

Short Communication

## TRENDS IN STROKE MORTALITY ON AN ISOLATED OKINOSHIMA ISLAND IN JAPAN

(stroke mortality/isolated island/epidemiology)

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(Received Oct. 31, 1986/Accepted Dec. 21, 1986)

Trends in stroke mortality on an isolated Okinoshima island were studied during a period of 19 years from 1964 through 1982. To calculate the standardized mortality ratio (SMR) and indirect standardized death rate, death certificates of island residents for the observed period were studied. There was a downward trend in stroke mortality on the island. The SMR values indicate that the stroke mortality was lower than the average for Japan. There were significant relationships between the indirect standardized death rate and the percentage of employment in agriculture and fishing and the livelihood protection rate.

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Many epidemiological studies on stroke have been carried out in various areas in Japan (1-4). The mortality from stroke in Japan appears to have been on the decrease, and death from cancer occupied first place in 1981. The downward trend of stroke mortality may be partly explained by an improvement in the dietary habits, life styles, and community medical and health activities. Further studies in detail are needed to clarify the

reasons of the decreasing stroke mortality in the various areas in Japan.

Since 1982 we have engaged in activities to prevent cardiovascular diseases in fishing communities on an isolated island (one of the Okinoshima Islands) in Japan. We have studied the trends in stroke mortality on the island during the 19 years from 1964 through 1982. The purposes of the present study were to determine whether there is a downward trend of stroke mortality on the island, and to correlate the trends with the lives of the residents and the community medical and health activities.

The isolated island of Nishinoshima (one of the Okinoshima Islands) is located in the Japan Sea about 44 km north of Shimane Peninsula. There are fifteen villages on the island. The total population was 4,830 in 1980. Most of the people are engaged in fishing, small-scale agriculture, and tourist services. To analyze trends in stroke mortality, we examined the death certificates of residents on the island from 1964 to 1982. The period was divided into four parts to determine the trend of stroke mortality in a small population. Periods I, II, III, and IV corresponded to 1964-1968, 1969-1973, 1974-1978, and 1979-1982, respectively. The following indications were calculated: mean number of deaths from stroke per year, crude stroke death rate, standardized mortality ratio (SMR), mean age at stroke death. The SMR was calculated by the indirect method (5). The national censuses and the reports for operation of the Kuroki Health Center for the period were studied to determine the industrial structure, economic conditions, and community medical and health activities on the island. The statistical method used was the correlation coefficient for relationship between stroke-death parameters and trends relative to life and community medical and health activity.

Table 1 shows the trends of various stroke-death parameters. The mean number of deaths per year in periods I and IV decreased from 21.0 to 12.3, and the crude death rate from 359.6 to 253.5. The SMR in period I was 1.01. This rate was slightly higher on the island than the average for Japan. Then the SMR decreased to 0.81 in period IV. There was also an appreciable decrease in the indirect standardized death rate. Its rate in periods I and IV decreased from 176.01 to 113.31. The decreasing rate in the indirect standardized death rate for 40-64-year-olds was greater than that for those over 65. This tendency may be due to the

Table 1. Trends in various indications for stroke death (Both sexes)

	period I 1964 - 1968	period II 1969 - 1973	period III 1974 - 1978	period IV 1979 - 1982
population size	5840	5210	5089	4830
mean number of deaths per year	21.0	17.2	13.4	12.3
crude death rate*	359.6	330.1	263.3	253.5
standardized mortality ratio (SMR)				
total	1.01	0.81	0.74	0.81
40-64 years old	0.83	0.48	0.63	0.62
65 and more years old	1.02	0.85	0.74	0.82
indirect standardized death rate*				
total	176.01	142.51	115.70	113.31
40-64 years old	143.59	73.68	69.58	50.71
65 and more years old	1934.75	1635.76	1168.35	1027.87
mean age at death (or $\pm$ S.D.)	76.0 $\pm$ 12.1	77.4 $\pm$ 11.2	77.5 $\pm$ 12.9	75.6 $\pm$ 11.6

