

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI.
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICAL SCIENCES
DEPARTMENT OF COMMUNITY HEALTH**



**A RETROSPECTIVE DESCRIPTIVE STUDY ON CEREBROVASCULAR
ACCIDENTS AT THE KOMFO ANOKYE TEACHING HOSPITAL (KATH) IN
KUMASI.**

**A DISSERTATION SUBMITTED TO THE SCHOOL OF GRADUATE
STUDIES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
THE AWARD OF MASTERS OF PUBLIC HEALTH DEGREE (HEALTH
SERVICES PLANNING AND MANAGEMENT).**

GRACE ATTAH - ADJEONG

SEPTEMBER 2008

DECLARATION

I hereby declare that, except for references to other people's works, opinions and observations which have duly been acknowledged, this work is the result of my own original research. I hereby declare that, this work has neither in whole nor in part been presented for a degree elsewhere.

.....
GRACE ATTAH - ADJEPONG

STUDENT

.....

.....

SUPERVISOR

HEAD OF DEPARTMENT

DR. CHARLES O. AGYEMANG

DR. EASMON OTUPIRI

DEDICATION

This piece of work is dedicated to my mother, Madam Dora Marfoa who first taught me as a child that it was important to go to school. It is also dedicated to my husband Mr. Bismark Attah-Adjepong for his encouragement and support during the period of my study, to my sons Ofori, Appenteng, Onuonyamfo and daughters Serwaa, Dansoa, Owusua and Marfoa.

ACKNOWLEDGEMENT

All praise and honor belong to God Almighty for his guidance, providence and kindness. My God is dependable, in Him; I derive fullness of life and satisfaction.

I wish to acknowledge all lecturers and staff of the Department of Community Health for the various roles each one of them played towards the successful execution of this project. I am also very grateful to my academic supervisor, Dr. Charles O. Agyemang for supervising this piece of work, offering encouragement and advise where they were due.

I am equally thankful to Dr. Opare Sam, the head of the Medicine Department, Mrs Margaret Karikari, head of the Physiotherapy Division, Mr. Nicholas Opoku Frimpong, head of the Records Department, the ethical clearance committee, the staff of the Records Department and the Komfo Anokye Teaching Hospital authorities.

I am also grateful to Pharm. Samuel Agyemang Boateng, the acting New Juabeng Municipal Director of Health services, Eastern Region, for helping with the analysis of the data, Dr. Joseph Opare Larbi and the entire staff of the Kwahu South District Health Administration for their co-operation during my period of stay in the District.

LIST OF ACRONYMS

BP	Blood Pressure
CI	Confidence Interval
CVA	Cerebrovascular Accident
CVD	Cardiovascular Disease
GIT	Gastro intestinal tract
LOHS	Length of hospital stay
KATH	Komfo Anokye Teaching Hospital
SD	Standard Deviation
WHO	World Health Organization

TABLE OF CONTENT

Front cover.....	
Title Page	i
Declaration.....	ii
Dedication	iii
Acknowledgement	iv
Abbreviations /Acronyms	v
Table of Contents	vi
List of Tables	vii
Abstract	viii

CHAPTER 1 - INTRODUCTION

1.1 Introduction.....	1
1.2 Background Information	1
1.3	Problem
Statement.....	2
1.4 Rationale of Study	3
1.5 Conceptual Framework	4
1.6 Research Questions	5
1.7 General Objective	5
1.8 Specific Objectives	5 - 6
1.9 Profile of study area	6

CHAPTER 2 - LITERATURE REVIEW

2.1 Introduction	7
2.2 Risk factors of stroke that can be treated or controlled.....	8 -
11	
2.3 Risk factors of stroke that cannot be changed	12 -
13	
2.4 Risk factors of stroke that are less well documented.....	13 -
14	

CHAPTER 3 - METHODOLOGY

3.1 Research Methods and Design	15
3.2 Data collection Techniques and Tools	15
3.3 Study Population	16
3.4 Study Variables. Sampling Technique and Sample Size	17 - 18
3.5 Data Handling and Analysis (Statistical Methods).....	19
3.6 Ethical Consideration	19
3.7 Assumptions.....	19

CHAPTER 4 – RESULTS

4.1 Data analysis/ Statistical method	20
4.211 Annual hospital and admission and death records.....	20
4.212 General stroke statistics	20
4.213 Age, stroke morbidity and mortality	20
4.214 Mean LOHS, mean age, mean blood pressures and stroke outcome.....	20
4.216 Socio-demographic information on sample.....	21
4.217 Most common presenting features.....	21

CHAPTER 5 – DISCUSSION

5.1 The stroke burden.....	29
5.2 Sex, stroke morbidity and outcome.....	29
5.3 Age, stroke morbidity and outcome.....	30
5.4 LOHS, stroke morbidity and outcome.....	30
5.5 Hypertension. Stroke morbidity and outcome.....	30
5.6 Other Presenting features.....	31

CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions	33
6.2 Recommendations.....	33 - 34

References	35 - 39
-------------------------	----------------

LIST OF TABLES

Table 3.3 Study variables

Table 4.211 Annual hospital and admission and death records

Table 4.212 General stroke statistics.

