

Prevalence of Systemic Lupus Erythematosus in Hawaii: Is There a Difference Between Ethnic Groups?

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This population-based study in Hawaii collected cases of systemic lupus erythematosus from medical facilities and a patient support group. A total of 454 cases was found and the prevalence was estimated at 41.8 per 100,000 population for 1989. The prevalence odds ratio for all non-Caucasians compared to Caucasians was 1.2 (0.9-1.5), for Japanese 1.3 (1.0-1.7), for Filipinos 1.5 (1.1-2.0), for Chinese 2.4 (1.7-3.4), and for Hawaiians 0.8 (0.6-1.1). Mortality rates were 3 times higher for non-Caucasians than for Caucasians in 1985 to 1989. Despite the observed differences, it remains unclear whether individuals with Asian or Pacific Islander ancestry are at higher risk for systemic lupus erythematosus. The variation in prevalence rates may be a result of differences in access to medical care and in survival.

Systemic lupus erythematosus (SLE) is an autoimmune disease of unknown etiology and most commonly SLE involves skin, joints, and kidneys. Because of the higher rates in women during their reproductive years,¹ sex hormones are believed to have pathogenic importance. Genetic and environmental factors (including viruses) are also suspected.²⁻⁴

Reported ethnic differences in SLE prevalence may provide evidence for hereditary risk factors. Individuals of African⁵⁻¹⁰ and Native American¹¹⁻¹² descent are affected more often than Caucasians. While some studies have reported high prevalence rates among Chinese¹³ and other Asians,¹⁴⁻¹⁶ a study from Japan¹⁷ reports comparatively low prevalence rates (5 per 100,000). Evidence from New Zealand suggests higher rates for Polynesians.¹⁸⁻¹⁹ Most population-based studies have reported prevalence rates of 40 to 50 cases per 100,000 population.²⁰⁻²² Prevalence and incidence of SLE have slightly increased over the last 40 years, probably because of earlier diagnosis, increased awareness of SLE, and prolonged survival.²³⁻²⁵

The multiethnic composition of Hawaii allows a unique opportunity for exploring possible ethnic differences in SLE

prevalence. Two hospital-based studies were performed on Oahu. Serdula²⁶ estimated a prevalence rate of 14.6 per 100,000 for 1975; Catalano²⁷ a rate of 22.4 per 100,000 for 1980. Both studies concluded that prevalence rates for SLE were higher for Japanese, Hawaiians, Chinese, and Filipinos than for Caucasians. Since many SLE patients never require hospitalization, the prevalence of SLE found in the hospital-based studies was probably an underestimate of the true prevalence. Also, hospitalization may have occurred preferentially for certain ethnic groups. Therefore, the current study was designed to estimate prevalence of SLE in Hawaii among the general population.

Methods

The diagnosis of SLE is based on criteria published by the American Rheumatism Association (ARA).²⁸ However, for the purposes of this study, any patient who had been given a diagnosis of SLE by a physician was considered a case. In

TABLE 1.—Demographic Characteristics of 454 Systemic Lupus Erythematosus Patients in Hawaii, 1989.

| | No. | % |
|------------------------|-----|----|
| <i>Sex</i> | | |
| Male | 53 | 12 |
| Female | 401 | 88 |
| <i>Ethnicity</i> | | |
| Chinese | 46 | 10 |
| Filipino | 63 | 14 |
| Hawaiian/Part Hawaiian | 52 | 11 |
| Japanese | 127 | 28 |
| Caucasian | 97 | 21 |
| Others | 69 | 15 |
| <i>Age</i> | | |
| <20 years | 41 | 9 |
| 20-39 years | 176 | 39 |
| 40-59 years | 174 | 38 |
| 60 years and older | 63 | 14 |

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conversations with the physicians, many of whom were rheumatologists, it was ascertained that they applied the ARA criteria. Two SLE case-finding strategies were used:

1. Five medical centers, 5 rheumatologists, 8 nephrologists, and 190 primary care physicians were contacted and asked for information on every case of SLE they had seen during 1988 and 1989. Social Security Number (SSN), age, sex, zip code, and ethnicity were abstracted from the medical records. A one-page questionnaire requesting demographic and medical information was mailed to each patient whenever the physician/medical facility agreed.