\* per 100,000 persons

Table 2. Trends in various indications for stroke death by sex (Male)

	period I 1964 - 1968	period II 1969 - 1973	period III 1974 - 1978	period IV 1979 - 1982
population size	2824	2503	2423	2319
mean number of deaths per year	9.6	7.0	8.2	5.3
crude death rate*	339.9	279.7	338.4	228.5
standardized mortality ratio (SMR)				
total	0.96	0.70	0.96	0.75
40-64 years old	0.89	0.23	0.90	0
65 and more years old	0.94	0.78	0.95	0.82
indirect standardized death rate*				
total	182.22	133.34	157.63	106.64
40-64 years old	206.21	46.61	128.59	0
65 and more years old	2044.44	1706.64	1685.19	1169.30
mean age at death (or $\pm$ S.D.)	73.9 $\pm$ 13.4	75.7 $\pm$ 10.4	74.4 $\pm$ 13.0	75.6 $\pm$ 13.3

\* per 100,000 persons

undertaking for preventing stroke and the improvement in the life habits on the island, because the effect of community and health activities for preventing stroke is shown faster in the middle age. A declining trend in stroke mortality in Japan since 1965 has been demonstrated (6). The stroke mortality on the island since 1971 gave a declining trend. The mortality decreased in accordance with the average for Japan, and in periods II-IV it decreased faster than the Japan average.

Table 3. Trends in various indications for stroke death by sex (Female)

	period I 1964 - 1968	period II 1969 - 1973	period III 1974 - 1978	period IV 1979 - 1982
population size	3016	2707	2666	2511
mean number of deaths per year	11.4	10.2	5.2	7.0
crude death rate*	387.0	376.8	195.0	278.8
standardized mortality ratio (SMR)				
total	1.06	0.91	0.54	0.87
40-64 years old	0.74	0.87	0.23	1.55
65 and more years old	1.08	1.11	0.58	0.81
indirect standardized death rate*				
total	167.72	145.61	81.34	118.77
40-64 years old	89.82	95.73	18.43	93.83
65 and more years old	11824.55	1849.25	817.26	926.64
mean age at death (or $\pm$ S.D.)	78.2 $\pm$ 10.3	78.5 $\pm$ 11.7	82.3 $\pm$ 11.3	75.6 $\pm$ 10.4

\* per 100,000 persons

Table 4. Trends of various indications relative to industrial structure, economic conditions, and community medical and health activity

	1965	1970	1975	1980
over 15 years old (%)	61.8	59.7	53.2	55.4
employment in agriculture and fishing (%)	49.4	42.5	36.0	30.8
livelihood protection (per 1,000 households)	25.57	31.07	28.66	13.20
hygiene-cost from total cho-finance (%)	4.39	3.06	7.71	5.07
number of PHN* (per 1,000 residents)	0.68	0.96	0.71	1.14
number of doctors	5	6	4	4
number of households visited by PHN for cardiovascular diseases	67	1469	247	935
participant-rate in health examinations for cardiovascular diseases (%)	29.5	19.7	23.0	26.8

\* public health nurse

As shown in Tables 2, the SMR for males ranged from 0.96 to 0.70 for the observed period. The trend decreased from periods III to IV. In females (Table 3), the SMR and the indirect standardized death rate decreased in periods I to III, then increased from period III to period IV. It should be noted that the SMR for females 40-64 years old in period IV was 1.55, and the indirect standardized death rate in period IV was higher than that for males.

Trends relative to industrial structure, economic conditions, and community medical and health activity are shown

in Table 4. There were significant ( $p < 0.005$ ) relationships between the indirect standardized death rate and the percentage of employment in agriculture and fishing ( $r = 0.756$ ) and the livelihood protection-rate ( $r = 0.656$ ). The downward trend in stroke mortality may be due mainly to the change in livelihoods as indicated by the industrial structure and economic conditions. Also it seems that the increasing number of public health nurses and the special undertaking for preventing stroke supported by the Ministry of Health and Welfare in period II partly influenced the declining trend in stroke mortality on the island.

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