Table 4.213 Age, stroke morbidity and mortality

Table 4.214 Mean LOHS, mean age, mean blood pressures and stroke outcome

Table 4.216 Socio-demographic information on sample

Table 4.217 Most common presenting features

ABSTRACT

INTRODUCTION: Stroke is a major challenge facing medicine with an alarming statistics of being the second leading cause of death and the leading cause of physical disability worldwide. Recognition and management of risk factors remain key to reducing morbidity and mortality from stroke.

OBJECTIVES: The main objective of this project was to conduct a retrospective study to assess stroke outcomes among stroke patients at KATH for the years 2006 and 2007.

METHODS/ DESIGN: A retrospective descriptive study involving review of adult stroke patients records on; age, sex, length of hospital stay, outcome of management (dead/alive), socio-demography, blood pressure on admission and before discharge or death, patient's knowledge of his/her hypertension status and the most common presenting features.

DATA ANALYSIS \ STATISTICAL METHOD

Data was first entered in excel 2003 and transported into Epi info version 3.4.1 for further statistical analysis.

RESULTS: Stroke constituted 1.3% of total hospital admissions and 6.3% of total hospital deaths within the period under review, 9.1% of total medical adult admissions and 13.2% of the total medical adult mortality were ascribed to stroke. A total of 1,050 cases made up of 537 (51.1%) males and 513 (48.9%) females were involved. 456(43.4%. 95% CI = 40.4%-46.5%) patients died from stroke of which 244 (53.5%) were men (RR= 1.10. 95% CI = 0.96-1.26).The peak age was 66-75 years representing 274 (26.1%) of stroke cases. The mean age of those who died was higher than that of those who survived (65.37 years versus 62.38 years).The average length of hospital stay of those who died was lower than that of those who survived (5.13 days versus 7.07).

Hemiplegia/hemiparesia and hypertension were topmost on the list of most commonly presenting features. Fifty-four patients (18%. 95% CI = 13.8%–22.8%) had previous episode of stroke.

CONCLUSION AND RECOMMENDATIONS: Stroke is an important health problem affecting both males and females with hypertension as a major risk factor. Majority of stroke victims belong to the active segment of the population. Attention needs to be focused on patients, health personnel and public education with the intention of reducing as many modifiable risk factors as possible to stop the weakening of the country's labor force by the disease and to forestall premature deaths.

KEY WORDS: Stroke, morbidity, mortality, risk factors.

CHAPTER ONE - INTRODUCTION

1.1 INTRODUCTION / BACKGROUND INFORMATION

Cardiovascular diseases (CVDs) describe various diseases that affect the heart and circulatory system¹ the most common ones being diseases of the heart muscle, hypertension, strokes, cardiomyopathies and rheumatic heart disease¹. The burden of CVD in the world is enormous and growing, and the majority of those affected are in developing countries.^{2, 3} It is estimated that 30.9% of all deaths in 1998, as well as 10.3% of the total disease related burden, in terms of disability adjusted life year loss (DALY loss) were attributable to CVD.⁴ Moreover, they accounted for 9.2% of the total deaths in the African Region in 2000 compared with 8.15% in 1990.⁵

An interesting aspect of the epidemiology of CVD around the world is the consistent report that stroke is a significant cause of morbidity, disability and death in people of African origin⁶. Approximately 80% of all deaths by stroke occur in developing countries.⁷ In Africa, the disease has been found to account for 0.9-4% of hospital admissions and 2.8%-4.5% of total deaths.⁸ Stroke case fatality in Africa averages about 35% ranging from 14.9% to as high as 77% when due to cerebral hemorrhage.⁸ This could be related to limited healthcare facilities and uncontrolled risk factors such as hypertension and diabetes.⁷ Studies conducted at Korlebu Teaching Hospital, Ghana showed that 69% 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. The overall male to female ratio was 1.2:1 but the relative risk (RR) of death from stroke was found to be higher for females.⁹

1

In another study conducted at Komfo Anokye Teaching Hospital (KATH), Ghana, it was revealed that 17.9% of acute medical admissions were ascribed to cardiovascular cause.¹⁰

Strokes have significant impact on the utilization of healthcare services and the associated costs.¹¹ Hospital personnel and the already limited space are likewise tasked by stroke patients because of their long stay in hospitals. In addition, stroke patients may also be predisposed to many complications where close care is not available. Significant improvement measures in the prevention, diagnosis and treatment of stroke should be emphasized. Achievement of this depends on the knowledge of the local pattern of the disease and preventable risk factors.¹²

