First-Ever Stroke Incidence and 30-Day Case Fatality in the Sicilian Aeolian Archipelago, Italy

Rosa Musolino, MD; Paolino La Spina, MD; Salvatore Serra, MD; Paolo Postorino, MD; Salvatore Calabrò, MD; Rodolfo Savica, MD; Giovanni Salemi, MD; Giuseppe Gallitto, MD, PhD

Background and Purpose—Not many data on stroke epidemiology come from studies on islands. This is the first report on a Mediterranean archipelago population.

Methods—Using recommended criteria, from July 1, 1999, to June 30, 2002, information was collected on first-ever stroke and 30-day case fatality in Aeolian island residents (13 431).

Results—The overall crude incidence rate was 154 of 100 000 (95% CI, 118 to 197; 128 in men and 180 in women) or 180, 154, and 87, if adjusted to the Italian, European, and world populations, respectively. The 30-day case fatality rate was 24.2% (95% CI, 14.22 to 36.75).

Conclusions—Besides genetic or dietary factors, our results may reflect local, limited possibilities of diagnosis and management for stroke patients. (Stroke. 2005;36:2738-2741.)

Key Words: epidemiology incidence stroke

Although stroke epidemiology is investigated worldwide,1,2,3 few studies have been performed on islands.4,5,6 This is the first report providing comparable data on stroke in a Mediterranean archipelago population.

Subjects and Methods

The Aeolian archipelago (116.1 km²) includes 7 volcanic islands off the northeast Sicilian coast. The climate is typically Mediterranean. In-migration and out-migration is very limited. At the 2001 census, the study population (13 431) was not significantly different from the Italian population (Figure). Moreover, it had not changed very much in the last 10 years (+1% comparing Census 1991 with 2001). Agriculture, fishing, and tourism are the main activities.

Medical care (free of charge) is supplied only by the National Health Service (NHS) through 10 general practitioners (GPs), 10 first aid stations, and a general hospital without computed tomography (CT) equipment. The nearest NHS referral centers (in Sicily) are Milazzo, with a neurological division and CT equipment, and Messina, with multiple facilities.

The study was based on “standard ideal criteria,” including World Health Organization (WHO) definition, first-ever-in-a-lifetime stroke, complete case ascertainment based on multiple overlapping sources, and prospective study design.1 It was performed from July 1, 1999, to June 30, 2002, thanks to the full cooperation of all Aeolian physicians and GPs in particular, who were trained to fill in a clinical schedule to notify the team of suspected stroke cases. Whenever possible, patients were hospitalized in our neurology unit in Messina to undergo assessment. In nonhospitalized patients, diagnosis was based mainly on the reports of local doctors after all potential cases had been revised and discussed with them. To achieve complete case ascertainment, we contacted GPs monthly and verified: Aeolian first aid station and hospital registries; records of mobile emergency services; admission and discharge lists from the island general hospital, the medical and neurological hospital divisions in Milazzo and Messina and from the university departments of medical (including geriatric unit) and neurological sciences (including neurology, neurosurgery, and intensive care unit) in Messina; and death certificates of Aeolian residents.

Crude incidence rates together with 95% CIs for single binomial proportions were calculated by the exact approach (2001 census). Standardized rates were obtained by the direct method with 10-year age grouping of the Italian, European,7 and WHO world population8 as standards, and CIs, by assuming Poisson Distribution (No. of events over time) as model. Correlations between risk factors and stroke type were conducted in 2×2 tables either by χ² or by the Fisher exact approach.

