

Stroke incidence rates among black residents of Harare — a prospective community-based study

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Objective. To estimate the crude incidence rates of cerebrovascular accidents among the black residents of Harare.

Design. Prospective community-based study.

Setting. Black residents of Harare, Zimbabwe.

Participants. Two hundred and seventy-three 'first-ever' strokes prospectively identified over a 12-month period.

Main outcome study factors. Cerebrovascular accident first-week fatality rate; age-and sex-related incidence.

Results. The crude incidence rate was estimated to be 30.7 per 100 000 (95% confidence interval 27.1 - 34.4) and the standardised rate was 68 per 100 000. Fifty-one per cent of stroke victims were below the age of 54 years. Thirty-five per cent of patients died within 1 week of the stroke. Overall, the age-specific rates for both sexes rose with age, with the rates for women being higher at all age strata except for the group 45 - 54 years.

Conclusion. With a standardised rate of 68 per 100 000 and a first-week mortality rate of 35%, stroke must now be considered an important cause of morbidity and mortality in the population.

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Cerebrovascular disease, which is reported to be the third commonest cause of death in the developed world^{1,2} and among black Americans,³ is no longer thought to be a rare diagnostic curiosity in black populations south of the Sahara.

While stroke incidence and mortality in developed countries have shown a steady decline since the 1940s, which accelerated in the late 1960s,^{4,5} accurate information about stroke incidence and mortality among the black population of Africa is generally lacking. The general impression of physicians, based on hospital discharge records, is that stroke incidence and mortality may be rising in Zimbabwe and other African countries. This study was set up to estimate the age-specific stroke incidence rates for first-ever strokes among black residents of Harare.

Method

The city of Harare is served by two major teaching hospitals and two small private general hospitals. There are two infectious disease hospitals and a large number of primary care clinics, all under the auspices of the City Health Department. All acute medical cases are admitted through general practitioners or the city health clinics directly to one of the four general hospitals. The city health clinics do not have beds for acute medical cases and the general practitioners do not visit patients in their homes, and cannot refer cases of stroke to nursing homes before acute treatment and evaluation by physicians in the general hospitals.

Population

Data from the central statistical office show that Harare has a population of just over 1 million inhabitants, of whom 887 768 are black. The age distribution, like that of other populations of developing cities, is skewed to the left.

The mid-year population estimates (Table I) were obtained from projections by the Central Statistical Office. These projections used total and age-specific fertility rates, sex ratio and life expectancy at birth.⁷ There is an estimated 40% unemployment rate and those employed work in the manufacturing, retail and transport industries. A large proportion, mainly women, are involved in the informal sector, buying and selling and general food vending.

Table I. Harare 1991 mid-year population and 'world population'

Age (yrs)	Harare population ¹³	World population ¹⁹
0 - 14	316 932	31 000
15 - 24	165 126	17 000
25 - 34	199 747	14 000
35 - 44	106 532	12 000
45 - 54	56 817	11 000
55 - 64	28 409	8 000
65 - 74	10 653	5 000
> 75	3 552	2 000
Total	887 768	100 000

In the World Health Organisation stroke study, a minimum population of 100 000 was recommended as necessary to obtain an incidence rate with reasonable accuracy.⁸ Given Harare's population size, it was felt that observation could be limited to 12 months only, during which enough strokes could be expected for reasonably accurate estimates to be obtained.

Case surveillance

In Harare all cases of stroke would therefore initially be admitted to one of the four general hospitals, with the two teaching hospitals taking over 95% of black stroke patients. Stroke was defined according to the WHO definition⁹ and only cases of first-ever stroke in blacks who had been

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residing in Harare continuously in the last 6 months or more were registered.

The four hospitals were visited daily from Monday to Friday by two research nurses, and all medical wards were checked for any new cases of stroke admitted since the previous visit. The emergency department was also checked to compare the actual ward admissions and the cases passing through the emergency department. To ensure complete collection of all possible cases for the stroke register, monthly inspection of the postmortem register for any stroke cases found at autopsy was carried out; monthly hospital discharge summaries were also checked for all patients with a diagnosis of stroke. On the basis of the history and neurological examination the diagnosis was made by the admitting physician. Where the diagnosis was unclear, the case was reviewed and discussed by the investigator and the physician and an agreement was reached with the help of further investigations if indicated. No computed tomography scans of the brain were done.