1.3 PROBLEM STATEMENT

Annually, as many as 15 million people suffer a stroke, of these 5 million die and another 5 million are left permanently disabled^{5,13} placing a heavy burden on individuals, families and communities. Recent reports have predicted that the 21st century will see a serious economic burden from non-communicable diseases in low income countries and have called for action.^{14,15} Studies conducted in Ghana, Mauritius, South Africa and Zimbabwe have shown an increase in stroke mortality that could be related to increasing levels of hypertension, obesity, tobacco use and diabetes.⁵ Despite evidence of the increasing burden of stroke in Africa, data are rare. The main objective of this study was to assess stroke outcomes among stroke patients at the Komfo Anokye Teaching Hospital (KATH) for the years 2006 and 2007.

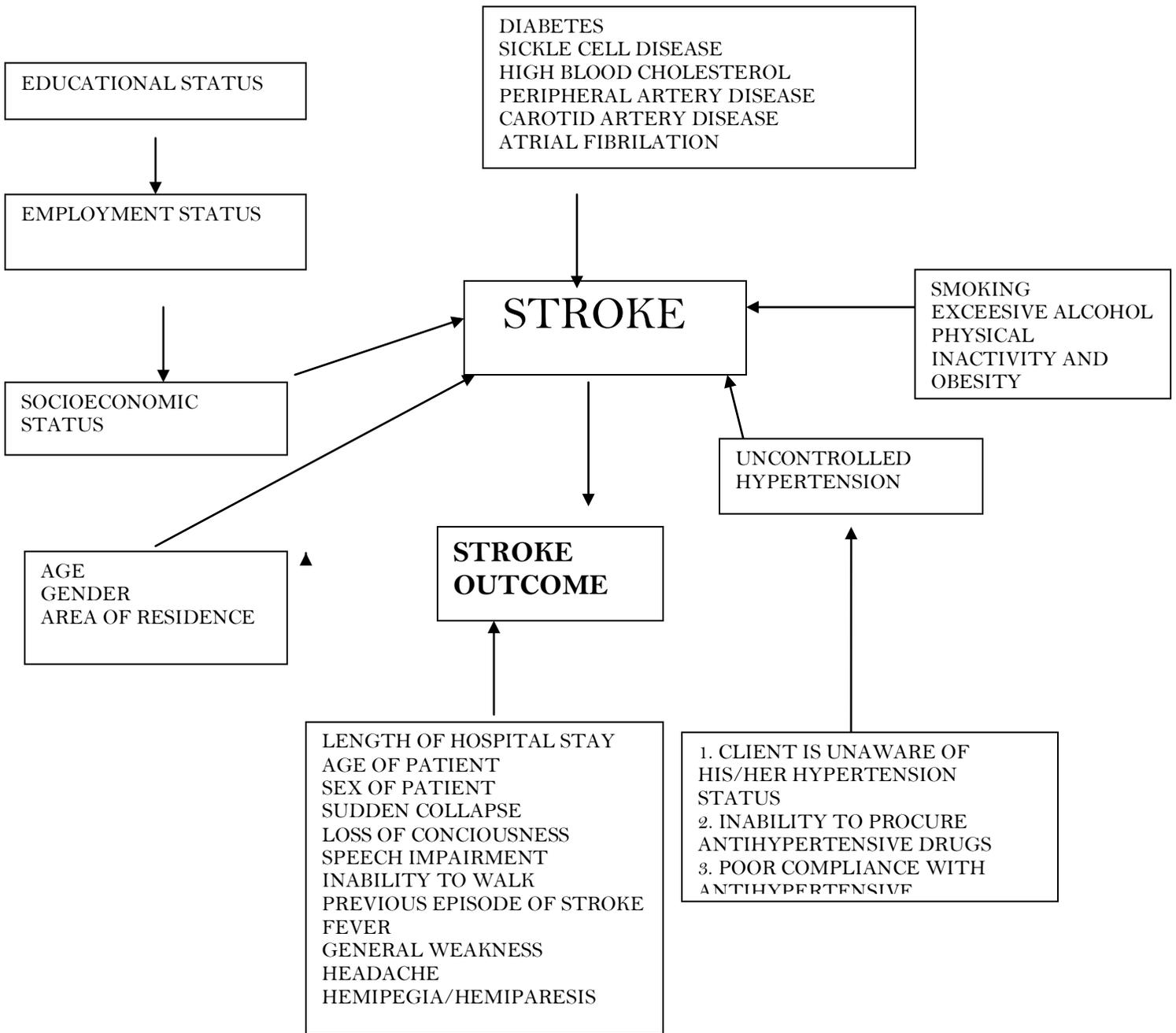
1.4 RATIONALE OF STUDY

It has been estimated that there will be 25 million deaths annually from CVD worldwide with 19 million in populations from developing countries by the year 2020.⁷

