Taming the Burgeoning Stroke Epidemic in Africa: Stroke Quadrangle to the Rescue

MO Owolabi

ABSTRACT

Objectives: *Globally, stroke is the second leading cause of death. This is a systematic review of the existing literature to examine the burden and profile of stroke in the World Health Organization (WHO) African region and proffer coordinated and responsive means to tackle the epidemic.*

Methods: *A systematic review of the literature was conducted according to the Centre for Reviews and Dissemination Guidelines using Pubmed, African Journals On-Line and Google Scholar databases. Over 1300 articles were obtained. All abstracts were screened, and every article that might have contained relevant information was read in full. Their heterogeneity made meta-analysis impossible. So a critical assessment of the data with a narrative review was conducted.*

Results: *Stroke has an annual incidence rate of up to 316 per 100 000, a prevalence rate of up to 315 per 100 000 and a three-year fatality of up to 84% in Africa. In 2002, model-based estimated age-adjusted stroke mortality rates ranged between 168 and 179 per 100 000 population for countries in the African region. There is severe scarcity of facilities and human resources for prevention, investigations, acute care and rehabilitation of stroke patients in Africa.*

Conclusions: *Africa bears a heavy burden of stroke. This author proposes a stroke quadrangle comprising a concerted network of four pillars: demographic surveillance and stroke research network, integrated community-based primary and secondary prevention programmes, easily accessible and well-equipped acute stroke care services, and neuro-rehabilitation centres and services. This network could be reinforced using information and communication technologies, telemedicine facilities and linked health information systems.*

Keywords: Africa, prevention, rehabilitation, stroke, surveillance

Poniendo Freno a la Creciente Epidemia de Accidentes Cerebrovasculares en África: Los Cuatro Ángulos del Ataque Cerebral al Rescate

MO Owolabi

RESUMEN

Objetivos: *El accidente cerebrovascular es la segunda causa principal de muerte a nivel mundial. El presente trabajo constituye una revisión sistemática de la literatura existente, encaminada a examinar la carga y perfil del accidente cerebrovascular en la región africana Organización Mundial de la Salud (OMS). Asimismo, el trabajo presenta formas de coordinación y respuestas para resolver el problema de la epidemia.*

Métodos: *Se llevó a cabo una revisión sistemática de la literatura de acuerdo con el Centro para las Revisiones y Pautas de la Diseminación, usando Pubmed, publicaciones africanas on-line, y bases de datos de Google Scholar.*

Se obtuvieron más de 1300 artículos. Todos los resúmenes fueron examinados, y todo artículo que podía haber contenido información pertinente fue leído por completo. Esta heterogeneidad hizo imposible un meta-análisis. Así que se realizó una valoración crítica de los datos con una revisión narrativa.

From: Department of Medicine, University College Hospital, PMB 5116, Ibadan, Nigeria, West Africa. Pioneering Regional Vice President (East, West and Central Africa), World Federation for NeuroRehabilitation, Senior Lecturer/Consultant Neurologist.

Correspondence: Dr MO Owolabi, Department of Medicine, University College Hospital, PMB 5116, Ibadan, Nigeria, West Africa, E-mail: mayowaowolabi@yahoo.com

Resultados: *El accidente cerebrovascular tiene una tasa de incidencia que puede alcanzar hasta 316 por 100 000, una prevalencia de hasta 315 por 100 000 y una fatalidad de tres años de hasta 84% en África. En 2002, las tasas de mortalidad por accidente cerebrovascular, ajustadas por edad, estimadas sobre la base de un modelo, fluctuó entre 168 y 179 por 100 000 de población para países en la región africana. Hay una severa escasez de instalaciones y recursos humanos para la prevención, investigación, cuidado intensivo, y rehabilitación de pacientes de accidente cerebrovascular en África.*

Conclusiones: *África tiene una pesada carga pesada de accidentes cerebrovasculares. Este autor propone un cuadrángulo del accidente cerebrovascular que comprende una red concertada de cuatro pilares: red de vigilancia demográfica e investigación del accidente cerebrovascular; programas integrados de prevención primaria y secundaria de base comunitaria, servicios de cuidado, bien equipados y de fácil acceso, para los casos de accidentes cerebrovasculares agudos; y centros y servicios de neuro-rehabilitación. Esta red podría ser reforzada con el uso de tecnologías de información y comunicación, instalaciones telemédicas y sistemas de información para la salud vinculados.*

Palabras claves: África, prevención, rehabilitación, accidente cerebrovascular, vigilancia

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INTRODUCTION

Stroke is the second leading cause of death worldwide, and the leading cause of acquired disability and impaired health-related quality of life in adults in most regions (1−8). World Health Organization (WHO) estimates for 2001 indicate that death from stroke in low-income and middle-income countries accounted for 85.5% of stroke deaths worldwide, and the disability adjusted life years (DALYs) lost in these countries was almost seven times those lost in high-income countries (1−8). Most of these low- and medium-income countries are in Africa. Evidence from developed countries suggests that one in 20 adults (age >14 years) is affected by stroke, including clinically covert strokes, and the incidence of acute cerebrovascular events (stroke and transient ischaemic attack combined) currently exceeds the incidence of acute coronary heart disease (1).