Data analysis

The age-specific crude incidence rates were calculated using the mid-year 1991 black population of Harare. Age standardisation by the direct method¹⁰ was achieved using the 'world population'^{11,12} for comparing the results with similar studies done elsewhere.

Results

Age-specific incidence rates for stroke

A total of 488 cases of stroke were identified and registered over a 12-month period ending December 1991. One hundred and sixty-two patients were excluded because they were not residents of Harare. These were referred by surrounding district hospitals or brought by relatives from villages outside Harare. A further 53 were also excluded because they had had repeat strokes. Two hundred and seventy-three cases, 142 men and 131 women, were diagnosed as first-ever strokes and the age-specific incidence rates are based on these cases.

The total age-specific crude incidence rates (Table II) ranged from 5.4 for the age group 15 - 24 years to 788.3/100 000 for the age group 75 years and above. As expected, the age-specific incidence rose with age. The 95% confidence intervals were fairly narrow for the estimates of rates for all age groups except for the 75 years and above group (498 - 1 090), and the 15 - 24-year group (1.9 - 9.0). These wide confidence intervals are due to the small number of cases in the respective age groups, which makes the accuracy of the respective estimates somewhat uncertain. The total crude incidence rate for both men and women was 30.7 (95% confidence interval 27.1 - 39.4/100 000).

The crude age-specific incidence rates by sex (Table III) showed the same pattern as the total incidence rates, viz. a rise with age. The observation of interest here was that the rates for women were consistently higher at all age groups

except for the 45 - 54-year group in which the rate for men was higher (125.7 - 101.9). The overall rate among women was 32.0/100 000 compared with 29.7 for men, thus giving a male/female crude ratio of 1:1.08.

The standardised annual stroke incidence rate in the black population of Harare was found to be 68/100 000 (Table IV).

Table II. Total age-specific stroke incidence rates (per 100 000)

Age (yrs)	Stroke	Incidence	95% CI
0 - 14	-	-	-
15 - 24	9	5.4	1.9 - 9.0
25 - 34	20	10.0	5.6 - 14.0
35 - 44	44	41.3	29.0 - 53.0
45 - 54	67	117.9	89.7 - 146.0
55 - 64	55	193.6	142.0 - 245.0
65 - 74	50	469.3	340.0 - 599.0
> 75	28	788.3	498.0 - 1 080.0
Total	273	30.7	27.1 - 34.4

Table III. Crude stroke incidence rates (per 100 000) by sex and age

Age (yrs)	Men	Women	Male rates	Female rates	Total rates
0 - 14	-	-	-	-	-
15 - 24	2	7	2.4	8.7	5.4
25 - 34	8	12	7.4	13.1	10.0
35 - 44	14	30	22.9	66.3	41.3
45 - 54	48	19	125.7	101.9	117.9
55 - 64	34	21	174.1	236.5	193.6
65 - 74	25	25	402.3	563.2	469.3
> 75	11	17	619.2	957.2	788.3
Total	142	131	29.7	32.0	30.7

Table IV. Annual standardised stroke incidence rates (per 100 000) from three community-based studies

Study	Year	Rates
Oxfordshire ¹⁵	1981 - 82	101.0
Ibadan, Nigeria ¹⁷	1973 - 75	74.8
Harare	1991	68.0

Rates per 100 000 standardised to the 'world population'.

First-week case fatality rate

Of the 273 patients, 96 (35%) died within the first week after the stroke. Forty-four were men and 52 were women. The case fatality rate was higher for women (40 - 31%).

Discussion

Incidence rates

Stroke was defined as: an acute loss of focal or, at times, global cerebral function, symptoms lasting more than 24 hours or leading to death, with no apparent cause other than a vascular one.⁹ This WHO definition was used in the study to conform with other community-based incidence studies.¹³

There are a few major sources of bias in this type of study. The first is related to uncertainty about the denominator. Obtaining accurate denominators in developing countries is not easy. Fortunately censuses were conducted in Harare in 1982 and 1992. Although accuracy of the data is always debatable, we feel that the denominator was as accurate as it could be.