The global society is expected to respond to this developing crisis by addressing challenges and opportunities for prevention of CVDs. Adequate health literacy is very important to inspire behavioral modification needed for good cardiovascular health.¹²

However, in Ghana, as in many African countries, information on stroke is very scant. Much work remains as the risks for and consequences of stroke remain alarmingly high. Stroke must thus essentially, be a priority on health agenda in the developing world. Increased research on stroke is accordingly needed to develop more effective strategies for primary and secondary prevention of stroke to reduce the high burden of premature mortality and morbidity. A research of this kind is thus not only timely but also necessary to provide more insight into some aspects of the problem and to provide the basis for further studies and appropriate intervention.

1.5 CONCEPTUAL FRAMEWORK



1.6 RESEARCH QUESTIONS

1. What proportion of adult medical admissions at KATH was due to stroke in 2006 and 2007?
2. What were the sex and age distributions in those cases?
3. What were the most common presenting features?
4. What proportion of the cases survived the attack and how many died?
5. What was the average length of stay for those who died and for those who survived?
6. What were the general characteristics of the stroke cases?
7. What were the average systolic and diastolic blood pressures on admission and before discharge or death for those that survived and for those that died?

1.7 GENERAL OBJECTIVE

The main objective of this project was to assess stroke outcomes among stroke patients at the KATH for the years 2006 and 2007.

1.8 SPECIFIC OBJECTIVES

1. To determine the number of adult stroke cases that reported for treatment at KATH in 2006 and 2007.
2. To describe the age and sex distribution among the total stroke cases.
3. To determine what the most common presenting features were.
4. To determine the proportion of stroke cases that survived and proportion that died.
5. To determine the average length of hospital stay for survivors and for those who died
6. To describe the general characteristics of the stroke cases.
7. To determine the average systolic and diastolic blood pressures on admission and before discharge or death for those that survived and for those that died.