Results

A first-ever stroke was confirmed in 62 of 92 cases (mean age 72.5±9.92; range 46 to 91 years of age), 26 men (mean age 71.5±10.3; range 53 to 91 years of age), and 36 women (mean age 74.6±9.61; range 46 to 90 years of age). Among them, 51 (82.2%) were hospitalized and had brain CT examinations. Of the 30 excluded patients, 16 had transient ischemic attacks (TIAs), 8 recurrent stroke, and 6 other
pathologies. The overall crude incidence rate was 154 of 100 000 (95% CI, 118 to 197) or 180 (95% CI, 154 to 208), 154 (95% CI, 130 to 180), and 87 (95% CI, 69 to 107), if adjusted to the Italian, European, and world populations, respectively. Age- and sex-specific incidence rates are detailed in Table 1. Forty-two patients (67.8%) had cerebral infarction, 8 (12.9%) intracerebral hemorrhage, 1 (1.6%) subarachnoid hemorrhage, and 11 (17.7%) ill-defined stroke.

No significant associations were found between risk factors, including hypertension (62%), cardiopathy (29%), diabetes mellitus (26%), hyperlipidemia (16%), atrial fibrillation (12%), previous TIA’s (6%), and cigarette smoking (20%), and both major stroke types.

The overall 30-day case-fatality rate was 24.2% (95% CI, 14.22 to 36.75), 23.1% in men (95% CI, 8.97 to 43.65), and 25% in women (95% CI, 12.12 to 42.20). Six men and 9 women (mean age 79.2; range 52 to 90±9.9 years of age) died within 30 days because of the qualifying stroke (n=12) or cardiovascular events (n=3). Among them, 8 had ill-defined, 4 ischemic, and 3 hemorrhagic stroke.

### Discussion

In the Aeolian population, we found a lower incidence rate of first-ever stroke, crude or adjusted to the Italian and European populations, respectively, than that reported in most impor-

<table>
<thead>
<tr>
<th>TABLE 1. Age and Sex-Specific Incidence Rates for First-Ever Stroke (cases per year per 100 000) in the Aeolian Archipelago</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Group, y</strong></td>
</tr>
<tr>
<td><strong>Cases, Persons/y</strong></td>
</tr>
<tr>
<td>&lt;45</td>
</tr>
<tr>
<td>45–54</td>
</tr>
<tr>
<td>55–64</td>
</tr>
<tr>
<td>65–74</td>
</tr>
<tr>
<td>75–84</td>
</tr>
<tr>
<td>&gt;84</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

6770 83.6–187.5 6661 126.2–249.3 13431 118.0–197.2

Adjusted to Italian population 146 212 180

Adjusted to European population 123 185 154

123.2–171.7 184.4–242.5 154.6–208.3

102.2–146.8 159.3–213.7 130.6–180.3

95% CI overlapping rejects significant statistical differences at 0.05 level.
TABLE 2. Incidence Rates of First-Ever Stroke in the Age Groups 55–84 Years (cases per year per 100 000) of Some Comparable Studies, Standardized to European and to WHO World Standard Population 2000 to 2025

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>European</th>
<th>WHO World Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeolian Islands (Italy)</td>
<td>1999 to 2002</td>
<td>490 (434.86–549.45)</td>
<td>454 (413.20–497.74)</td>
</tr>
<tr>
<td>South London (United Kingdom)</td>
<td>1995 to 1996</td>
<td>457 (416.58–500.88)</td>
<td>444 (403.66–487.28)</td>
</tr>
<tr>
<td>Arcadia (Greece)</td>
<td>1993 to 1995</td>
<td>538 (493.43–585.44)</td>
<td>514 (470.52–560.42)</td>
</tr>
<tr>
<td>Vibo Valenta (Italy)</td>
<td>1996</td>
<td>554 (508.82–602.11)</td>
<td>514 (470.52–560.42)</td>
</tr>
<tr>
<td>Fredericksberg (Denmark)</td>
<td>1989 to 1990</td>
<td>643 (594.25–694.68)</td>
<td>623 (575.03–673.90)</td>
</tr>
<tr>
<td>L’Aquila (Italy)</td>
<td>1994</td>
<td>704 (652.95–757.98)</td>
<td>664 (614.49–716.48)</td>
</tr>
<tr>
<td>Melbourne (Australia)</td>
<td>1995 to 1996</td>
<td>776 (722.35–832.57)</td>
<td>735 (682.82–790.11)</td>
</tr>
</tbody>
</table>