The second major source of bias in this type of study is due to incomplete ascertainment of cases. In developed countries, as many as 40 - 90% of stroke patients may be managed at home.^{14,15} The situation in Harare is different in the sense that there is no domiciliary visit by general practitioners and that all patients with symptomatic strokes are admitted directly to hospital. Referral to the few existing rehabilitation homes takes place after initial treatment of the acute event and subsequent assessment in the hospital.

The sources of cases found by the method of surveillance used in this study are shown in Table V. Autopsy rates are very low in this country for cultural reasons, which may be so strong that patients die in hospital before a clear diagnosis is established; they may therefore not undergo an autopsy. It is impossible to estimate how many more cases could have been found with higher autopsy rates than those applying to Zimbabwe. Deaths outside the hospital have to be cleared by the police in collaboration with the pathologists. One is confident that with the method used in this study of daily ward visits, weekly checks of the autopsy registers and monthly checks of the hospital discharge summaries, a minimal number of cases of new strokes during the study period would have been missed.

Table V. Sources of cases by hospital and area monitored

Source	Hospital				
	1	2	3	4	
Daily ward surveillance	107	86	42	29	
Emergency department*	-	2*	-	-	
Postmortem registers†	2	3	-	-	
Monthly discharge summaries	<u>2</u>	<u>1</u>	<u>1</u>	<u>0</u>	
Total	111	90	43	29	273

* The same two cases appeared in the postmortem register of hospital 2.

† Hospitals 3 and 4 have no emergency departments or mortuaries. Autopsy cases are transferred to the pathologists at the two teaching hospitals.

Although errors due to 'missed' cases are thought to be minimal in this study, the error caused by inclusion of 'sudden' neurological signs not of vascular origin cannot be estimated. With computed tomography, non-stroke cerebral lesions misdiagnosed as stroke range between 1.5% and 7%.^{15,16} Because no computed tomography was used in this study because of costs, the obtaining of a complete history and, where possible, eye-witness accounts was emphasised to minimise misdiagnosis.

This is the second community-based stroke incidence study of a black population south of the Sahara. The results for Harare are similar to those obtained in the only other study of this nature in Ibadan, Nigeria,¹⁷ with regard to the rise with age. These two studies, however, differ in respect of the male/female ratio. The overall male/female

standardised ratio was 1:1.13 compared with 2.6:1 in Ibadan. The stroke incidence rates by sex seem to differ from place to place. In the WHO stroke incidence study,⁹ for example, the rates were higher for women in the participating Scandinavian centres, whereas the incidence rates were higher for men in most of the Japanese centres.

This observed variation in male/female ratio of incidence rates cannot be readily explained. Prevalence of hypertension is also known to vary between sexes from population to population. The prevalence of hypertension is much higher among Zulu women in South Africa than among men in both rural and urban populations.¹⁸ Other reports within southern Africa suggest the opposite.¹⁹ The findings of higher rates among women in this study may suggest that the prevalence of hypertension, the most important risk factor, is higher in black Harare women than in men.

One can only speculate on the reasons for the higher case fatality rate in women at 1 week (44 men : 52 women). It may be that the pathological types of stroke are different. If hypertension as a risk factor is more common in women, then haemorrhagic stroke, which has a worse outcome, could be more common in this group and thus lead to a higher case fatality rate in women.

With a crude incidence rate for stroke of 30.7/100 000 and an age-standardised rate of 68/100 000, cerebrovascular accident has now to be considered an important cause of morbidity in the black population of Harare. Because of the age structure of the population, the mean age of stroke victims is much lower than in developed countries. The socio-economic burden on the family and nation resulting from stroke morbidity or premature deaths is likely to be immense, given lost earnings and treatment costs. Life expectancy for black Zimbabweans rose from 50.8 in 1969 to 56.4 in 1982 (Central Statistical Services, Zimbabwe) and is expected to exceed 60 years by the turn of the century. The ageing population and an increasing prevalence of cardiovascular risk factors associated with urbanisation (especially changes in dietary habits) are likely to lead to a sharp rise in the incidence rates of vascular disease, especially stroke, against the background of observed decline in stroke mortality rates in several developed countries.

Conclusions

The minimum crude incidence rate for stroke among black residents was found to be 30.7/100 000. The age-standardised rate was 68/100 000. The age-specific rates rise with age, with higher rates in women than in men.

Cerebrovascular accidents are major causes of morbidity and mortality in this population.

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