Moreover, the burden of stroke and other vascular diseases is likely to increase substantially over the next few decades in the lower-income countries because of the ongoing epidemiological transition, initially adding to the infectious and poverty-related disease burden and later becoming the dominant causes of death and disability (9−11). In addition, in the countries comprising Sub-Saharan Africa (SSA), the epidemic affects a relatively younger population which constitutes the needed workforce to power economic growth (12, 13).

However, the significance of these trends is considerably overshadowed by the attention given to the impact of human immunodeficiency virus and other infectious diseases (2, 14, 15). This scenario is further worsened by the 10−90 problem (16) in which 10% of research resources are chasing 90% of disease burden and *vice versa*. It results in lack of critical data required for taming the epidemic. Thus, while good-quality data on the epidemiology, prevention and management of stroke are rapidly accumulating for economically developed countries, particularly over the past two decades, there is a lack of reliable data for developing countries especially in Africa (1, 17, 18).

This is a systematic review of the existing literature to examine the burden and profile of stroke in WHO Africa region, and proffer coordinated and responsive means of tackling the epidemic.

METHOD

A systematic review of the literature was conducted according to the Centre for Reviews and Dissemination Guidelines using Pubmed, African Journals On-Line (AJOL) and Google Scholar databases.

The Pubmed search for 'stroke in Africa' returned 744 papers while the AJOL search for 'stroke' yielded 161 articles. For the Google Scholar database, advanced scholar search was conducted with the search terms 'stroke' and 'Africa' in the title in all subject areas. Further search was conducted using combinations of the key country/geographic terms, disease-specific terms such as 'stroke and Nigeria'. The reference lists and citation history of key papers were screened to obtain more publications. Articles published between 1960 and mid-2011 were included. Some of the publications retrieved from Pubmed were also present in Google Scholar and AJOL. Articles that were neither related to the study objectives nor written in English or German language were excluded. Altogether more than 1300 articles were obtained. All abstracts were screened, and every article that might have contained relevant information was read in full. Because of the heterogeneity of the publications, a meta-analysis was impossible. A critical assessment of the data with a narrative review was conducted.

BURDEN OF STROKE IN AFRICA

Stroke prevalence

Community-based studies

Community-based studies constitute the best way to determine the true prevalence of stroke, although they are very rare in Africa due to lack of manpower and research funding. Estimating the prevalence of stroke survivors in the community is complicated by the difficulty in making a retrospective and yet accurate diagnosis of stroke and stroke type months or years after the event (9, 10). Estimations are also biased by under-representation of fatal cases (9, 10). Therefore, prevalence, which depends on incidence and case fatality, is better estimated from incidence studies of first-ever stroke and survival. But in SSA, incidence studies are very rare and difficult to do (9, 10).

Door to door surveys

As in most low-income countries, door-to-door surveys have mainly been used. In a door-to-door survey conducted between 1986 and 1988 in Ethiopia, stroke had a crude prevalence of 15 per 100 000 (9, 10). This low prevalence may be due to high case fatality. It may also reflect low stroke incidence in rural Ethiopia in that period, or simply that patients with mild strokes that had recovered were not detected.

In 1982 and 1987, in Aiyete, Nigeria, stroke had an estimated crude prevalence of 58 per 100 000. However, the denominator population was far too small to establish stroke prevalence accurately (19). In 2005 to 2006, another study conducted in Lagos, Nigeria, yielded a crude prevalence rate of stroke of 114/100 000 (20). This may suggest at least a doubling of the stroke prevalence in Nigeria. As reported by several other studies, males were more affected (male:female = 1.51) and age was a strong risk factor with prevalence of nearly 5% for those in the ninth decade of life (20).

Demographic surveillance

Stroke prevalence studies in demographic surveillance sites that provide an accurate denominator have arguably provided the most accurate measures of stroke burden in recent years, despite the limitations (9, 10). The largest study of the prevalence of disabling hemiplegic stroke in SSA was done in 1994 in the rural Hai district of Tanzania (9, 10). It provided an age-standardized (Segi world population) prevalence of disabling stroke of 154 per 100 000 in men and 114 per 100 000 in women over 15 years of age.

In 2001, a stroke prevalence study in Agincourt, rural South Africa, with diagnosis of stroke based on the WHO definition of stroke, yielded an age-standardized (Segi world population) stroke prevalence of 290 per 100 000 people over the age of 15 years. In men, the prevalence was 281 per 100 000 and in women, 315 per 100 000 (9, 10).

The Tanzanian and Agincourt studies both have the advantage of accurate denominators and careful assessment of people who screened positive for stroke. However, the higher prevalence of stroke in Agincourt may be due to epidemiologic transition or because the Tanzanian study included only disabling hemiplegic stroke (9, 10).

The prevalence of stroke is less than half that found in high-income regions but disabling stroke prevalence may be at least as high as in high-income areas. This may be because studies in high-income countries are incidence studies which captured mild stroke as well as recovered stroke. The case fatality may also be lower due to existence of acute stroke care and rehabilitation facilities in addition to a higher proportion of ischaemic stroke. [Haemorrhagic stroke has been associated with higher fatality] (21, 22). Furthermore, the denominator population in developed countries contain a larger proportion of elderly people in whom stroke is more likely to occur. However, without community-based incidence studies with long-term follow-up, determining whether the low prevalence results from low incidence or high case fatality, or both, is impossible (9, 10).