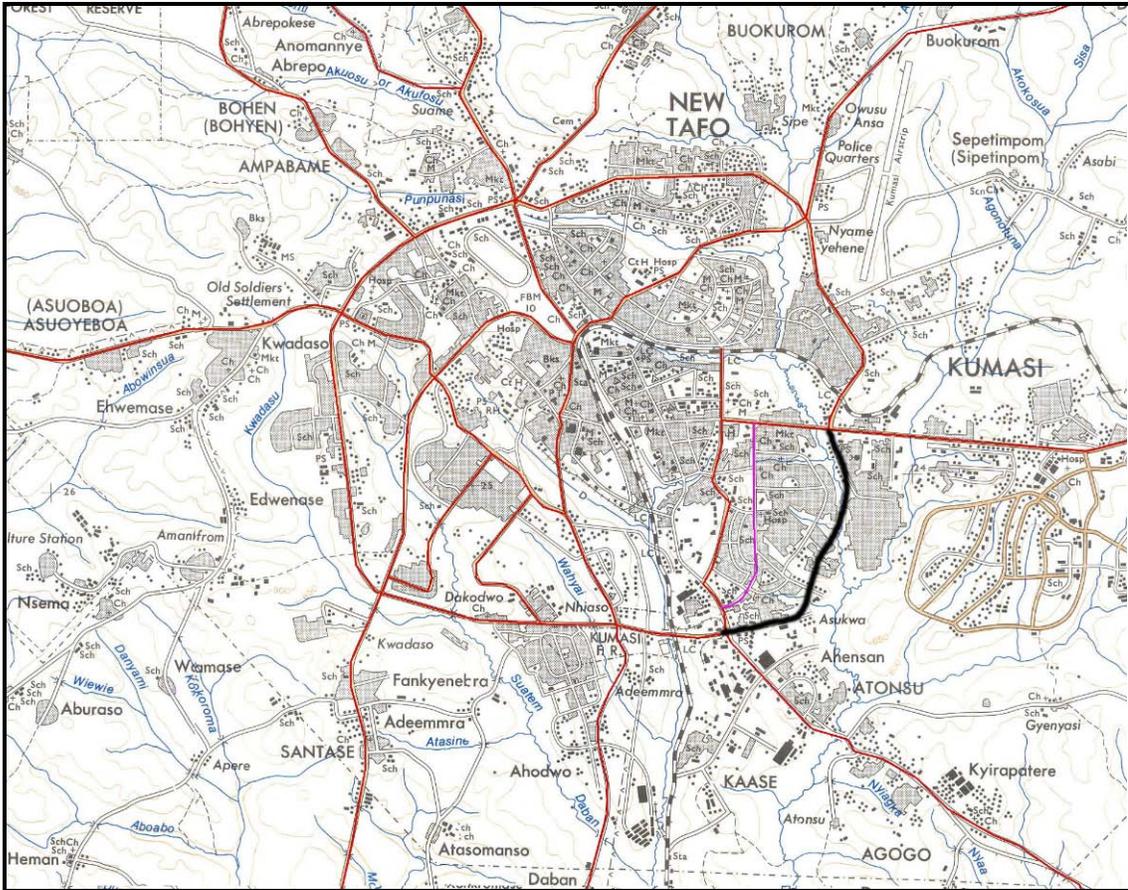
1.9 PROFILE OF STUDY AREA

Komfo Anokye Teaching Hospital is located in Kumasi, the capital of the Ashanti Region in Ghana. The strategic location of this 1000 bed capacity hospital at the confluence of the country's transportation network and the position of Kumasi as the leading commercial centre in Ghana makes it about the most accessible tertiary medical facility in the country. As a result of this, it receives referrals from eight out of the ten regions of the country. An increasing number of patients also come in from the neighbouring countries. Its catchments area therefore has an estimated population of ten million people.

The hospital has the following directorates: Obstetrics and Gynecology, Surgery, Child Health, Polyclinic, Anesthetics and Intensive Care Unit, Medicine, Diagnostic, Oncology, Accident and Emergency, Dental, Technical Services, Domestic Services.

Kumasi is located in the transitional forest zone and is about 270km north of the national capital, Accra. It is between latitude $6.35^{\circ} - 6.40^{\circ}$ and longitude $1.30^{\circ} - 1.35^{\circ}$, an elevation which ranges between 250 – 300 metres above sea level with an area of about 254 square kilometres.

Map 1: Map showing some parts of Kumasi Metropolitan Area



1.9.1 Climate

The Metropolis falls within the wet sub-equatorial type. The average minimum temperature is about 21.5°C and a maximum average temperature of 30.7°C. The average humidity is about 84.16 per cent. The moderate temperature, humidity and the double maximal rainfall system (214.3mm in June and 165.2mm in September) have a direct effect on population growth and the environment as it has precipitated the influx of people from every part of the country and beyond its frontiers to the metropolis.

1.9.2 Vegetation

The city falls within the moist semi-deciduous South-East Ecological Zone. Predominant species of trees found are Ceiba, Triplochlon, Celtis with Exotic Species. The rich soil has promoted agriculture in the periphery. A patch of vegetation reserve within the city has led to the development of the Kumasi Zoological Gardens, adjacent to the Ghana National Cultural Centre and opposite the Kejetia Lorry Terminal. This has served as a centre of tourist attraction. In addition to its scenic beauty as a tourist centre its other objectives include education, preservation of wildlife, relaxation and amusement. Apart from the zoological gardens, there are other patches of vegetation cover scattered over the peri-urban areas of the metropolis. However, the rapid spate of urbanization has caused the depletion of most of these nature reserves.

1.9.3 Health

The Ghana Health Service provides Clinical and Public Health Services through hospitals, clinics, static and outreach stations (Public and Private). Kumasi Metropolis is endowed with many Hospitals, Clinics, Maternity Homes and Outreach Stations. There are 15 Private Laboratories in addition to the Laboratories in the various hospitals.

The table below shows the distribution of Health Facilities, Private Laboratory service and outreach stations in Kumasi.

Table 1: Health Institutions per Sub-Metro Health Areas

Sub-Metro	Gov't Hospitals	Quasi Gov't Hospitals Clinics	Mission Hospital Clinic	Private Hospital	Private Clinics	Mat. Home	Homeopathic Clinic	Private Labs	Outreach Stations
Asokwa	1	1	1	14	22	18	3	1	47
Bantama	1	0	1	15	16	12	0	7	36
Manhyia North	1	0	1	5	10	16	13	2	41
Manhyia South	1	0	0	7	8	6	4	2	25
Subin	2	3	0	3	11	3	0	3	20
Total	6	4	3	44	67	55	20	15	169

1.9.4 Vision of KATH

To become a medical centre of excellence offering clinical and non-clinical services of the highest quality standards comparable to any inter-culture standards, within 5 years.

