

Stroke in Trinidad and Tobago: Burden of illness and risk factors

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ABSTRACT

This study describes the burden of stroke on hospital services in a Caribbean community. The settings are the two main acute general hospitals in Trinidad observed over a 12-month period. All subjects were admitted with a clinical diagnosis of acute stroke. The measures were hospital admission rates, length of hospital stay, case-fatality rates, disability at discharge, and risk factors for stroke. There were 1 105 hospital admissions with a diagnosis of stroke. The median length of stay was 4 days, with an interquartile range of 2 to 9, and stroke accounted for approximately 9 478 bed days per annum. The hospital admission fatality rate was 29%. Among surviving patients, 437 (56%) were severely disabled at discharge. Age-standardized admission rates for first strokes in persons aged 35–64 years were 114 (95%CI: 83 to 145) per 100 000 in Afro-Trinidadian men and 144 (109 to 179) in Indo-Trinidadian men. The equivalent rates for women were 115 (84 to 146) and 152 (118 to 186). Among patients with first strokes, 348/531 (66%) reported physician-diagnosed hypertension, but only 226 (65%) of these reported being on antihypertensives at admission. Stroke in Trinidad and Tobago is associated with a high case-fatality rate and severe disability in survivors. Modifiable risk factors were reported in a majority of stroke cases, and there is a need to develop effective preventive strategies.

As populations of middle-income countries have aged, non-communicable diseases have increased in importance, and causes of death have increasingly resembled those found in industrialized nations. Cerebrovascular disease has emerged as an important cause of death in the Caribbean region. PAHO reported age-standard-

ized cerebrovascular mortality rates of 19 per 100 000 in the United States compared with 55 in Trinidad and Tobago, 54 in Jamaica, and 59 in St. Vincent and the Grenadines (1). Cerebrovascular mortality has decreased substantially in industrialized countries (2), but in the Caribbean its decline has been more recent and more modest (3, 4). Mortality statistics underestimate the burden of stroke, but few data are available concerning its occurrence, survival and disability in stroke cases, or the relevance of risk factors. In this study our aim was to collect descriptive data concerning all patients admitted to the hospital with stroke on the Caribbean island of Trinidad over a 12-month period (from September 1994 through August 1995 in one of two urban hospitals,

and from October 1994 to September 1995 in the other). We wanted to evaluate the occurrence of stroke by relating hospital admissions to a defined catchment population as denominator and to describe risk factors encountered in stroke cases.

MATERIALS AND METHODS

The study was part of a research program approved by the Ministry of Health of Trinidad and Tobago. The island of Trinidad has two main general hospitals which are situated in the northern city of Port of Spain and the southern city of San Fernando. According to official statistics, these hospitals account for 92% of all medical hospital admissions on the island (5).

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We counted stroke admissions over a 12-month period from September 1994 to August 1995 at Port of Spain Hospital, and from October 1994 to September 1995 at San Fernando Hospital. We followed the definition and general methods (history, physical examination, and clinical investigation) used by others to identify and evaluate cases of stroke (6, 7). A nurse fieldworker visited admitting wards daily and identified patients whom the attending medical staff had diagnosed as having acute stroke on the basis of WHO's case definition (6). In uncertain cases, the details were reviewed jointly by two of the authors (Bickram and Gulliford), and if the diagnosis was equivocal, or if clinical assessment revealed a cause for stroke other than vascular origin, then the case was excluded. Clinical records were reviewed concurrently, not retrospectively. The validity of the clinical diagnoses made by attending medical staff was not evaluated further, but the reliability of data collection procedures was evaluated on a random sample of 41 patients with satisfactory results.