Incidence of stroke

Hospital-based data

Most studies of stroke in Africa are hospital-based case series. Hospital-based data cannot give true prevalence or incidence because the denominator population is not known. Moreover, it is also affected by referral bias. Patients who die quickly from stroke or those with mild stroke may not be captured. Nevertheless, it can give information about the relative frequency of stroke in comparison to other diseases.

Stroke is now the leading cause of adult medical admissions at the University College Hospital, Ibadan, Nigeria and the leading cause of medical coma (23). It is the leading cause of admissions from hypertension-related complications accounting for 40% of hypertensive complications in the University of Port Harcourt Teaching Hospital, Nigeria (24). In several studies from the West African sub-region, it emerged as the leading cause of adult neurologic admissions, constituting up to 65% of such admissions (25).

Furthermore, a steady increase of stroke admissions has been observed in some institutions which have monitored their stroke admissions over time. In Tanzania, stroke admissions increased from 23 per 100 000 in 1935 to 86 per 100 000 in 1962 (9, 10). In Ghana, the number of stroke patients admitted per year increased from about 50 in 1960 to 622 in 1993 and the percentage of total adult medical admissions due to stroke increased from less than 2% in 1960 to about 12% in 1993 (9, 10). Stroke admissions to hospital are clearly rising in Africa. Although this could be due to increased patronage of orthodox medicine, increasing stroke incidence in an ageing population in the throes of epidemiological transition is a more plausible explanation.

Using hospital data, two urban studies roughly estimated stroke incidence. In Zimbabwe (1991), the crude incidence of stroke was 31 per 100 000 per year while the standardized (Segi world population) incidence was 68 per 100 000 (9, 10). In Pretoria, South Africa, the crude stroke

incidence for people over age 20 years was 101 per 100 000 per year (9, 10).

Although hospital-based stroke incidence appears lower in Africa than in other parts of the world, this may simply be because the population is still much younger. It may also be that the available hospital-based African studies underestimated stroke incidence.

Community-based incidence

Stroke incidence, estimated on the basis of representative community samples with rigorous case ascertainment and accurate diagnosis, provides far more information about stroke burden than hospital-based studies. Nevertheless, such studies require considerable resources and rigorous methods (9, 10). There are only two community-based incidence studies from SSA. From the (1973–75) stroke registry in Ibadan, Nigeria, the crude annual incidence of first-ever stroke was 25 per 100 000 for men, 13 per 100 000 for women and 26 per 100 000 for the entire population. However, this is probably an underestimation because of difficulties with case ascertainment resulting from the very large population, a very small study staff and non-inclusion of those who patronised traditional healers (22).

In Tanzania, stroke incidence was recorded in two demographic surveillance sites: Hai (rural) and Dar-es-Salaam (urban) from 2003–2006. Patients with stroke were identified by use of a system of community-based investigators and liaison with local hospital and medical centre staff. Patients who died from stroke before recruitment were identified *via* verbal autopsy, which might have included non-incident strokes (9, 10). Overall, crude annual stroke incidence rates were 94.5 per 100 000 in Hai and 107.9 per 100 000 in Dar-es-Salaam. When age-standardized to the WHO world population, annual stroke incidence rates were 108.6 per 100 000 in Hai and 315.9 per 100 000 in Dar-es-Salaam (9, 10).

Age-standardized stroke incidence rates in Hai were similar to those seen in developed countries. However, age-standardized incidence rates in Dar-es-Salaam were higher than seen in most studies in developed countries. This could be because of a difference in the prevalence of risk factors and as such emphasizes the importance of health-screening at a community level (9, 10).

Urbanization in Africa, as in other parts of the developing world, is increasing rapidly, and the results from this study suggest that, in the absence of effective preventive measures, this is likely to lead to substantial increases in stroke incidence and mortality.

Mortality

In the Global Burden of Disease estimates of all-cause mortality in 2001, high coverage (≥ 85%) death registration data were available for less than 1% of the SSA population (9, 10). The Global Burden of Disease investigators estimated that 355 000 stroke deaths (3% of all deaths) occurred in SSA during 2001, using the combination of available death registration data, sample death registration studies (predominantly from urban hospital populations), epidemiological studies and the cause-of-death model for estimating cause of death in regions with little or no cause-of-death data (9, 10).

In 2002, age-adjusted stroke mortality rates estimated by modelling ranged between 168 and 179 per 100 000 population for countries in the African region (8).

The 2004 WHO World Health Report, which used updated techniques based on those developed for the Global Burden of Disease studies to estimate cause of death in WHO member countries in 2002, found that there were about 359 000 stroke deaths (3% of all deaths) in Africa compared with almost 1.5 million (16% of all deaths) in Europe. Stroke caused an estimated 52% of vascular deaths in Africa compared with 38% of vascular deaths in high-income Europe (9, 10).

Africa is at an earlier stage of health transition with a higher ratio of stroke death to coronary death. As a population undergoes health transition, the pattern of vascular disease is thought to change from one dominated by stroke, with a high proportion caused by cerebral haemorrhage, to a pattern dominated by atherosclerotic stroke, coronary heart disease and peripheral vascular disease (9, 10, 13).