2. The Hawaii Lupus Foundation, a state-wide patient support group, sent a copy of the questionnaire to all 500 individuals on their mailing list.

Data on cases obtained from both sources were entered into a computerized data base and duplicates were eliminated by matching for SSN. Prevalence rates were calculated using population estimates by age, sex, and ethnicity for 1989 from the Hawaii Health Surveillance Program (an unpublished report). Ethnicity information from this annual household survey is considered more reliable than census information because the ethnic categories used in the census are inappropriate for Hawaii's ethnically diverse population, especially because of the many children from mixed marriages. Six categories of ethnicity (Hawaiian, Japanese, Chinese, Caucasian, Filipino, other) were used for classification. Individuals with any percentage of Hawaiian ancestry were classified as Hawaiians. The category "other" includes individuals with mixed non-Hawaiian, unknown, and other ancestries.

A model with prevalence rates for SLE as the dependent

variable, and sex, age, and ethnicity as independent variables, was constructed using logistic regression.²⁹ All deaths coded 710.0 (ICD-9) systemic lupus erythematosus were obtained from the state records of deaths for 1985 to 1989 and age-adjusted mortality rates were calculated. Statistical analysis was performed using the SAS® software package.³⁰

Results

Altogether 588 cases of SLE were identified: 206 through rheumatologists and nephrologists, 159 through hospital records, 56 through primary care physicians, 46 through the Pediatric Arthritis Center, and 121 through the Lupus Foundation. After deleting duplicates, 454 prevalent cases remained, giving an estimated SLE prevalence rate of 41.8 per 100,000 population in 1989.

The cases are predominantly women and distributed across all ethnic groups (Table 1). Prevalence rates vary by sex, age, and ethnicity (Tables 2 and 3). Results of the logistic regression (Table 4) show statistically significant increased SLE prevalence odds ratio for individuals of Chinese and Filipino ancestry when compared to Caucasians. Observed differences for the other ethnic groups failed to demonstrate statistical significance. Rates of all non-Caucasians compared to Caucasians were insignificantly higher.

Seven hundred sixteen questionnaires were mailed: 500 to members of the Lupus Foundation and 216 to patients identified through medical records. One hundred thirty (26%) of the former and 87 (40%) of the latter were returned. Of the 217 returned questionnaires, 199 were usable for analysis, reflecting 78 cases identified through the medical system only, 73 identi-

TABLE 2.—Estimated Prevalence of Systemic Lupus Erythematosus among Females, Hawaii, 1989.

Rates are per 100,000 population.

| Age | Total | | Chinese | | Filipino | | Hawaiian/ Part Hawaiian | | Japanese | | Others | | Cauca- sian | | Non- Cauca- sian | |
|---------------|-------|------|---------|------|----------|------|-------------------------------|------|----------|------|--------|------|----------------|------|------------------------|------|
| | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate |
| <20 | 33 | 20 | 4 | 93 | 10 | 67 | 6 | 13 | 3 | 18 | 8 | 16 | 2 | 7 | 31 | 23 |
| 20-39 | 161 | 91 | 17 | 244 | 33 | 173 | 20 | 68 | 35 | 109 | 30 | 77 | 26 | 51 | 135 | 106 |
| 40-59 | 150 | 127 | 11 | 172 | 14 | 98 | 14 | 78 | 50 | 149 | 20 | 115 | 41 | 146 | 109 | 121 |
| 60+ | 57 | 70 | 7 | 98 | 3 | 38 | 5 | 69 | 18 | 49 | 7 | 80 | 17 | 133 | 40 | 59 |
| All | 401 | 74 | 39 | 157 | 60 | 107 | 45 | 44 | 106 | 88 | 65 | 57 | 86 | 71 | 315 | 76 |
| Age- adj.* | | 74 | | 161 | | 104 | | 53 | | 81 | | 68 | | 71 | | 78 |