Data collected included age, date of birth, gender, ethnic group classified according to the fieldworker's subjective impression (8), and whether this was a first time stroke or a recurrence. We also recorded whether symptoms or signs were still present 24 hours after onset. When possible, we interviewed the patient, a relative, or other informant to obtain information concerning the following risk factors: whether a doctor ever told the subject he/she had high blood pressure; whether the subject had ever taken antihypertensive medication and was on it before this admittance; how many times a week the subject walked more than a mile at one time; whether the subject drank any alcohol during most weeks (and how much); whether the subject currently smoked; if not, how long since he/she had stopped and how many cigarettes he/she used to smoke. The presence of hypertension was assessed in three ways, according to clinical diagnosis, according to the WHO definition (BP = 160/95 mm Hg or treatment with antihypertensive

drugs) or according to the response to the question: "Did a doctor ever tell you that you had high blood pressure?" Finally, we recorded the date of discharge and vital status at discharge. Physical functioning at discharge was assessed by the Barthel score (9), with a score of nine or less indicating severe disability. Admission rates were calculated using the population of Trinidad as the denominator (10). Using the world population as a reference, age-standardized rates (and their 95% confidence intervals [95%CI]) were estimated separately for all admissions and for admissions with confirmed first strokes. Associations between admission rates and age, gender, and ethnicity were tested by using logistic regression analysis.

RESULTS

During the 12-month study period for each hospital, 1 139 patients were admitted with rapidly developed focal disturbance of cerebral function hav-

ing no apparent cause other than vascular. Thirty-four patients had symptoms or signs lasting less than 24 hours and were excluded from the study, leaving 1 105 patients admitted with stroke. There were 294 cases with recurrent strokes, and in 23 cases it was not known whether this was a first or recurrent episode. Thus 788 strokes were considered to be first episodes. Table 1 shows the distribution of cases according to age, gender, and ethnic group. There were 325 in-hospital deaths, for a hospital admission fatality rate of 29%. Overall 437 (56%) of the surviving patients had a Barthel score of nine or less at discharge, consistent with severe disability. The median length of stay was 4 days. Total hospital bed occupancy from stroke in Trinidad was estimated to be 9 478 bed days per annum.

Table 2 gives number of strokes by age and age-specific admission rates for all stroke admissions. Analysis by logistic regression confirmed the expected age effect, but there were significant interactions between age and

TABLE 1. Characteristics of patients admitted to the hospital, by gender

	Men (<i>n</i> = 534) No. (%)	Women (<i>n</i> = 571) No. (%)
Age-group (years)		
≤34	5 (1)	7 (1)
35-44	19 (4)	33 (6)
45-54	56 (10)	76 (13)
55-64	137 (26)	107 (19)
65-74	171 (32)	152 (27)
75+	139 (26)	186 (33)
Not known	7 (1)	0 (2)
Ethnic group		
Afro-Trinidadian	247 (46)	262 (46)
Indo-Trinidadian	202 (38)	216 (38)
Mixed	50 (9)	66 (12)
Other and not known	35 (7)	27 (5)
First stroke	375 (70)	413 (72)
Deaths from stroke	156 (29)	169 (30)
Barthel score at discharge		
0 to 9	206 (55)	231 (58)
10 to 19	136 (36)	129 (32)
Not known	36 (10)	42 (10)
Length of stay (days) ^a	4 (2 to 8)	4 (2 to 9)

^a Figures are median (interquartile range).

TABLE 2. Hospital admission rates for all stroke cases by age (in years), gender, and ethnic group

	Hospital admissions per 100 000 (number of cases) ^a					
	<35	35–44	45–54	55–64	65–74	≥75
Men						
Afro-Trinidadian	3 (4)	25 (6)	91 (14)	506 (58)	892 (89)	1388 (73)
Indo-Trinidadian	1 (1)	23 (7)	189 (37)	536 (60)	900 (59)	1269 (36)
Mixed	0 (0)	32 (3)	32 (2)	254 (11)	345 (11)	1230 (21)
Other and not known	– (0)	– (3)	– (3)	– (8)	– (12)	– (9)
Women						
Afro-Trinidadian	2 (2)	46 (11)	139 (21)	312 (37)	729 (74)	1590 (113)
Indo-Trinidadian	2 (3)	59 (17)	228 (46)	464 (54)	728 (53)	1221 (39)
Mixed	3 (2)	19 (2)	74 (5)	251 (12)	503 (19)	951 (26)
Other and not known	– (0)	– (3)	– (4)	– (4)	– (6)	– (8)

^aData for 17 admissions whose ages were "not known" are not shown.

sex and between age and ethnic group. In the younger age groups, admission rates were higher in women than in men, but at older ages admission rates were similar for both sexes. In those under 65 years of age, admission rates were higher in Indo-Trinidadians than in Afro-Trinidadians, while at older ages admission rates were similar in these two ethnic groups. Admission rates tended to be lower in those of mixed ethnicity than in those of either African or East Indian descent. Age-standardized admission rates (and their 95%CI) for first strokes in the 35 to 64-year age group were 114 (83 to 145) per 100 000 in Afro-Trinidadian men and 144 (109 to 179) in Indo-Trinidadian men. The equivalent rates for women were 115 (84 to 146) and 152 (118 to 186) per 100 000.