Two sites in SSA have published information on stroke deaths specifically. The Agincourt study in South Africa found that stroke caused 6% of all deaths between 1992 and 1995 (9, 10). Stroke was the commonest cause of death in the age group 55−74 years, and the second commonest cause of death in the age group 35−54 years and above 75 years (9, 10). The crude stroke mortality was 127 per 100 000 over age 35 years (9, 10). In a verbal autopsy study in Tanzania, stroke caused 5.5% of adult deaths in three regions: Dar-es-Salaam [urban], Hai [prosperous rural] and Morogoro [impoverished rural] (9, 10).

Age-specific stroke mortality in Agincourt and the three regions of Tanzania mentioned above, might be as high as in England and Wales, and perhaps higher in younger age groups, but larger studies based on accurate vital registration data are clearly needed (9, 10). Such data will produce evidence of any change in stroke mortality particularly as lifestyle, cardiovascular risk burden, population age structure, relative stroke incidence and case fatality rates change in Africa. The ranking of stroke mortality will depend on the relative burden of infectious, neoplastic and nutritional disorders.

Case Fatality

Hospital-based studies have demonstrated a one-month case fatality of between 27% and 46% in Africans (9, 10, 26, 27). In the hospital-based INTERSTROKE study, the one-month case fatality for stroke was 22% in the African region compared to 4% in high-income countries (3). Reports of post-stroke deaths in SSA are, however, unreliable due to factors

such as the limited death certification and lack of coverage of primary healthcare services (27). Post-stroke case fatality rates should ideally be calculated using com-munity-based studies because of the heterogeneity of stroke type and severity, and the likelihood that many patients are not admitted to hospital (9, 10).

In the Ibadan community-based stroke registry (1975), case fatality at three weeks was 35% for all strokes being highest for cerebral haemorrhage (61%) and subarachnoid haemorr-hage (62%). However, this case fatality may not be very reliable because stroke types must have been diagnosed unreliably without computed tomography (CT) scanning (21, 22).

In the Tanzanian community based incident stroke study (2003), case fatality was 28.7% at 28 days and 84.3% at three years. The 28-day case fatality rate was at the lower end of rates reported for other low and middle income countries, even when including those identified by verbal autopsy, while the three-year case fatality rates were notably higher than seen in most developed world studies. Recent studies from the developed world suggest three-year case fatality rates of 43 to 54% and five-year case fatality rates of 53 to 60% (26).

This high fatality may be due to the severe scarcity and prohibitive costs of facilities and human resources for investigations, acute care and rehabilitation of stroke patients in Africa (16).

Cost of stroke

The economic burden of stroke is considerable. The cost of stroke for the year 2002 was estimated to be as high as $49.4 billion in the United States of America (USA), while costs after hospital discharge were estimated to amount to 2.9 billion Euros in France (9, 10, 12, 17, 28). Clearly, even a fraction of such amounts can cause enormous economic damage to low-income countries (12).

There are very few studies on the cost of stroke care in Africa. A study in Togo estimated direct cost per person of 936 Euros in only 17 days, about 170 times more than the average annual health spending of a Togolese (29). Subsidising and improving post-stroke care may help to reduce stroke case fatality and morbidity in Africa.

Profile of stroke survivors in Africa

The estimated disability adjusted life years lost due to stroke was 1230 per 100 000 in Angola, Africa compared to 200 per 100 000 in Switzerland, Europe in 2002 (8, 13). In Nigerian Africans, stroke impairs all facets of health-related quality of life (HRQOL) particularly domains in the physical sphere (physical, cognitive, psycho-emotional and eco-social domains). The severity of impairment correlates to the stroke severity (6, 7). Many of these disabling strokes occur in young people.

Overall, stroke tended to occur in a younger population in Africans compared to high-income countries (3, 13). This may be due to genetic factors, high proportion of undiagnosed and uncontrolled hypertension, the shorter life expectancy in African countries and a higher proportion of younger people (3, 13).

Risk factors for stroke in Africa

The proportion of haemorrhagic stroke in Africa ranges from 29% to 57% in comparison with 16 to 20% in North America (13). In the INTERSTROKE study, haemorrhagic stroke was 34% in Africa and 9% in high-income countries (3, 31). This suggests a higher burden of uncontrolled hypertension in Africa because the proportion of haemorrhagic stroke in a population seems to correlate with the prevalence and severity of uncontrolled hypertension (9, 10, 13, 26, 27). Up to 98% of stroke patients in Africa have hypertension (13, 26, 27). The population attributable ratio of stroke due to hypertension in South Africa was 50% (32) and 60% in North Africa (33), reported in 2000 and 2011 respectively.

Hypertension, once rare in West Africa, is emerging as a serious endemic threat. It has been referred to as a 'silent killer' as it often has no early detectable symptoms despite being a major cause of serious health conditions, including heart disease, stroke and renal disease (34). Of the ten topmost modifiable risk factors accounting for 90% of the risk of stroke, hypertension is the strongest (3). Prevalence rates for hypertension vary across and within regions in Africa. An analysis of all national data in Zimbabwe in the 1990s found that between 1990 and 1997, the national crude prevalence of hypertension increased from 1% to 4%. Up to 36.6% of adult Nigerians are hypertensive (35, 36).

The impact of migration from rural to urban areas was demonstrated in a longitudinal study in Kenya, in which moving from a rural to urban setting produced significant increases in blood pressure within a short time. Growing migration from rural areas to urban areas also portends worsening prevalence of hypertension as migrants adopt lifestyle changes in physical activity, dietary habits and stress level. Regardless of gender or type of community, advancing age is associated with an increased prevalence of hypertension, and this implies greater burden of hypertension as population ageing occurs in Africa (35, 36).

