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STROKE-RELATED MORTALITY AT KORLE BU TEACHING HOSPITAL, ACCRA, GHANA
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STROKE-RELATED MORTALITY AT KORLE BU TEACHING HOSPITAL, ACCRA, GHANA

E. K. WIREDU and P. K. NYAME

ABSTRACT

Objectives: **To determine whether mortality from and the pattern of stroke have changed since the last study in Accra in 1981, the sites of the different types of stroke and the role of hypertension and cerebrovascular disease and to describe the age and sex distribution.**
Design: **Cross-sectional study of fatal stroke cases over a five-year period.**
Setting: **Korle Bu Teaching Hospital, Accra, Ghana.**
Subjects: **All fatal strokes in persons aged 20 years and above, confirmed at autopsy.**
Results: **Mortality from stroke constituted eleven per cent of autopsies carried out at the Korle Bu Teaching Hospital, Accra, in the five-year period 1994 to 1998. A similar study in 1981 showed the same proportion indicating that the proportion of deaths due to stroke has not changed. The overall male to female ratio was 1.2:1 but the relative risk (RR) of death from stroke was higher for females at 1.23 (95% Cl=l.10-1.38). Although haemorrhagic stroke was still more common than cerebral infarction the proportion (61%) was much less than that of the previous study (89%). Males were more likely (RR 2.07 95% Cl= 1.75-2.45) to die from haemorrhagic stroke than females (RR 1.32, 95% Cl=l.10-1.57). Sixty nine per cent of stroke patients died in less than 24 hours after onset of stroke. The peak age of fatal haemorrhagic stroke was 50-59 years and that of infarction was 60-69 years. Male mortality exceeded female mortality in all age groups up to 60-69 years after which female mortality became preponderant ($\chi 2$ with Yates correction = 4.28, 0.05>p<0.02). Hypertension was the dominant factor in haemorrhage and an important factor in infarction while cerebral atherosclerosis was the major factor in infarction. Haemorrhage into intraparenchymal sites, mainly the cerebral hemispheres, was more common than into the subarachnoid space.**
Conclusion: **The proportion of deaths from stroke in autopsy cases has not changed since the last study in 1981 and stroke still remains an important cause of death in Accra. Cerebral haemorrhage is still a more common cause of fatal stroke than infarction, although the pattern appears to be changing gradually. Females have a slightly greater risk of dying from stroke than males. A community-based study is needed to provide more insight into some aspects of the problem and to provide the basis for appropriate interventions and policy, especially with regard to a control of risk factors.**

INTRODUCTION

In the first study on mortality from cardiovascular diseases in Ghana, then Gold Coast, from 1921 to 1953, seventy three deaths out of 3,645 autopsied cases (2%) were due to stroke(1). However, more recent data suggest that stroke has become a major cause of morbidity and mortality(2). Anim in a series of 10,720 non-traumatic deaths in Accra from 1972-81 found the overall incidence of stroke as a cause of death to be 11%(3). Several studies of the pattern of stroke in Accra have shown that 60% to 90% of strokes are haemorrhagic(1-5). This pattern is consistent with that of other Black populations(6,7) but in disagreement with two studies from Nigeria(8,9).

Stroke, whether haemorrhagic or infarctive, is related to the level of blood pressure and hypertension is the most important risk factor for stroke. Several studies have indicated that treatment of hypertension considerably reduces the incidence of both fatal and non-fatal strokes(10). With the introduction of a market economy in Ghana, a wide variety of antihypertensive drugs, including newer and more potent ones, have become available in the country. Whether this has had any impact, or not, on incidence and mortality from stroke in the country has not been determined.

The specific purposes of this study therefore are to determine whether mortality from and the pattern of stroke have changed since the last study in Accra in 1981, and to describe the age and sex distribution of mortality

from stroke. In addition to these the sites of the different types of stroke and the role of hypertension and cerebrovascular disease are presented. Finally, these are compared with studies from other parts of the world.

MATERIALS AND METHODS

Cases studied: Post-mortem records of the Department of Pathology, University of Ghana Medical School and Korle Bu Teaching Hospital in Accra were examined for the five-year period 1994 -1998. The total number of natural or non-traumatic deaths was determined for each year for those 20 years of age and above. Deaths from stroke were determined and recorded according to type as haemorrhagic or infarctive. All cases of unnatural deaths, undetermined causes and deaths of subjects under 20 years of age were excluded(3).

Statistical analysis: Univariate analysis was done by the $\chi 2$ -test with Yates correction to compare proportions of deaths due to stroke between the sexes. Results were considered statistically significant for $p < 0.05$. The relative risks (RR) of death from stroke between the sexes and also from the different types of stroke and 95% confidence intervals (CI) were calculated using the Confidence Interval Analysis microcomputer programme (CIA, available from British Medical Journal, London).

