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Occurrence of Alzheimer Disease in Michigan: An Epidemiologic Review of Rates and Risk Factors

Christine Cole Johnson, PhD*

Alzheimer disease is a progressive degenerative neurological disorder of insidious onset characterized by the deterioration of cognitive functioning. Little is known about the etiology and epidemiology of this condition. The only risk factor consistently associated with Alzheimer disease is advancing age. As the population of the elderly continues to grow, many public agencies, including those in Michigan, are concerned about social, personal, and financial implications and seek estimates of the number of people with dementia. To date, mortality rates based on vital statistics have been noninformative because Alzheimer disease is difficult to diagnose clinically and has been considered to be a nonspecific sign of aging, rarely appearing as an underlying cause of death on death certificates. Incidence rates from 100 to 1,500 new cases per 100,000 persons per year have been measured among older adults. Reported prevalence ratios range from 3 to 15.3 per 100 persons aged 65 and older. Prevalence estimates for Michigan indicate that an additional 49,000 to 130,000 cases will exist in the year 2030 compared to 1980. (Henry Ford Hosp Med J 1988;36:117-20)

Alzheimer disease is an unremitting, progressive degenerative disorder of insidious onset characterized by memory loss, confusion, and a variety of cognitive disorders. This incurable condition results in the deterioration of cognitive functioning and the ability for self-care. Pathologic findings include atrophy of the brain, a marked loss of neurons, neurofibrillary tangles, granulovacuolar changes, and neuritic plaques (1). No treatment offers substantial amelioration of symptoms. Only recently have the dementias been recognized as a disease distinct from aging.

One aim of epidemiology, as the basic science of public health, is to determine the occurrence of a disease in a population. Such information is the first step toward the search for risk factors and the assessment of the impact of a disease on a population. Since the aged population is increasing in Michigan and nationwide, government agencies are attempting to address the issues related to this disease. However, the study of the epidemiology of Alzheimer disease is in its infancy. Consensus diagnostic criteria have been established only recently (2,3). The disease is a clinical diagnosis of exclusion, and the criteria used to define cases have varied among descriptive epidemiologic studies. Risk factor studies for Alzheimer disease have appeared in the literature only in the last ten years (4).

A task force on Alzheimer disease and related conditions was formed in Michigan in early 1986. This report presents information that was gathered for the task force to assess the prevalence and potential for prevention of Alzheimer disease in Michigan.

Descriptive Epidemiology

Mortality

Mortality data from death certificates often yield valuable epidemiologic information, particularly for lethal diseases. However, Alzheimer disease, while considered by some to be the fourth or fifth most common cause of death and perhaps the most common cause among people over age 65, is not listed in the United States vital statistics tables, not even in the extended listing of 263 causes of death (1,5). When an acute event leads to death in a cancer victim, for instance, the cancer is appropriately listed as an underlying cause of death. However, dementia has been ignored, with the most common underlying cause of death in a patient with Alzheimer disease being pneumonia and other respiratory conditions, followed by cardiovascular-related difficulties (1,6). This inaccuracy probably results from dementia being considered as a nonspecific sign of aging.

Mortality data nevertheless reflect the predominant feature of Alzheimer disease—the striking increase of disease with age. Considering the tremendous degree of underreporting, annual mortality rates for this disease have been reported to be 1.2 per 100,000 for persons aged 60 to 65 and a corresponding rate of 11.6 for those over age 65 (4). In 1984, Michigan's annual mortality rate for Alzheimer disease for persons aged 65 and older was 13.2 per 100,000, with corresponding rates of 14.0 for males and 12.7 for females. These mortality data also exhibited a substantial increase with age, ranging from 2.1 per 100,000 in those aged 60 to 64 to 24.9 for those aged 75 and older.

A life-shortening effect is usually associated with the diagnosis of Alzheimer disease (6,7). Early death associated with this disease is most common among males, older patients, and
those in poor physical condition (7). One study reported that 74-year-old patients diagnosed with Alzheimer disease had a life expectancy of 5.1 years versus the expected 9.6 years, while for 60-year-old patients the life expectancy dropped from 23.1 to 7.1 years (1). However, because of improvements in mortality for the aged through progress in medical care, people suffering from dementia have experienced improved survival (8).

Prevalence

The prevalence ratio, the number of cases per number of persons in a given population at a specified time, is most useful in measuring the social and economic impact of a disease. Prevalence ratios include both newly occurring and continuing disease conditions; therefore, the duration of disease before cure or death contributes to the measure of prevalence. Aside from differences that may exist due to variations in populations, differences in disease criteria and diagnostic protocols can make comparisons between studies difficult.

Age-specific prevalence rates for dementia in general or Alzheimer disease specifically are unknown. However, despite the problems particularly associated with dementia and the usual caveats associated with observational studies, the reported prevalence ratios for broad age categories from both institutional and population surveys are fairly consistent. Conservative prevalence estimates approximate that 10% to 11% of the population aged 65 and older have mild dementia of all types. Severe dementia exists in 1% of the population under age 65, in 4% to 6% of those over age 65, and in over 15% of those past age 85 (1,7-10). These estimates are probably conservative due to a high degree of underreporting.