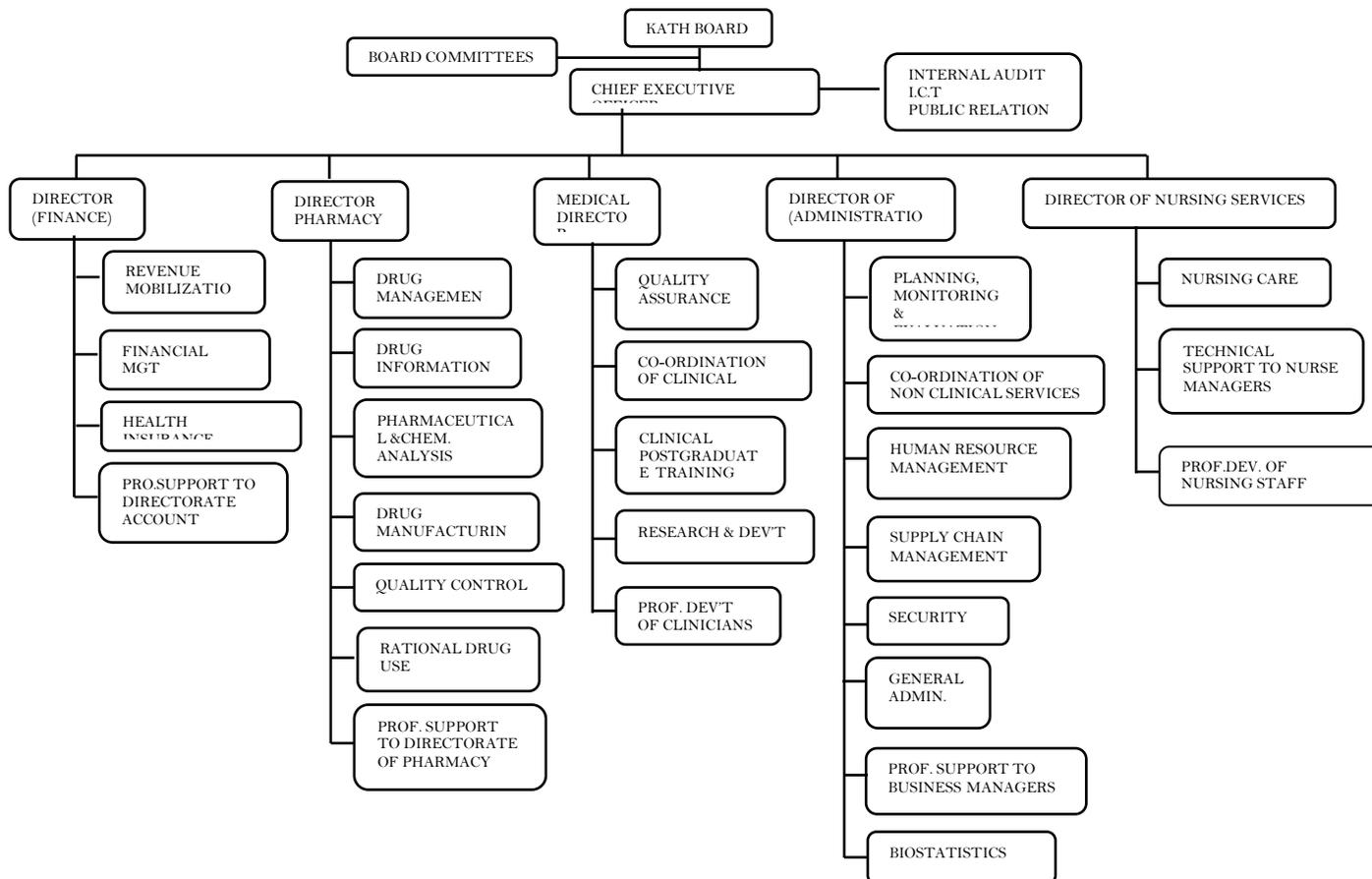
1.9.5 Mission of KATH

To provide, quality services to meet the needs and expectations of all its clients. This will be achieved through well-motivated and committed staff applying best practice and innovation.

1.9.6 Decentralized structures at KATH

Principally, KATH has five (5) broad decentralized structures headed by Directors.

A number of decentralized institutions are under each of the Directors as shown below:



Source: 2006 Annual Performance Report of KATH.

1.9.7 Service Organization

The service organization of KATH is segregated along the pattern of diseases, sex, age etc. Based upon the above, there are 12 Directorates of which 10 are clinical and 2 are non- clinical. The organogram of a typical clinical and non Clinical Directorates are shown below.