RESULTS

A total of 9,760 deaths of persons aged 20 years and above from natural causes were autopsied during the five-year period 1994 to 1998 at the Korle Bu Teaching Hospital mortuary. Out of these, 1,086 cases were due to stroke, representing an average of 11.13% of all natural deaths for the period. Table 1 shows a breakdown of these figures. The overall male to female ratio was 1.2:1. There were 5,831 male deaths of which 594 (10.19%) were due to stroke and 3,929 female deaths with stroke accounting for 492 (12.52%) of these. This sex difference was statistically significant ($\chi 2$ with Yates correction = 12.7114, $p < 0.001$, 1 df; CI= 0.01-0.04). An estimate of the relative risk (RR) of death from stroke in females compared to males is 1.23 (95% CI = 1.10 to 1.38). Four hundred and eighteen of the males were referred by the coroner while 176 were hospital cases. Of the females, 331 were coroners' and 161 were hospital cases. Thus 69% of patients died outside a hospital or within 24 hours of admission to a hospital. There was no significant sex difference ($\chi 2$ with Yates correction=1.066, $p < 0.200$; 95% CI=-2.44 to 8.63).

Table 1

Incidence of stroke seen at autopsy

Year	No. of deaths			Strokes		
	Male	Female	Total	Male	Female	Total
1994	790	468	1,258	65	43	108
1995	806	535	1,341	105	105	210
1996	1437	978	2,415	132	114	246
1997	1433	1007	2.440	147	124	271
1998	1365	941	2,306	145	106	251
Total	5,831	3,929	9,760	594	492	1,086

Table 2

Types of stroke

Year	No. of strokes	Haemorrhagic		Infarctive		Combined	
		No.	%	No.	%	No.	%
1994	108	74	68.52	32	29.63	2	1.85
1995	210	129	61.43	73	34.76	8	3.81
1996	246	164	66.67	75	30.49	7	2.85
1997	271	151	55.72	117	43.17	3	1.11
1998	251	148	58.96	100	39.84	3	1.20
Total	1,086	666	61.32	397	36.56	23	2.11

Table 3

Age and sex distribution of stroke cases

Age group	Male				Female			
(years)	Haemorrhage	Infarction	Combined	Total	Haemorrhage	Infarction	Combined	Total
20 - 29	21	5	2	28	17	11	0	28
30 - 39	38	7	0	45	22	6	3	31
40 - 49	107	20	2	129	69	15	1	85
50 - 59	111	48	4	163	74	35	5	114
60 - 69	77	57	0	134	43	65	1	109
70 - 79	26	34	0	60	31	44	4	79
80 - 89	9	14	0	23	11	23	1	35
90 - 99	1	4	0	5	1	4	0	5
100 - 109	0	0	0	0	1	2	0	3
Not stated	5	2	0	7	2	1	0	3
Total	395	191	8	594	271	206	15	492

The stroke cases were further subdivided into the different types and their distribution is shown in Table 2. There was a preponderance of haemorrhagic over infarctive stroke (ratio of 1.7:1). In 0.24% of cases both types of stroke were present in the same patient. Table 2 also shows a gradual decline in the proportion of deaths due to haemorrhagic stroke (from 68.5% in 1994 to 59% in 1998) with a corresponding rise in the proportion of infarctive strokes (from 29.6% in 1994 to 39.8% in 1998). When the sex distribution of the types of stroke were examined (Table 3), there were more male deaths from haemorrhagic than infarctive stroke in the ratio of 2:1 with RR of death from haemorrhagic compared to infarctive stroke of 2.07 (95% CI= 1.75-2.45). In the females the ratio of haemorrhagic to infarctive strokes was 1.3:1 with RR of death from haemorrhagic compared to infarctive stroke of 1.32 (95% CI= 1.10-1.57). The age was stated in 587 of the males with a mean of 54.48 years (SD 14.22) while it was stated in 489 females with a mean of 57.57 years (SD 15.83). The age distribution is also shown in the Table 3. Haemorrhagic stroke showed a sharp rise in incidence in both sexes from the age group 40 - 49 years, reached a peak in the 50-59 years group and then declined. The incidence of infarctive stroke also showed a sharp rise in the same age group as in the haemorrhagic type but reached a peak a decade later. 55.7% of the strokes occurred in persons less than 60 years old with 32% occurring under the age of 50 years. Male mortality exceeded that of women in all age groups between 60 and 69 years with reversal of the trend thereafter. There was a preponderance of females in the older age groups with 47.2% being 60 years or older compared to 37.8% of males ($\chi 2$ with Yates correction = 9.33, $0.020>p<0.00$ 95% CI=3.51-15.30).