Several surveys have demonstrated very low prevalence of hypertension awareness and control (BP < 140/90 mmHg) in Africa. In Tanzania, slightly < 20% of hypertensive subjects were aware of their diagnosis, approximately 10% of them were treated and < 1% were controlled (12). A survey in Ghana showed that 34% were aware of their condition, of whom 18% were treated and only 4% were controlled. Whereas in the USA, 69% of hypertensive subjects were aware of their diagnosis, 58% of them were treated and 31% were controlled. The low prevalence of awareness, treatment and control of hypertension poses a serious challenge for stroke prevention in Africa (12).

This scenario also applies to diabetes mellitus and dyslipidaemia which are on the increase in Africa (34).

According to the International Diabetes Federation (IDF), the current estimated prevalence rate of Type 2 diabetes in Africa is about 2.8%. Countries such as Malawi and Ethiopia have rates under 2%, whereas Ghana, Sudan and South Africa have prevalence rates over 3% (34). Currently, there are 10.4 million individuals with diabetes in SSA, representing 4.2% of the global population with diabetes. By 2025, it is estimated that this figure will increase by 80% to reach 18.7 million in this region, with a higher prevalence in the urban areas (34). Studies indicate that an ageing population, coupled with rapid urbanization, is expected to lead to the increasing prevalence of diabetes in Africa (34).

Furthermore, dyslipidaemia has emerged as an important risk factor in Africa. For example, Norman and colleagues found that high cholesterol level (≥ 3.8 mmol/L) accounted for 59% of ischaemic heart disease and 29% of ischaemic stroke burden in adults aged 30 years and over (34). The prevalence of dyslipidaemia, especially cholesterol has been shown to vary across regions in Africa. In a study of healthy workers in Nigeria, 5% of the study population had hypercholesterolaemia; 23% had elevated total serum cholesterol; 51% had elevated LDL-cholesterol and 60% had low HDL-cholesterol, with females recording better overall lipid profiles (34). Population-based studies in Tanzania and Gambia also showed elevated total serum cholesterol level of > 5.2 mmol/L in up to 25% of persons aged > 35 years. Elevated cholesterol appears to be more prevalent in urban areas and among the higher socio-economic classes (34).

The epidemic of stroke, hypertension, diabetes and dyslipidaemia in Africa is driven by multiple factors working collectively. Obesity and lifestyle factors such as poor diet, sedentary lifestyle and smoking contribute to the increasing rates of stroke in Africa. In a meta-analysis among West African populations, the prevalence of obesity was 10.0%. A study in Benin found that abdominal obesity was positively associated with increased probability of the metabolic syndrome. Obesity was a predominant risk factor for women compared to men, but smoking was mostly a risk factor for men (34).

Additionally, structural and system level issues such as lack of infrastructure for healthcare, urbanization, poverty and lack of government programmes also drive this epidemic and hamper proper prevention, surveillance and treatment efforts (34).

BURDEN OF STROKE IN NIGERIA

Nigeria is Africa's most populous country with a population of over 150 million people. It therefore bears the greatest burden of stroke in terms of absolute numbers of people affected. The projected cumulative gross domestic product (GDP) loss due to stroke, heart disease, and diabetes from 2006–15 is $1.17 billion (30). The estimated mortality from stroke in Nigeria for the year 2005 was 126 per 100 000 (37).

However, the country has about 50 practising neurologists while neuro-radiological investigations are not readily available and when available, they are not affordable because of out-of-pocket payments. Computed tomography brain scan is essential for the investigation and management of stroke patients. It is needed to confirm the diagnosis and type of stroke. Clinical scales have not been shown to be reliable enough for therapeutic decisions (38).

Data from hospital-based studies show that the 30-day case fatality rate from stroke is high and ranges from 28% to 40% (37). The dominant modifiable risk factor for stroke in Nigeria is systemic hypertension which is present in almost all cases with a great majority of the victims not knowing their blood pressure status before suffering from the disease. Diabetes mellitus is another important risk factor among Nigerians and is present in up to 11% of cases (37). With the current pandemic of HIV/AIDS, increasing numbers of apparently cryptogenic cases of stroke are being discovered to be seropositive for the virus (37).

As a result of scarcity of neurologists in the country, a great majority of the stroke patients are managed by general practitioners and internists. Some present to traditional healers or spiritualists, while others remain at home. Therefore, thrombolytic agents are not used at present because of their non-availability, late presentation and absence of required rapid laboratory and neuro-diagnostic testing. There is no comprehensive stroke centre in Nigeria at present.

PROPOSING THE STROKE QUADRANGLE

The escalating burden of stroke in Africa, in the absence of human, financial, material and research resources (16, 39), demands urgent action.