* Age adjusted by the direct method to the total population of Hawaii, 1989.

fied though the Lupus Foundation only, and 48 cases identified by both. Forty percent of cases had never been hospitalized because of SLE, 49% had been hospitalized 1 to 9 times, and 11% more than 9 times. Among the patients who had never been hospitalized, 35% were Caucasian, whereas only 12% of those who had been hospitalized at least once were Caucasian. For Caucasians the mean number of hospitalizations related to SLE was 1, and for all others it was 2.7. SLE patients identified through the Lupus Foundation differed in almost all characteristics from the cases identified through medical records (Table 5). SLE Mortality rates were low for all ethnic groups, but 3 times higher for non-Caucasians than Caucasians (Table 6).

Discussion

The prevalence rate of 41.8 per 100,000 is consistent with other reports.^{9,20-21} Nevertheless, it probably underestimates the true prevalence rate. Patients suffering from a mild form of SLE, who have infrequent contact with the medical system or who are treated by primary care physicians in rural areas, could have been missed in this study. The fact that 60% of the foundation members were not located through the medical system suggests either that a considerable number of SLE patients may have been missed or that these members were not true cases. If a proportionate number of patients who are not members of the Foundation were missed, there could be as many as 950 SLE patients in the state or nearly 90 per 100,000 population. For many reasons, that appears unlikely. However, some self-reported diagnoses may not have been confirmed cases of SLE. If only cases identified through medical records were considered prevalent cases, the estimated prevalence rate becomes 36.2 per 100,000, still much higher than reported in both previous studies.

A major shortcoming of this study lies in its reliance on physician diagnosis rather than the ARA diagnostic criteria.

However, 365 out of 454 (80%) cases were identified through rheumatologists, nephrologists, and hospitals. Based on conversations with many of these physicians, the authors feel confident that the ARA criteria had been applied by these specialists. Therefore, ascertainment bias should be fairly small.

Although access to medical care is estimated to be above 95% in Hawaii,³¹ Hawaiians and Filipinos, who form a larger part of the population in rural parts of the islands, were more likely to be missed during the case-finding process. Therefore, the prevalence rates for these ethnic groups are probably underestimates. Low health care utilization among Hawaiians may also have resulted in higher mortality due to SLE and lower prevalence of SLE. The rate for Chinese is less stable because of the relatively small Chinese population.

Compared to both earlier Hawaii hospital-based studies,²⁶⁻²⁷ the two- to threefold higher prevalence rate in 1989 can be explained by the inclusion of SLE patients who never had been hospitalized. Forty percent of SLE patients in this study had never required hospital care. Caucasians experiencing fewer hospitalizations could explain the large ethnic differences found in the earlier studies. The results of this study differ from the earlier findings of a statistically significant increased prevalence rate for non-Caucasians. It has been documented that Caucasians have a later onset and a milder course than other ethnic groups.³² The threefold increased SLE-related mortality for non-Caucasians in this study supports that finding. On the other hand, the differences in mortality could be a result of differences in medical care. Since Serdula's study,²⁶ the mortality rate for non-Caucasians has decreased by 50%, possibly a result of improved medical care.

Since prevalence is a result of both incidence and mortality, cross-sectional studies do not allow direct risk measurement; hence risk inference must be interpreted with caution. Although

TABLE 3.—Estimated Prevalence of Systemic Lupus Erythematosus among Males, Hawaii, 1989.