Risk factors assessed through interviews are shown in Table 3. Data were analyzed for 531/788 (67%) patients with confirmed first strokes from whom interview data were obtained. Approximately one-third of cases had a clinical diagnosis of diabetes, which was more frequent among Indo-Trinidadians and among women. Approximately two-thirds of those studied were found to have hypertension. Of the 348 patients reporting that a doctor had told them they had high blood pressure, 303 (87%) reported taking medication for high blood pressure at some time, but only 226 (65%) reported doing so at the time of ad-

mission. In this predominantly older group of subjects, most (73%) reported that they never walked more than a mile at a time. Self-reported use of alcohol was low, and lower in women than in men. In men the frequency of current smoking ranged from 25% to 33%. Fewer women were smokers, but cigarette smoking was similar in the different ethnic groups.

DISCUSSION

This study provides one of the first descriptions of morbidity from stroke in a Caribbean community. The results

show that stroke is common and is accompanied by high hospital admission rates, but outcomes are poor with a high case fatality rate and severe disability in surviving subjects. A majority of stroke cases had modifiable stroke risk factors, indicating an unmet need for stroke prevention.

Our report studied both the main hospitals in Trinidad, accounting for 92% of admissions, and it included an entire year of study in each hospital. One fieldworker made all of the observations, and the reliability of data recording was documented. The study suffers from the weakness that it is hospital-based. We did not attempt to identify non-hospital cases, which would have presented significant practical difficulties and required more resources. We relied on clinical diagnoses made by attending medical staff—a justifiable assumption since acute stroke usually presents as a readily recognizable entity, but we acknowledge the possibility of unreliable diagnoses in a few cases.

The hospital admission rates reported are comparable with the higher estimates reported for stroke incidence by Malmgren (11) and by the WHO MONICA project (12). The conclusion that the incidence of stroke is unusually high in Trinidad and Tobago is consistent with the high age-specific mortality rates reported there (3). Vari-

TABLE 3. Risk factors assessed in 523 of a total of 531 patients admitted into the hospital with first strokes

	Total ^a (n = 531) No. (%)	Afro-Trinidadian		Indo-Trinidadian	
		Men (n = 133) No. (%)	Women (n = 130) No. (%)	Men (n = 98) No. (%)	Women (n = 108) No. (%)
Clinical diagnosis of diabetes	176 (33)	29 (22)	38 (29)	29 (30)	49 (45)
Clinical diagnosis of hypertension	353 (66)	77 (58)	95 (73)	55 (56)	73 (68)
BP ≥ 160/95 mmHg or treated	367 (69)	90 (68)	95 (73)	70 (71)	74 (69)
Told by doctor blood pressure high	348 (66)	87 (65)	97 (75)	52 (53)	72 (67)
Ever taken medicine for high BP	303 (57)	71 (53)	84 (65)	45 (46)	67 (62)
Taking medicine for high BP now	226 (43)	54 (41)	55 (42)	35 (36)	54 (50)
Never walks more than a mile at one time	386 (73)	89 (67)	102 (78)	60 (61)	96 (89)
Drinks no alcohol	459 (86)	101 (76)	127 (98)	73 (74)	105 (97)
Current cigarette smoker	87 (16)	30 (23)	9 (7)	30 (31)	8 (7)
Ex-smoker	46 (9)	24 (18)	5 (4)	7 (7)	4 (4)

^aOf first strokes with risk factor data, 54 were of mixed ethnicity and in eight cases the ethnic group was "not known."

ations in stroke mortality seem to reflect variations in incidence more than in case fatality (7). Ethnic differences among persons admitted to the hospital with stroke were also consistent with incidence and mortality data. Miller (13) reported results from the St. James Cardiovascular survey, a cohort study carried out in Port of Spain, Trinidad, which included 1 343 men and 1 149 women aged 35 to 69 years. These patients received follow up for approximately 7 years, and there were 88 cardiovascular deaths and 32 cerebrovascular deaths. In this age group the incidence of stroke was higher among Indo-Trinidadians than Afro-Trinidadians (relative risk 1.6). Miller concluded that hypertension was the predominant risk factor in the Afro-Trinidadian population, while diabetes was relatively more important in the Indo-Trinidadian population.