This author proposes the stroke quadrangle (Fig. 1) comprising a concerted network of four pillars: demographic

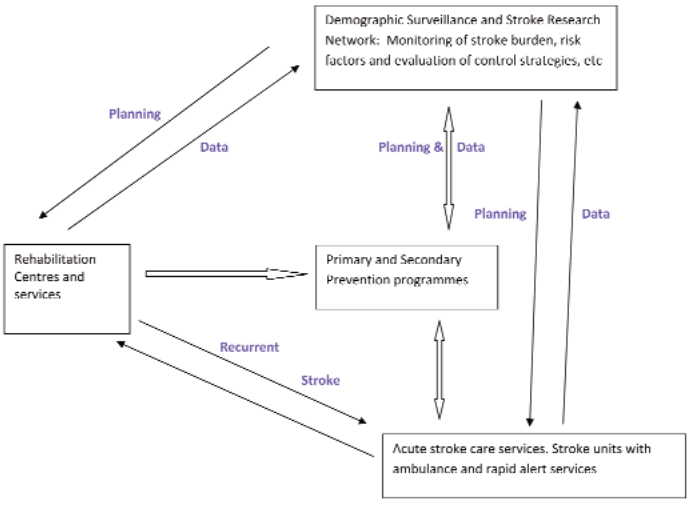

Fig. 1: The stroke quadrangle.

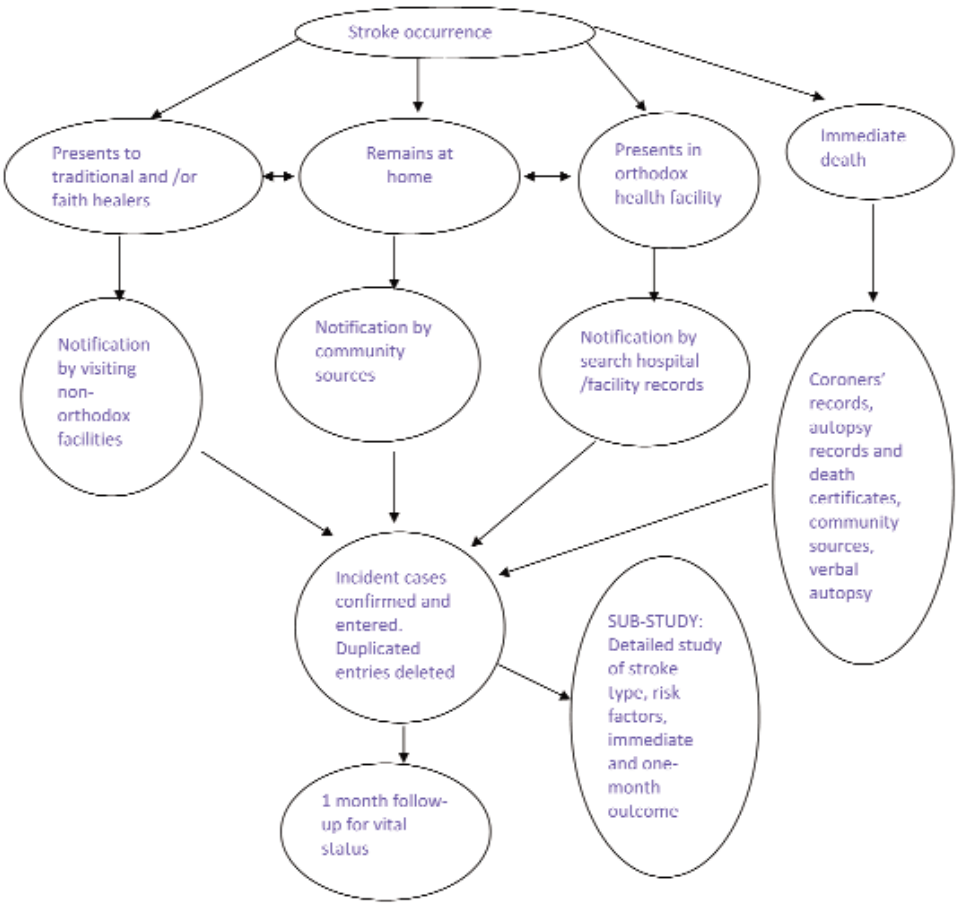

Fig. 2: Stroke incidence studies schema for near-total case ascertainment.

surveillance and stroke research network, community-based primary and secondary prevention programmes, easily accessible and well-equipped acute stroke care facilities, and neuro-rehabilitation centres and services. This network could be reinforced using modern information and communication technologies and linked health information systems.

Stroke incidence, estimated on the basis of representative community samples with rigorous case ascertainment and accurate diagnosis, provides the best means of stroke surveillance. Such studies require considerable resources and rigorous methods. Standardized criteria for the ideal stroke-incidence study have been established and recently updated (40, 41). For complete case ascertainment in stroke surveillance studies, the strategies proposed in Fig. 2 are recommended. Well-conducted stroke surveillance (with accurate and complete registers) provides essential data that can be used to improve appropriate allocation of health resources, assess the burden of stroke, describe populations at risk, identify associated risk factors, monitor trends over time, provide the basis for designing and implementing interventions, and monitor and evaluate the effectiveness of interventions (2, 28). This should be integrated into well-funded stroke research networks capable of generating high-impact findings on which effective control and care policies can be based.

Innovative multilevel, multi-strategy, multisectoral approach should be used for stroke prevention. Figure 3 illustrates this concept for stroke prevention through hypertension detection and treatment incorporating the adoption of healthy lifestyle (exercise, diet). This model should also be adopted for detection and control of diabetes, dyslipidaemia and obesity. Dietary factors have been associated with stroke. Physical inactivity can increase the risk of stroke by up to 50%, and both the intensity and duration of exercise are important factors to consider in interventions aimed at reducing stroke mortality. Population-based strategies aimed at shifting the levels of risk factors to lower values in the entire population are likely to lead to a substantial reduction of the global burden of stroke and other cardiovascular diseases (12).