The majority of persons with dementia (at least 55%) have Alzheimer disease (10). Table 1 displays prevalence ratios from studies designed specifically to measure Alzheimer disease rather than all dementias combined (11-18). A recent California study, involving comprehensive diagnostic workups of subjects, yielded a strikingly high prevalence of Alzheimer disease: 15.3% among persons over age 65 in a retirement community (18).

Incidence

Incidence, the measure of the number of new cases per number of persons in a population over a specified time period, is of most value for etiologic studies but is usually more difficult to determine. For the dementias, incidence rates are even less available than prevalence data. Follow-up studies of British and Swedish elderly populations revealed incidence rates of 15 cases per 1,000 persons per year (4,8). The only United States population-based incidence study, from Rochester, Minnesota, measured an incidence rate of 1 per 1,000 in persons over age 29 (6); rates restricted to older age groups were not presented. Reported incidence rates generally increase exponentially with age and tend to be slightly higher in females. Little information exists regarding the variation of incidence by time, race and other personal characteristics, or geography, except that dementia is reported wherever older people are studied (5,7).

Risk Factors

The only generally accepted risk factor for Alzheimer disease is age, even within the elderly subgroup (1). Considering the conditions presenile dementia and senile dementia together as Alzheimer disease, as most investigators now regard them, the disease is rare before age 65 but becomes increasingly more common as age advances (5).

Only one study, in Mississippi, has systematically measured the prevalence of Alzheimer disease in a biracial population (17). For either sex, blacks unexpectedly had somewhat higher population prevalence ratios. Additionally, Alzheimer disease represented a higher proportion of all dementias in blacks compared to whites (6).

Other factors which have been suggested to be associated with Alzheimer disease are head injury, prior thyroid disease, and familial occurrence of dementia and the Down syndrome (2,7,19). A weak association with female gender has been suggested (7). Etiologic hypotheses have included associations with disorders of the immune system, slow viral infections, and toxic reactions to aluminum (20). However, no associations have been detected to date with toxic, environmental, or occupational exposures, animal contacts, socioeconomic status, tobacco, alcohol, diet, or diseases with altered immune responses (2,7). Diagnostic difficulties and the problems associated with people who are poor historians impede the collection of data and are considerations that must be addressed in future epidemiologic studies.

Prevalence of Alzheimer Disease in Michigan

One of the charges to the Michigan Task Force on Alzheimer’s Disease and Related Conditions was to estimate the present and future magnitude of this condition in Michigan. Since Alzheimer disease is neither a reportable or registered disease, nor reliably listed on death certificates, prevalence estimates can best be obtained by applying prevalence ratios reported in study...
populations to the population projections for Michigan for the elderly age groups.

Table 2 presents the predicted number of Alzheimer disease cases in Michigan from 1980 to 2040. A conservative estimate of 4.2 cases per 100 persons aged 65 and older (11) and the most recently reported prevalence projection of 11.2 (18) were used to calculate a range for the estimated number of cases. The same information for each county in Michigan is available from the author upon request.

**Discussion**

No one knows if the incidence of Alzheimer disease is increasing. Even the most basic descriptive statistics of this disease are difficult to obtain due to 1) the lack of mention of the condition on death certificates, and 2) a scarcity of studies that have systematically ascertained cases within a defined population. Reliable mortality rates would become available if Alzheimer disease was consistently listed on death certificates as the underlying cause of death; however, the validity of these rates would depend on the accuracy of diagnosis, which at this time is made definitive only through postmortem examination.

Mortality rates, incidence rates, and prevalence ratios could be determined through the eventual establishment of a population-based surveillance system or registry for Alzheimer disease, similar to programs that assess the occurrence of reportable infectious diseases or to cancer registries. Such systems could be developed on a regional or statewide basis and await the development of screening tools or markers that could be used to survey large populations.

Even if the incidence of Alzheimer disease is static, three factors will contribute to an inevitable epidemic of dementia in Michigan as well as nationwide, barring the discovery of preventive or curative measures. The first factor is based simply on demographics: due to previous birth rates and overall declines in mortality, an increasingly larger percentage of the population in Michigan will be over age 65 in the next decades. The US census projects that the proportion of the population aged 65 and older will increase from 11.2% in 1980 to 15.5% in 2020, and there is no reason to believe that Michigan's population will differ (6). Second, the mortality rates for the elderly are declining, particularly for those over age 80 who are at highest risk for Alzheimer disease (6,21). Third, persons with dementia are living longer; the duration of the disease has been lengthened as medical advances in the last 30 years have delayed death from intercurrent infections, especially pneumonia (22).

Based on this information, the task force made three recommendations. First, physicians in Michigan (and nationwide) should be encouraged and instructed to include Alzheimer disease as an underlying cause of or contributor to death when death certificates are completed. Careful and accurate completion of death certificates would yield valuable data for not only Alzheimer disease but other conditions of concern in public health. Second, consideration must be given to the possibility of eventual statewide or regional surveillance of Alzheimer disease. With current diagnostic technology, the implementation of these two recommendations would require that as many suspect cases as possible undergo autopsy or at least a comprehensive diagnostic evaluation. Third, the state should support laboratory, clinical, and population studies of Alzheimer disease by at least endorsing research projects, providing qualified researchers access to records, and if possible through financial support. In terms of epidemiology, few studies have been undertaken; work is needed in both the study of risk factors and in describing the natural history of the disease.

**References**