Rates are per 100,000 population.

| Age | Total | | Chinese | | Filipino | | Hawaiian/ Part Hawaiian | | Japanese | | Others | | Caucasian | | Non-Caucasian | |
|-----------|-------|------|---------|------|----------|------|-------------------------------|------|----------|------|--------|------|-----------|------|---------------|------|
| | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate | No. | Rate |
| <20 | 8 | 5 | 0 | 0 | 2 | 11 | 2 | 4 | 1 | 6 | 2 | 4 | 1 | 3 | 7 | 5 |
| 20-39 | 15 | 8 | 2 | 36 | 1 | 6 | 4 | 12 | 6 | 18 | 1 | 2 | 1 | 2 | 14 | 11 |
| 40-59 | 24 | 21 | 4 | 59 | 0 | 0 | 1 | 6 | 11 | 36 | 1 | 6 | 7 | 22 | 17 | 21 |
| 60+ | 6 | 8 | 1 | 19 | 0 | 0 | 0 | 0 | 3 | 10 | 0 | 0 | 2 | 15 | 4 | 6 |
| All | 53 | 10 | 7 | 34 | 3 | 5 | 7 | 7 | 21 | 19 | 4 | 3 | 11 | 8 | 42 | 10 |
| Age-adj.* | | 10 | | 27 | | 5 | | 7 | | 17 | | 3 | | 8 | | 10 |

* Age adjusted by the direct method to the total population of Hawaii, 1989.

significant differences between Caucasians and certain Asian ethnic groups (Chinese and Filipino) were observed, this difference in prevalence may not be a result of an increased risk for SLE but it could be from differences in medical care, diagnosis, and mortality.

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TABLE 5.-Comparison of Questionnaire Data for SLE Patients in Hawaii, 1989.

A.-Recruited through medical system
 B.-Recruited through medical system and Lupus Foundation
 C.-Recruited through Lupus Foundation only

| | A | B | C |
|-----------------------------------|----|-----|-----|
| Number of cases | 78 | 48 | 73 |
| Mean age in 1989 (years) | 38 | 34 | 48 |
| Mean age at onset (years) | 27 | 22 | 29 |
| Mean age at diagnosis (years) | 29 | 25 | 37 |
| Oahu residents (%) | 80 | 83 | 95 |
| Proportion Caucasian (%) | 6 | 17 | 37 |
| Proportion Filipino (%) | 18 | 17 | 4 |
| Proportion Japanese (%) | 38 | 25 | 23 |
| Skin disease (%) | 56 | 68 | 71 |
| Kidney disease (%) | 62 | 53 | 30 |
| Joint disease (%) | 91 | 81 | 80 |
| Hospitalizations for SLE | 3 | 2.5 | 1.6 |
| Morbidity (days during last year) | 58 | 46 | 46 |
| Born in Hawaii (%) | 83 | 69 | 63 |

TABLE 4.-Prevalence Odds Ratio (POR) and 95% Confidence Interval for Demographic Variables in SLE Patients in Hawaii, 1989.

| Variable | POR | 95% CI |
|-------------------------------------|-----|---------|
| Sex (female/male) | 7.5 | 5.6-9.9 |
| Age (20-39yrs/<20yrs) | 3.7 | 2.6-5.1 |
| Age (40-59yrs/<20yrs) | 5.2 | 3.7-7.3 |
| Age (60 and over/<20yrs) | 2.5 | 1.7-3.8 |
| Ethnicity (Japanese/Caucasian) | 1.3 | 1.0-1.7 |
| Ethnicity (Filipino/Caucasian) | 1.5 | 1.1-2.0 |
| Ethnicity (Chinese/Caucasian) | 2.4 | 1.7-3.4 |
| Ethnicity (Hawaiian/Caucasian) | 0.8 | 0.6-1.1 |
| Ethnicity (Non-Caucasian/Caucasian) | 1.2 | 0.9-1.5 |

TABLE 6.-Age-specific Death Rates for SLE in Hawaii, 1985 to 1989.
 Rates are per million population per year.

| Age | Caucasians | | Non-Caucasians | |
|-------------|------------|------|----------------|------|
| | No. | Rate | No. | Rate |
| 0-19 years | 0 | 0 | 3 | 2.1 |
| 20-39 years | 1 | 1.9 | 10 | 8.1 |
| 40-59 years | 1 | 3.8 | 8 | 9.6 |
| 60+ years | 1 | 6.3 | 9 | 15.6 |
| Total | 3 | 2.4 | 30 | 7.5 |