The haemorrhagic cases were grouped according to the site of the haemorrhage as shown in Table 4. There were more cases of intraparenchymal (88.1%) compared to subarachnoid haemorrhage (11.9%). Within the parenchyma, haemorrhage into the cerebral hemispheres was more common than into the pons and cerebellum in that order, with a slight preponderance in the right than left cerebrum in the cases where the specific site was stated. Sites of infarction followed roughly a similar pattern.

Table 5 shows the causes of the various types of stroke. Hypertension was the dominant factor in the development of stroke being involved in 76.7% of cases. It was the cause of haemorrhagic stroke in 616 persons of which 20 also had cerebral atherosclerosis, 15 also had chronic renal disease, nine had eclampsia and three had diabetes mellitus in addition. Atherosclerosis was the sole cause in one case while three cases were the result of ruptured mycotic aneurysms due to infective emboli from bacterial endocarditis. There were 18 miscellaneous causes comprising 13 ruptured cerebral berry aneurysm, four bleeding disorders and one case of ruptured vascular malformation. Hypertension was again a major cause in the infarctive strokes with 195 cases of which 98 also had cerebral atherosclerosis, eight had chronic renal disease and two had diabetes mellitus and one had eclampsia cerebral atherosclerosis was the sole cause of infarction in 140 persons. In 21 persons there were thrombotic phenomena in the form of thirteen cases of cerebrovascular thrombosis and eight thromboemboli from mural cardiac thrombi while six persons developed infarction as a result of septic emboli from bacterial endocarditis. The two miscellaneous causes were a case each of metastatic carcinoma of the breast and combined aortic stenosis and incompetence. No cause could be found for 28 cases of haemorrhagic strokes, which were deemed to be spontaneous haemorrhages, and 33 infarctive strokes.

Table 4

Site distribution of stroke

Type of stroke	Site of stroke							
	LT cerebrum	RT cerebrum	Cerebrum*	Pons	Cerebellum	Subarachnoid	Multiple sites	Total
Combined	–	–	–	–	–	–	23 (2.1%)	23 (2.1%)
Infarction	140 (12.9%)	167 (15.4%)	28 (2.6%)	7 (0.6%)	10 (0.9%)	–	45 (4.1%)	397 (36.6%)
Haemorrhage	194 (17.9%)	220 (20.3%)	61 (5.6%)	41 (3.8%)	34 (3.1%)	79 (7.3%)	37 (3.4%)	666 (61.3%)
Total	334 (30.8%)	387 (35.7%)	89 (8.2%)	48 (4.4%)	44 (4.0%)	79 (7.3%)	105 (9.7%)	1,086 (100.0%)

* side not stated

Table 5

Cause of stroke

Cause	Haemorrhage	Infarction	Combined
Hypertension	596 (89.5%)	97 (24.4%)	22 (95.7%)
Hypertension + C. Ather.	20 (3.0%)	98 (24.7%)	0 (0.0%)
Cerebral atherosclerosis	1 (0.2%)	140 (35.3%)	0 (0.0%)
Bacterial endocarditis	3 (0.5%)	6 (1.5%)	0 (0.0%)
Thrombotic phenomena	–	21 (5.3%)	0 (0.0%)
Others	18 (2.7%)	2 (0.5%)	0 (0.0%)
Not determined	28 (4.2%)	33 (8.3%)	1 (4.3%)
Total	666 (100%)	397 (100%)	23 (100%)

C. Ather. = Cerebral Atherosclerosis

Table 6

Comparison of sites of haemorrhagic stroke with a previous study

Site of haemorrhage	Present study	Anim. and Kofi (16)
Intracerebral	71.3%	70.6%
Cerebellar	5.1%	13.2%
Pons	6.2%	11.8%
Subarachnoid	11.9%	4.4%
Multiple sites	5.6%	–

Table 6 compares the sites of haemorrhagic stroke in this study to those of a previous study. Although the sites are similar, there is a reduction in the proportions of pontine and cerebellar haemorrhages with an almost three-fold increase in subarachnoid haemorrhage. In addition, haemorrhage into multiple sites accounted for 5.6% of cases but was not described in the previous study.