Figure 3: Organogram for Clinical Directorate

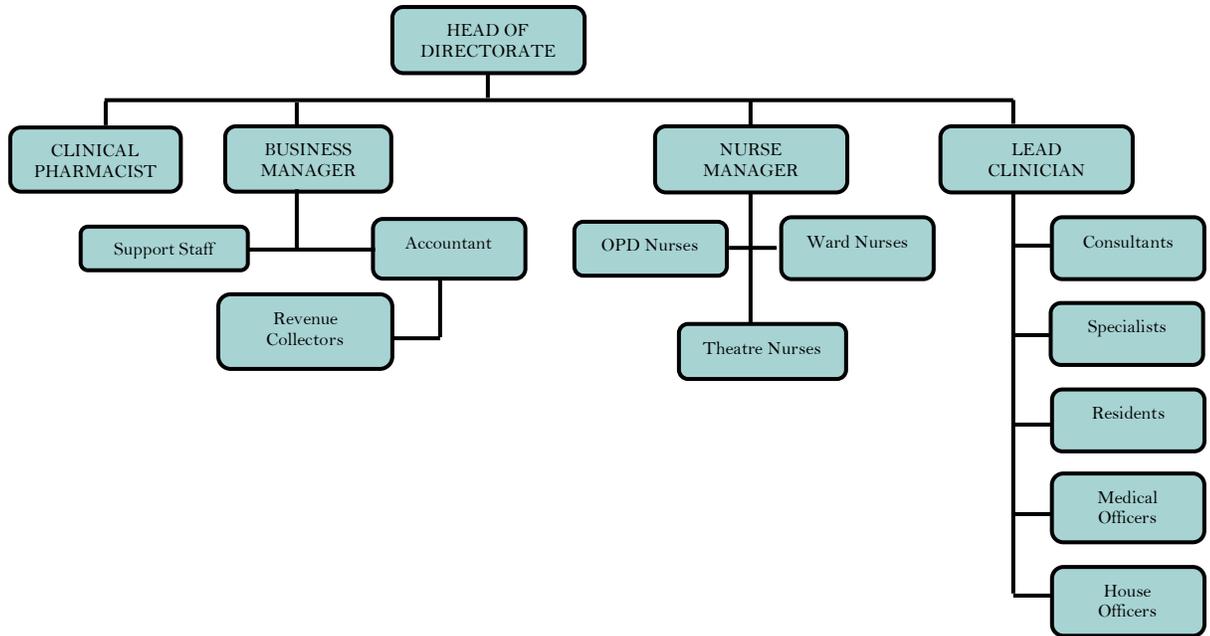
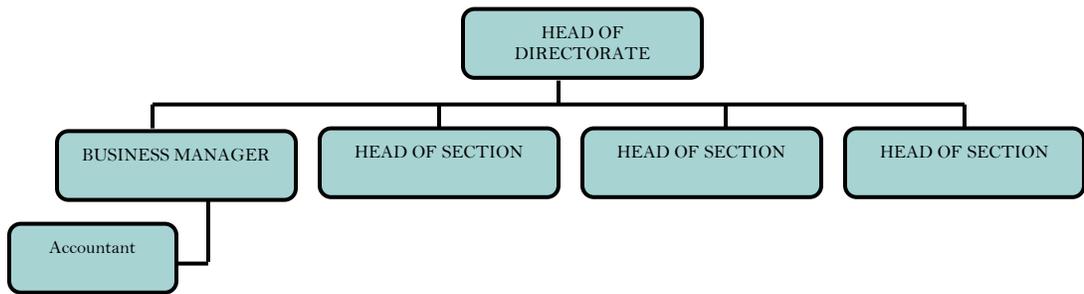


Figure 4: Organogram for Non Clinical Directorate



Source: KATH composite Programme of work 2008 pag 6

CHAPTER TWO - LITERATURE REVIEW

2.1 Introduction

The traditional definition of stroke, "rapidly developing clinical signs of focal (sometimes global) disturbance of cerebral function, lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin¹⁶ is the broadly accepted standard. Stroke is a common neurological problem accounting for a third of all deaths in Western countries.¹⁷ Reported rates of stroke recurrence after an initial stroke have varied widely from 3% to 22% at 1 year to 10% to 53% at 5 years in different studies.¹⁸ Ischemic strokes including embolic and thrombotic strokes account for 80% of all strokes while hemorrhagic strokes such as primary intracerebral hemorrhage and subarachnoid hemorrhage account for 20%.¹⁹ Mortality rates are higher in African decent populations living in Western countries than in White people at ages below 70 years.²⁰ A higher prevalence of hypertension, diabetes mellitus (DM), obesity, smoking and low socioeconomic status may contribute to the higher stroke incidence and mortality seen in African decent populations as compared to White people.²¹

In developed countries, the prevalent health problems are those lifestyle illnesses associated with increased wealth. In contrast, diseases occurring in developing countries can largely be ascribed to poverty, poor healthcare infrastructure and limited access to healthcare.²² Notwithstanding, many developing countries have undergone economic and demographic growth in recent years resulting in a shift from diseases caused by poverty toward chronic non-communicable diseases^{15,22} Cappuccio⁶ argues that ischaemic heart disease and stroke are now the most common causes of death in the world and that 70% of these deaths occur in developing countries, besides the impact of the HIV/AIDS epidemic, and that ischaemic heart disease and stroke will remain the most common causes of morbidity, disability, and death in developing countries in 2020.

The global society has a moral responsibility to respond to the worldwide changes in health problems.¹³

In Nigeria, stroke case fatalities of 9% in the first 24 hours, 28% at 7 days, 40% at 30 days, and 46% at 6 months and 17% of medical deaths were found in hospital based studies,²³ whereas stroke accounted for 0.5% to 45% among neurological admissions.²³ Most strokes are preventable. The focus of primary prevention thus is reduction of as many modifiable risk factors as possible.^{24,12} Despite the opportunities for effective prevention, cardiovascular risk factor management remains inadequate.

