SUMMARY Since 1971, stroke registers in several countries have been cooperating in a study of stroke epidemiology, initiated by WHO. One of the registers covers the population of Frederiksberg, Copenhagen. During the first two years of registration strokes were recorded in 556 Frederiksberg citizens. A certain diagnosis of cerebral hemorrhage — verified by angiography, spinal fluid examination, or autopsy — was made in 10% of the patients; subarachnoid hemorrhage was demonstrated in only 2%; most of the remaining patients probably had cerebral infarction.

INFORMATION about the incidence, course, and prognosis of cerebrovascular disease is indispensable not only for epidemiological purposes, but also for the planning of community health care facilities. In order to provide such information, an international, cooperative stroke registration project was started in 1971, under the auspices of the World Health Organization (WHO). The project is based on "stroke registers" operating in selected communities in Europe, Asia, and Africa. The present paper, which is one of a series of preliminary reports from participating centers, deals with the incidence of stroke in a Danish urban community.

Methods

The Frederiksberg Stroke Register was set up in June, 1971, at Frederiksberg Hospital, Copenhagen, the aim being to carry out a prospective registration, evaluation, and follow-up of all patients with stroke in the local population. The routine work was done by members of the neurological staff, assisted by a specially appointed secretary and an interviewer, in cooperation with the Danish Institute for Clinical Epidemiology.

Study Area and Population

The municipality of Frederiksberg is an administratively independent, mainly residential district in Greater Copenhagen, with an area of 8.7 km² and a population of 98,000 (table 1). Compared with the Danish population as a whole, the Frederiksberg population includes higher proportions of old people and self-employed persons in the higher income brackets. There are about 40 general practitioners in the district, and one public hospital — Frederiksberg Hospital — to which nearly all patients with stroke requiring admission are referred, usually as emergencies. Treatment of stroke patients at home is unusual in Frederiksberg.

Case-Finding

The methods of case-finding were essentially the same as those described by other participants in the WHO-study. Patients admitted to Frederiksberg Hospital were registered either in a special unit designed for non-surgical emergencies, or in the medical or neurological wards. All general practitioners and staffs of nursing institutions in the district were asked to notify the register of all new strokes not referred to Frederiksberg Hospital; such patients were subsequently examined by a hospital neurologist, often in their homes. Information about fatal strokes occurring outside hospital was obtained by monthly reviews of all death certificates issued in Frederiksberg; supplementary clinical data were obtained from certifying doctors.

Throughout the study period all sources of information, including hospital admission records, were checked at regular intervals.

Diagnosis of Stroke

Eligible for registration were all permanent residents of Frederiksberg who during the reporting period suffered a stroke, defined as proposed by WHO: "Rapidly developed signs of focal (or global) disturbance of cerebral function, leading to death or lasting more than 24 hours, with no apparent cause other than vascular." The term "global" disturbance applies mainly to cases of subarachnoid hemorrhage without focal neurological signs.

An attempt was made in every registered case to diagnose the anatomical type of the stroke. For the purposes of the present study, however, type diagnoses were considered safe only when they were either confirmed by autopsy or based on the following criteria. Cases with grossly bloody spinal fluid were diagnosed as intracerebral hemorrhage or subarachnoid hemorrhage, the distinction being based on the presence or absence of localizing neurological signs. Cases with angiographically demonstrated occlusion of appropriate intra- or extracranial arteries were diagnosed as cerebral infarction. All other cases were classified as "type unknown."

According to the strict clinical design of the study, patients with cerebrovascular lesions revealed by angiography or autopsy were admitted to the study only if a well-defined stroke in the above sense had occurred.