Indeed, there is good evidence that lifestyle changes such as reduction in salt intake, weight loss, increased physical activity, limited alcohol consumption and nutritional factors can effectively and substantially decrease blood pressure and risk of stroke (12). This evidence supports the conduct of population-based interventions aimed at promot-

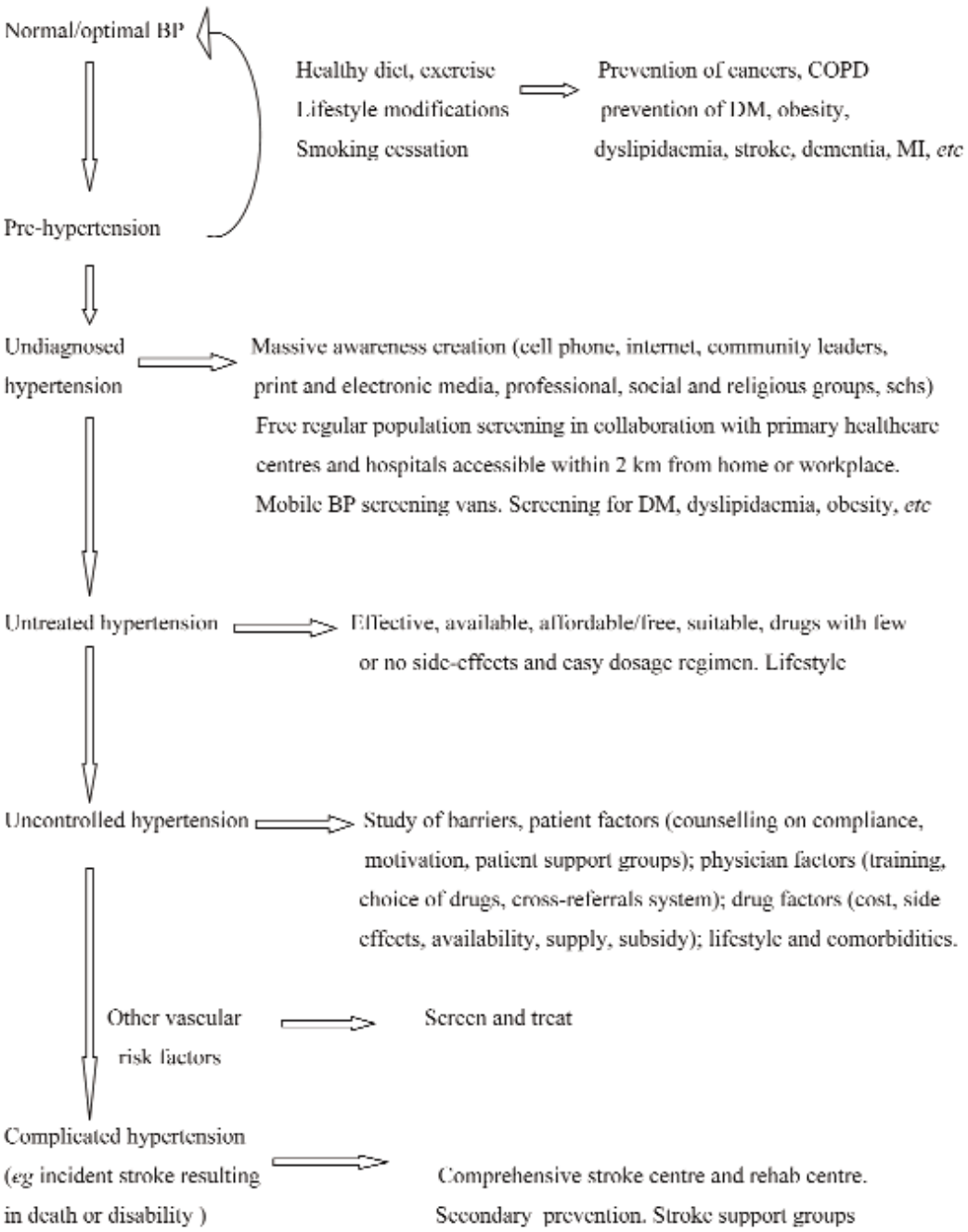

Fig. 3: Conceptual framework for an innovative multi-level, multi-strategy approach.

ing healthy lifestyles in the community and relevant health policies in African countries. Such programmes should typically include educational, fiscal, or environmental incentives to reduce salt intake, reduce tobacco use, limit alcohol consumption, increase physical activity, maintain a lean body weight, reduce the consumption of saturated fats, and increase the consumption of fruits and vegetables (12).

A comprehensive approach is necessary to reach all segments of the population in healthcare settings, schools, work sites, churches, mosques, community centres and other public health settings. Use of the radio and other mass media has a large potential for raising awareness on cardiovascular health. More generally, health policy has a large potential to enable the adoption of healthier lifestyles (12).