DISCUSSION

Mortality from stroke started declining in the western world, especially in the United States, from the beginning of the last century(11) with the rate of decline accelerating sharply in the early 1970s(12). The basis of this decline remains debatable. Some authors have attributed it to the reduction of risk factors, particularly the effective treatment of hypertension(11,13), while others have argued that this alone cannot adequately explain this decline(12,14). The results of this study show that the proportion of deaths due to stroke (11.1%) has not changed since 1981. Hypertension was the cause of or contributed to the development of stroke in 76.7% of cases. Stroke is related to the level of blood pressure, which is the most important risk factor. Treatment of hypertension, both diastolic and systolic, substantially reduces the incidence of stroke(10). Although the study could not determine the exact figure due to incomplete histories in many cases, a substantial proportion of the cases were not known to have hypertension before the development of stroke. It is possible therefore that the reason for this lack of change in the proportion of deaths from stroke is the high incidence of undiagnosed hypertension. Most Ghanaians do not see their doctor unless they feel unwell and this is a major contributory factor to this high level of undiagnosed hypertension. This explanation is supported by a previous report from this hospital in which 72 out of 181 hypertensives who died from stroke were undiagnosed hypertensives(16). In a study among blacks in Harare, 45% of patients with stroke had undiagnosed hypertension(6). Another possible explanation is that the case fatality rate of stroke may not have changed or may even have risen thus maintaining the proportion of overall deaths due to stroke in the face of a falling incidence. A third possible explanation is that perhaps the true incidence of death from stroke has fallen but so also have the true incidences of deaths from other causes so that the proportion of deaths from stroke has remained unchanged. Finally, it may be that although most persons with hypertension who died from stroke were diagnosed and put on therapy, economic hardship or simply non-compliance prevented adequate treatment of their hypertension. In the Harare study 45% of stroke patients with hypertension had defaulted in their treatment(6). As with most problems, the answer is probably a combination of all these possible reasons.

While the proportion of deaths due to stroke has not changed, the incidence of the types of stroke is changing. In the 1954 and 1981 studies, haemorrhagic stroke accounted for 90.4%(1) and 88.8%(3) respectively of all stroke mortality compared to 61.3% in this study. A recent study using CT scan of patients referred to this hospital(5) showed the proportion of haemorrhagic strokes to be about 60%, a figure closer to the findings of this study. Although the proportion of cerebral haemorrhage is declining and that of infarction is increasing, the pattern is still at variance with what obtains in Western countries where the incidence of cerebral infarction far exceeds that of haemorrhage. Yates observed a decline in the incidence of cerebral haemorrhage and a rise in cerebral infarction from 1900, with the two attaining near parity in 1953-54 and infarction exceeding haemorrhage from 1955-56(17). It is possible that this trend is beginning in the Ghanaian population, albeit at a slower pace, and we should expect infarction to exceed haemorrhage in time.

The overall male to female ratio in this study was 1.2:1, which is not much different from the 1.4:1 in the 1981 study. More males than females died from stroke in both studies. Despite this finding, females were more likely to die from stroke than males with a 1.2 relative risk. Mortality increased with age as has been shown by others(9,18,19). The peak age still remains 50-59 years but there appears to be an increase in the proportion of cases aged 60 years and above from 35.6% in 1981 to 41.9% in this study. However, disconcerting is the fact that still a considerable proportion of deaths, about a third occur below age of 50 years while more than half occur before 60 years, the retiring age. A similar finding was obtained in a South African study(19), which mentioned the social and economic consequences of this. This is at variance with the figures for United Kingdom and the U.S where the vast majority of deaths from cerebrovascular disease occur after 74 years of age(20). The high proportion of death from stroke in younger Ghanaians is not simply due to the relative young population in Ghana. Ghana has about 97% of her population below 64 years with just under 52% in the age group 15 to 64 years while the UK and U. S. have about 85% and 87% respectively below 65 years and 65% each of their populations in the 15 to 64 years age group. However, the proportions of fatal strokes from this age group in the UK and US are 7.6% and 12.6% respectively(20), a far cry from the more than 55% in the Ghanaian population. The actual reason for this vast difference needs to be investigated.

Male mortality from stroke exceeded that of females in all age groups less than 70 years. Thereafter, there is a slight female preponderance. A similar trend is seen in the UK and US but the female preponderance in later years is more marked(20). The sites of haemorrhagic stroke are similar to those found by Anim and Kofi(16). However, there is a reduction in the proportions of pontine and ceberellar haemorrhages with a marked increase in subarachnoid haemorrhage. The reason for the differences is not clear.

Stroke remains an important cause of death in Accra. As this and other studies have shown, the incidence of mortality from stroke, and indeed stroke itself, rises with age. As life expectancy rises and the Ghanaian population

ages, stroke would be expected to become an even more important cause of morbidity and mortality. The majority of cases, 69%, die very quickly before any medical intervention can take place. The data presented in this study provide only an indication of the extent of the problem. A community-based study is needed to provide more insight into the problem and to provide the basis for appropriate interventions and policy, especially with regard to control of risk factors, as prevention is the ideal strategy for containing stroke(13).

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