Results

Between July 1, 1971, and June 30, 1973, a total of 588 strokes were registered in 577 Frederiksberg citizens. In 21 of these further examinations revealed non-vascular intracranial diseases (tumor, metastases, encephalitis, etc.) which had been misdiagnosed as stroke. After exclusion of these patients the series comprised 556, each of whom had suffered at least one stroke during one of the two study
The overall annual incidence of stroke in the reporting period was 2.8 per 1,000 population (2.7 for males, 2.9 for females). If only first strokes are considered, the incidence rates were 2.2 for males and 2.5 for females. Table 2 shows that the age-specific incidence rose steeply with age, being in each group higher for males than for females; the sex difference was statistically significant only at ages 55-64 years (x^2 = 8.0; p < 0.01) and 65-74 years (x^2 = 6.1; p < 0.02). When the rates were adjusted for age to the 1972 Danish population, the resulting annual stroke incidence was 1.9 per 1,000 for males, 1.6 for females.

The distribution by type of stroke is shown in table 3. Cerebral hemorrhage was demonstrated in 58 (10.4%) of the patients, subarachnoid hemorrhage in only 13 (2.3%); most of the remaining patients had cerebral infarction, the clinical diagnosis was verified in 164 cases (29.5%) by autopsy or other studies. The increase of stroke incidence with age was marked for both infarction and intracerebral hemorrhage, but not for subarachnoid hemorrhage, which in 9 of 13 cases afflicted patients under 65 years of age.

Discussion

We found the incidence of stroke to be highly age-dependent and to be higher for males than for females. Only subarachnoid hemorrhage is as common in middle age as later in life; this explains the remarkably small number of subarachnoid hemorrhages in the elderly of Frederiksberg. Intracerebral or subarachnoid hemorrhage could be demonstrated in less than 15% of the patients; it can thus be assumed that about four-fifths of all the registered strokes were due to infarction.

In one respect our results differed markedly from those previously published: As shown in table 4, the age-specific incidence rates were consistently lower than those found in other communities. It is of interest to compare our results with those of Aho in Espoo-Kauniainen, Finland; the two studies, both of which were parts of the international WHO stroke project, were carried out simultaneously in European...
Concomitants of Atherosclerotic Carotid Artery Stenosis

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SUMMARY To identify metabolic and other concomitants of a single important type of atherosclerotic cerebrovascular disease, 75 patients with angiographically and surgically proven internal carotid stenosis were compared with age and sex matched control subjects with respect to plasma cholesterol, triglycerides and glucose. They were also compared for blood pressure, cigarette smoking, evidence of ischemic heart disease, peripheral vascular disease and for a family history of these diseases.

Patients with carotid stenosis had higher systolic and diastolic blood pressures and higher plasma cholesterol and triglyceride concentrations than the control groups. They had, as well, a far greater likelihood of being cigarette smokers and a greater likelihood of having diabetes mellitus and previous evidence of coronary and peripheral vascular disease. Patients with carotid stenosis were far more likely to have 2 or more of these common concomitants of atherosclerosis than were the control subjects.

The data suggest that the precursors of carotid stenosis are similar to those of coronary atherosclerosis and raise the hope that modification of these factors may decrease the incidence of this highly prevalent form of cerebrovascular disease.

THERE IS little evidence that specific treatment will restore function when brain infarction has occurred already. Most therapeutic efforts have been devoted, therefore, to treatment of acute ischemia and to prevention of stroke in patients with transient ischemic attacks. Antiplatelet agents, and endarterectomy are often employed in hopes of preventing infarction when symptomatic cerebrovascular disease is present. Establishment of significant risk factors for stroke could lead the way to earlier, and possibly more effective, treatment aimed at stroke prevention. The potential for prevention has been demonstrated by the lowered incidence of stroke in hypertensive subjects following antihypertensive therapy.1-4

Most risk factor studies in cerebral vascular disease have been concerned with humoral factors as well as with blood pressure, and the results have often been conflicting. One possible explanation is that in some of the reports all stroke patients were studied as if only one etiology for stroke existed. We believe that the different types of vascular pathology responsible for the stroke syndrome might have different predisposing factors, and that the risk factors for each etiological entity should be studied individually. The fact that the incidence of atherosclerosis is different for various sites in the cerebral circulation suggests that each

References

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