Data from Trinidad and Tobago in the INTERSALT study suggested that blood pressure and sodium intake were not unusually high, but these data were collected from a semi-rural community in Tobago where diet and other lifestyle risk factors may be different from those in Trinidad (14). In our study, diabetes was more frequent among Indo-Trinidadians, but the frequency of hypertension was similar among cases from the different ethnic groups. About two-thirds of cases had

diagnosed hypertension, but of these only 65% were receiving antihypertensive treatment at the time of admission. Cigarette smoking was likely to be a significant risk factor in men only in this community. In these older subjects, consumption of alcohol and participation in physical exercise appeared to be relatively infrequent, but further investigation of the effect of life-long exposures is needed. In Tobago, overall alcohol use was also low in the INTERSALT data (14), but alcohol use was found to be a significant predictor of mortality in a prospective study of Tobagonians (15).

In a recently published review of the global burden of stroke, it was argued that primary prevention of stroke through population strategies aimed at reducing the prevalence of risk factors was likely to be the most cost-effective approach to reducing the disease burden (4). Clinical management of hypertension has been shown to reduce the risk of stroke by up to 40% (16). Rutstein (17) argued that cerebrovascular disease could be considered amenable to medical intervention and that strokes should be considered sentinel events that draw attention to the effectiveness of public health and clinical services for the control of hypertension and other risk factors. In Trinidad and Tobago, government and private clinics provide good ac-

cess to primary care with some success at detecting and initiating treatment for hypertension. In an audit, however, we found that successful blood pressure control was only achieved in a minority of treated subjects, as had been reported in North America (18). Demographic change means that conditions like stroke will impose an increasing burden on the health care systems and economies of countries in Latin America and the Caribbean over the coming decades. The present survey serves to highlight the considerable burden of stroke on hospital services and the poor outcomes achieved. Identifying, evaluating, and implementing strategies to reduce the population risk of stroke by reducing harmful exposures, especially elevated blood pressure, should therefore be an important priority for researchers and health decision-makers.

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REFERENCES

1. Pan American Health Organization. Volume 1: *Health conditions in the Americas*. 1990 edition. Washington, DC: PAHO; 1990.
2. Uemera K, Pisa Z. Trends in cardiovascular disease mortality in industrialized countries since 1950. *World Health Stat Q* 1988; 41:155-178.
3. Gulliford MC. Epidemiologic transition in Trinidad and Tobago 1953-1992. *J Epidemiol* 1996; 25:357-365.
4. Kalache A, Aboderin I. Stroke: The global burden. *Health Policy Planning* 1995; 10: 1-21.
5. Republic of Trinidad and Tobago, Office of the Prime Minister, Central Statistical Office. *Annual Statistical Digest 1992*. Port of Spain: Central Statistical Office; 1995.
6. Aho K, Harmsen P, Hatano S, Marquardsen J, Smirnov VE, Strasser T, on behalf of the participants in the WHO Collaborative Study on the Control of Stroke in the Community. Cerebrovascular disease in the community: Results of a WHO Collaborative Study. *Bull World Health Organ* 1980;58:113-130.
7. Wolfe CDA, Taub NA, Woodrow J, Richardson E, Warburton FG, Burney PGJ. Does the incidence, severity, or case fatality of stroke vary in southern England? *J Epidemiol Community Health* 1993; 47:139-143.
8. Gulliford MC, Ariyanayagam-Baksh SM, Bickram L, Picou D, Mahabir D. Counting the cost of diabetic hospital admissions from a multi-ethnic population in Trinidad. *Diabet Med* 1995;12:1077-1085.
9. Wolfe CDA, Taub NA, Woodrow EJ, Burney PGJ. Assessment of scales of disability and handicap for stroke patients. *Stroke* 1991;22:1242-1244.
10. Republic of Trinidad and Tobago. Office of the Prime Minister, Central Statistical Office, Volume II. *Age structure, religion, ethnic group, education*. In: 1990 population and housing census. Port of Spain: Central Statistical Office; 1994.
11. Malmgren R, Bamford J, Warlow C, Sandercock P. Geographical and secular trends in stroke incidence. *Lancet* 1987;ii: 1196-1200.
12. Thorvaldsen P, Asplund K, Kuulasmaa K, Rajakangas AM, Schroll M, for the WHO Monica Project. Stroke incidence, case fatality and mortality in the WHO MONICA project. *Stroke* 1995;26:361-367.

