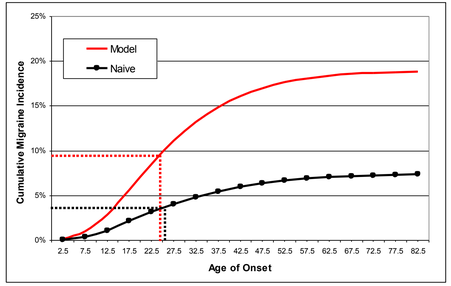

Figure 1b: Female five-year age-specific incidence rates of current migraine headache comparing the model method, the diagonal method, and the naive method.

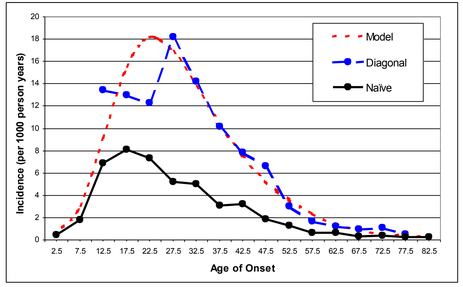

Figure 2b: Female five-year age-specific cumulative incidence rates of current migraine headache comparing the model method and the naive method.

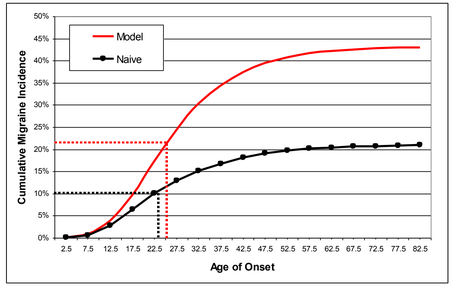

Table 1. Median age of onset and cumulative incidence for males and females using alternative methods.

	Naive	Diagonal	Model
Males:			
Median Age of Onset	25.5	21.2	24.1
Cumulative Incidence	7.5%	NA*	18.0%
Females:			
Median Age of Onset	23.2	26.1	25.2
Cumulative Incidence	21.0%	NA*	43.0%

*Not calculated because age-specific incidence for the youngest age group could not be estimated.

CONCLUSIONS

Comparison of "naïve" age-specific estimates to "diagonal" estimates (recent onset cases only) reveals the influence of recall and survey errors on incidence estimates. For example, In Figure 1b, the female age-specific **diagonal** estimates are substantially higher than the corresponding age-specific **naïve** estimates.

The "model" based estimates suggest that cumulative lifetime risk of migraine is substantially higher than estimates of one-year prevalence and that the median age of onset occurs long after puberty for both males and females.

Given the prevalence of active migraine in the population and the estimated cumulative incidence from this study, duration of illness, on average, is likely to be short for the majority of people with migraine.

The sharp contrast between the "naïve" and "diagonal" methods suggest the active cases represent only a share of the total historical cases and that a majority of migraine cases have remitted.

While "model" based estimates of cumulative risk are relatively high in this study for both males and females, they are consistent with or lower than what has been reported in previous prospective studies of migraine incidence[2,3,4].

REFERENCES

1. Stewart WF, Simon D, Shechter A, Lipton RB. Population variation in migraine prevalence: A meta-analysis. J Clin Epidemiol 1995;48(2):269-280.
2. Breslau N, Lipton RB, Stewart WF et al. Comorbidity of migraine and depression: Investigating potential etiology and prognosis. Neurology 2003;60(8): 1308-1312.
3. Nachit-Ouinekh F, Dartigues JF, Chrysostome V et al. Evolution of migraine after a 10-year follow-up. Headache 2005;45(10):1280-1287.
4. Lyngberg AC, Rasmussen BK, Jorgensen T, Jensen R. Incidence of primary headache: A danish epidemiologic follow-up study. AJE 2005;161(1): 1066-1073.
5. Rasmussen BK, Jensen R, Schroll M, Olesen J. Epidemiology of headache in a general population - a prevalence study. J Clin Epidemiol 1991;44(11): 1147-1157.
6. Patten SB. Recall bias and major depression lifetime prevalence. Soc Psychiatry Psychiatr Epidemiol 2003;38(6):290-296.
7. Stewart W, Brookmyer R, Van Natta M. Estimating age incidence from survey data with adjustments for recall errors. J Clin Epidemiol 1989;42(9): 869-875.
8. Stewart WF, Linet MS, Celentano DD et al. Age- and sex-specific incidence rates of migraine with and without visual aura. Am J Epidemiol 1991;134 (10):1111-1120.
9. Stewart WF, Lipton RB, Celentano DD, Reed ML. Prevalence of migraine headache in the united states. relation to age, income, race, and other sociodemographic factors. JAMA 1992;267(1):64-69.
10. Lipton RB, Scher AI, Kolodner K et al. Migraine in the united states: Epidemiology and patterns of health care use. Neurology 2002;58(6):885-894.
11. The international classification of headache disorders: 2nd edition. 2004;24 Suppl 1:9-160.
12. Wagenaar WA. My memory: A study of autobiographical memory over six years. Cognitive Psychology 1982;10(225):252.
13. Kalbfleisch J, Prentice R. The statistical analysis of failure time data, new york: Wiley, 1980; New York: Wiley, 1980.
14. Cox D, Oakes D. Analysis of survival time data. : Chapman and Hall, 1984.

Poster presented at the 2006 annual meeting of the American Headache Society, Los Angeles, California, USA.

This study was sponsored by the National Headache Foundation via a grant from Ortho-McNeil Neurologics, Inc.
IRB review was conducted by the Committee on Clinical Investigations at Albert Einstein College of Medicine.