Furthermore, community-based stroke awareness programmes using multiple media should be instituted to ensure early recognition and presentation of acute stroke. Subsidized emergency services with dedicated telephone lines and ambulance services will ensure early presentation and proper hyperacute stroke care. Many well-equipped certified com-

prehensive stroke centres fitted with telemedicine facilities are urgently needed to be located within quick reach of stroke patients. Computed tomography brain scan, a critical component of hyperacute stroke care, should be made readily available and affordable for stroke patients. Local guidelines need to be developed with particular attention to meticulous blood pressure control after stroke (42).

Improvement of HRQOL with neuro-rehabilitation services, which is extremely rare in SSA, relies on a goal-oriented, patient-centred coordinated multidisciplinary model (Fig. 4b). East, West and Central Africa, with an

Fig. 4a: Cycle of neuro-rehabilitation.

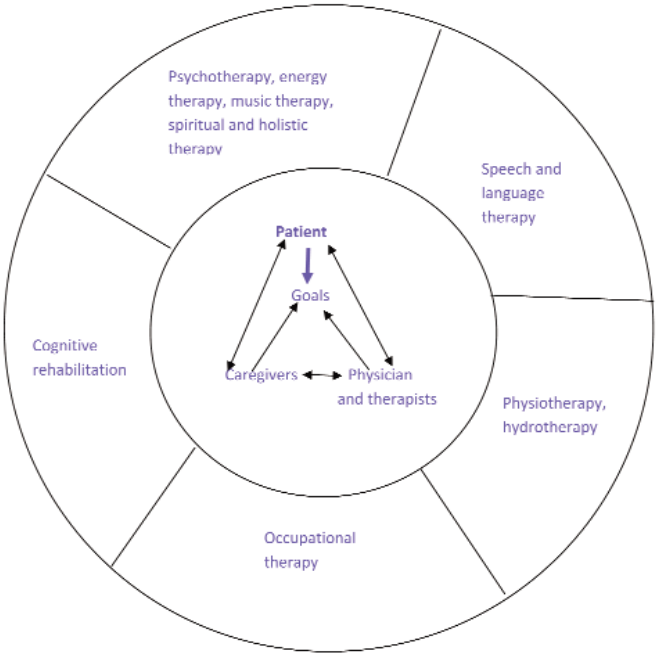

Fig. 4b: Model of neuro-rehabilitation utilized at the WFNR-Blossom Specialist Medical Centre, Ibadan.

estimated population of roughly 250 million have only one newly established neuro-rehabilitation facility located in Ibadan, Nigeria. It is a centre supported by the World Federation for NeuroRehabilitation (WFNR). More speech therapists, occupational therapists, psychotherapists and other rehabilitation professionals are urgently needed. More people should be encouraged to go into these careers while training institutions should be strengthened to produce these professionals.

The success of the stroke quadrangle depends on adequate funding, training of staff and collaboration among relevant professional bodies, partnerships with developed countries and stroke advocacy programmes. International assistance in equipping, training and retraining of specialists and sponsorship of high quality community-based studies will be helpful.

CONCLUSIONS AND RECOMMENDATIONS

Stroke mortality is projected to increase faster in middle-income and low-income countries than in high-income countries. Therefore any global goal for reducing mortality from stroke will have a larger effect on number of lives saved in these countries than on lives saved in high-income countries (5). In combating the silent but catastrophic epidemic of stroke in developing countries, we are already running out of time. While policy-makers' attention for stroke is eclipsed by infectious diseases, the epidemic is gaining ground and we are almost losing the battle in resource-poor countries which unfortunately are hardest hit. Even in the absence of reliable data, cardiovascular diseases (CVD) were predicted to overtake infectious diseases as leading causes of premature loss of healthy life expectancy in Africa (43, 44). The experience that is being gained in other populations, and especially in Asia, informs us that stroke is the dominant manifestation of CVD that results, to a large extent, from endemic hypertension during the early and middle stages of epidemiological transition (11).

Stroke, therefore, is an appropriate model to assess the burden of CVD in Africa. To ignore stroke in Africa will inevitably lead to an increase in suffering, poor coordination and inefficient use of health services, and place populations at the mercy of suboptimal treatments and prevention strategies (2). Stroke is a costly disease because of the large numbers of premature deaths, ongoing disability in many survivors, impact on families or caregivers and impact on health services (9, 10, 17, 28). The entire health budgets of some countries in Africa may not be adequate to tame the epidemic which also maims the workforce, engendering a vicious cycle (12).

The cliché 'prevention is better than cure' cannot be truer than now. This is because developing countries are not equipped with expensive state-of-the-science facilities for hyperacute stroke care or stroke rehabilitation to handle the epidemic when it becomes full-blown. Community-based prevention strategies have been shown to be effective and cheap (12, 14, 15). However, for efficient and effective prevention, well coordinated population-based surveillance system premised on accurate population-based data is required. Secondary prevention also needs to be integrated into acute stroke care and rehabilitation services.

A strong political commitment is necessary to foster the relevant policy and environmental changes to support adequate education and prevention programmes. Primary, secondary and appropriate tertiary health services need to be

adjusted to better suit the care for non-communicable diseases in low-resource settings of Africa (12, 43). Finally, the stroke quadrangle should be vigorously implemented with concerted multi-level, multidisciplinary, intersectoral, inter-governmental, private sector, civil society and community action. To improve the abysmally short life expectancy in Africa, there is an urgent need to revise the Millennium Development Goals to incorporate strong stroke and cardiovascular disease and death prevention targets. A stitch in time saves nine.

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