13. Miller GJ, Kirkwood BR, Beckles GLA, Alexis SD, Carson DC, Byam NTA. Adult male all-cause, cardiovascular and cerebrovascular mortality in relation to ethnic group, systolic blood pressure and blood glucose concentration in Trinidad, West Indies. *Int J Epidemiol* 1988;17:62-69.
14. INTERSALT Cooperative Study Group. Appendix tables, Centre-specific results by age and sex. *J Human Hypertension* 1989;3:331-407.
15. Patrick AL, Boyd-Patrick HA, Holder Y. Predictors of all-cause mortality in an island population of African descent, Tobago. *West Indian Med J* 1996;45(suppl 2): 30. (Abstract).
16. Collins R, Peto R, MacMahon S, Herbert P, Fiebach NH, Eberlein KA, et al. Blood pressure, stroke and coronary heart disease: II, Short term reduction in blood pressure: Overview of randomised drug trials in their epidemiological context. *Lancet* 1990; 335:827-838.
17. Rutstein DD, Berenberg W, Chalmers TC, Child CG III, Fishman AP, Perrin EB. Measuring the quality of medical care: A clinical method. *N Eng J Med* 1976;294: 582-588.
18. Mahabir D, Bickram L, Picou D, Gulliford MC. Quality of blood pressure monitoring and control in primary care in Trinidad and Tobago. *West Indian Med J* 1995;44(suppl 2):15. (Abstract).

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RESUMEN

Los accidentes cerebrovasculares en Trinidad y Tabago: carga de la enfermedad y factores de riesgo

En este estudio se describe la carga que imponen los accidentes cerebrovasculares sobre los servicios hospitalarios de una comunidad caribeña. Las instituciones examinadas fueron los dos hospitales generales de mayor importancia en Trinidad y el período de observación fue de 12 meses. Todos los sujetos fueron ingresados al hospital con un diagnóstico clínico de accidente cerebrovascular agudo. Las variables medidas fueron las tasas de ingreso al hospital, estancia hospitalaria, tasas de letalidad, discapacidad al egreso y los factores de riesgo de accidente cerebrovascular. Se ingresó a 1 105 casos con diagnóstico de accidente cerebrovascular. La estancia mediana fue de 4 días, con un recorrido intercuartílico de 2 a 9, y los accidentes cerebrovasculares ocuparon alrededor de 9 478 días-cama al año. La tasa de letalidad para los casos ingresados fue de 29%. De los pacientes que sobrevivieron, 437 (56%) sufrieron de alguna discapacidad grave al egreso. Las tasas de ingreso estandarizadas por edad en pacientes de 35 a 64 años con un primer accidente cerebrovascular fueron de 114 (IC95%: 83 a 145) por 100 000 habitantes en hombres trinitarios de ascendencia africana y de 144 (109 a 179) en hombres trinitarios de ascendencia india oriental. Las tasas correspondientes en mujeres fueron de 115 (84 a 146) y 152 (118 a 186). De los pacientes con un primer accidente cerebrovascular, 348/531 (66%) declararon tener hipertensión diagnosticada por un médico, pero solamente 226 (65%) de ellos indicaron estar tomando antihipertensivos cuando ingresaron. En Trinidad y Tabago los accidentes cerebrovasculares se asocian con una tasa elevada de letalidad y con discapacidades graves en los supervivientes. Se notificaron factores de riesgo modificables en la mayoría de los casos de accidente cerebrovascular y es necesario idear buenas intervenciones de tipo preventivo.