95% CIs in parentheses.

tant international studies on first-ever stroke incidence2,3 adhering to standard criteria.4 Even after standardization to the European7 and WHO population8 for patients 55 to 84 years of age (Table 2), our incidence rate appears among the lowest compared with similar Italian9,10 or international studies.2,3 Investigations performed on small islands may offer some advantages: the population is often static and genetically homogeneous; lifestyle is usually healthier than in continental areas; and GPs represent a valid point of referral. The weaknesses of this model include small sample size and reduced availability of special healthcare services.2

Previous reports on islands include wider areas with larger (and better-served) heterogeneous populations. In particular, an incidence rate from 159 to 240 (standardized to world population) was found in a multiethnic population of Auckland, New Zealand,4 where Maori and Pacific people showed a significantly higher estimate relative risk of stroke than Europeans, probably related to higher risk factors. On Martinique,5 as well as in Barbados,6 in black people, the incidence (151 and 131, standardized to the European population) was lower than that reported from the United States and the United Kingdom, suggesting a significant role of the acculturation process.4

In Italy, the highest incidence of stroke, (standardized to the Italian and European population) was reported in the L’Aquila district (237 and 228), a central mountainous area,9 and the lowest in Vibo Valenta (199 and 136), in the south of the peninsula.10 However, in L’Aquila, the standard of health care was higher than in Vibo Valenta or the Aeolian archipelago.

Our 30-day case fatality rate was in the high range of those usually reported.3 However, comparison is hard because of the small number of patients, the high percentage of ill-defined strokes, and the particular medical setting. Difficulty in getting access to specialized referral centers might explain this datum.

On the basis of the present study, the reliability of our results is disputable. Epidemiological studies on stroke may reflect age distribution of the study population1 as well as variation in ascertainment methods.11 On the Aeolian islands, the proportion of subjects >65 years of age (15.64%) was insignificantly lower than in Italy (18.25%) but very similar to that in Europe (15.8%).2 Because of the particular geographic, cultural, and healthcare situation, patients with mild manifestations could have been missed because of misdiagnosis or because they did not come under medical observation. Moreover, patients labeled as TIA, who may represent additional cases, were not assessed.11

Of course, a small, isolated population may not be very representative of a country because of a restricted gene pool and special dietary habits.1 In the Aeolian population, information on the prevalence of risk factors is not available. Diet based on Mediterranean food, and some literature data suggest that habitual intake of fruit and vegetables,12 and above all fish,13 is protective against stroke, particularly ischemic stroke. However, stroke patients may be underestimated and inadequately treated because of the lack of specialized facilities locally. Perhaps a more appropriate planning of healthcare strategies aimed at improving diagnosis and management of stroke might display a different situation.

Acknowledgments

We are grateful to A. Carolei and C. Marini, Department of Internal Medicine and Public Health Care, Neurological Clinic, University of L’Aquila, for their helpful criticism, and to the general practitioners of the Aeolian Archipelago (Drs Bernava, Pairo, Basile, Biancheri, Formica, Fama, Iachino, Giambò, Saltalamacchia, Ideno, Longhitano, Merenda, Casterovinci, Pappalardo, Federico, and Rando) and to the directors of neurology, hospital divisions in Messina (Drs Petitto and Nastasi) and Milazzo (Dr Caliri) for their invaluable collaboration.

References


First-Ever Stroke Incidence and 30-Day Case Fatality in the Sicilian Aeolian Archipelago, Italy
Rosa Musolino, Paolino La Spina, Salvatore Serra, Paolo Postorino, Salvatore Calabró, Rodolfo Savica, Giovanni Salemi and Giuseppe Gallitto

Stroke. 2005;36:2738-2741; originally published online November 10, 2005;
doi: 10.1161/01.STR.0000190907.88846.df
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2005 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/36/12/2738

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/