2.2 Risk factors for stroke that can be treated or controlled

High blood pressure (hypertension): High blood pressure is the most important controllable risk factor for stroke.^{20,24} The world health report 2002 shows that high blood pressure is the leading cause of avoidable mortality and morbidity in all world regions.¹⁴ Hypertension and stroke are emerging as important threats to the health of adults in Africa.²⁵ However, due to scarce resources and healthcare provision, the detection of hypertension is still haphazard and unreliable and the prevention of stroke lacking.²⁶ Hypertension awareness, treatment and control rates as low as 34.0%, 28.0% and 6.2%, respectively have been found in the Ashanti region of Ghana.²⁷ It has been shown in the literature that simple, effective management of high blood pressure alone can reduce stroke incidence by as much as 70%.¹⁹

Diabetes mellitus: Diabetes and impaired glucose tolerance are becoming epidemic in both developed and developing countries.⁷ In Ghana, the prevalence of diabetes in urban areas is about 6.4%, while in Tanzania, adult male mortality associated with diabetes is about 34 per 100,000. The relative risk of stroke associated with diabetes has

been estimated to be 1.5 to 3.0.⁷ Current estimates indicate that about 150 million people have type 2 diabetes globally, and this figure is expected to double by 2025⁷ with a majority of these patients living in the developing world. Patients with diabetes commonly have hypertension and hyperlipidemia which further increases their risk.² Although diabetes is treatable, the presence of the disease still increases one's risk of stroke.^{19, 2}

Carotid artery disease: A carotid artery narrowed by fatty deposits from atherosclerosis may become blocked by a blood clot leading to the development of stroke. People with peripheral artery disease have a higher risk of carotid artery disease, which raises their risk of stroke.^{24, 28, 29}

Atrial fibrillation: Atrial fibrillation is a known risk factor for stroke and its incidence rises with age.³⁰ The heart's upper chambers quiver instead of beating effectively, leading to the blood pooling and clotting. If a clot breaks off, enters the bloodstream and lodges in an artery leading to the brain, a stroke results.^{24, 28, 29} Patients with atrial fibrillation have a risk of 5% each year to develop stroke, and this risk is even higher in those with valvular atrial fibrillation.²⁸

Transient ischemic attacks (TIAs) and Prior stroke: TIAs are "warning strokes" that produce stroke-like symptoms but no lasting damage.²⁴ A person who has had one or more TIAs is almost 10 times more likely to have a stroke than someone of the same age and sex who has not.²⁴ Up to approximately 30% of people who suffer TIAs will develop a stroke within 5 years.¹² Research has shown that prior stroke before surgery

is strongly and independently associated with vulnerability for stroke after cardiac surgery, particularly for men.³¹

Other heart diseases: Common heart disorders such as coronary artery disease, valve defects, irregular heart beat, and enlargement of one of the heart's chambers can result in blood clots that may break loose and block vessels in or leading to the brain.^{24, 29} People with coronary heart disease or heart failure have a higher risk of stroke than those with hearts that work normally.²⁴

Sickle cell disease: Sickle cell anaemia can cause blood cells to clump and block blood vessels, thereby increasing stroke risk.²⁴ It has been argued that sickle cell disease increases one's risk of ischaemic stroke because of increased haemolysis and altered rheologic properties of red blood cells.⁷ Stroke is the second leading cause of death in people under 20 who suffer from sickle cell anaemia.²⁸

High blood cholesterol: People with high blood cholesterol have an increased risk of stroke.²⁴ Effective Control of high blood cholesterol reduces the incidence of stroke by approximately one-third.³²

Cigarette smoking: Cigarette smoking doubles the risk of stroke.⁷ While tobacco use is decreasing in developed countries due to strong tobacco control programs (tobacco prevalence in several Western countries varies between 15% and 29.9%)⁷ the opposite trend is observed in many developing countries (where, for instance, prevalence is 60% in Yemen and Kenya).⁷ Developing countries are becoming the main target of the transnational tobacco industry, which takes advantage of the weak or non-existent tobacco control programs in these countries⁷ the use of oral contraceptives combined with cigarette smoking greatly increases stroke risk.²⁴ Eliminating smoking will not

only extend life and result in an enhancement in the number of years lived without disability but will also reduce disability into a shorter period.³³

Socio-economic factors: Men and women of low socio-economic status face an unequal social and health disadvantage.³⁴ There is some evidence that strokes are more common among low-income people than among more affluent people.²⁴ Low education and income have been found to be associated with a higher stroke incidence at ages 65-74 years, however beyond age 75, it is rather higher socioeconomic status that has been found to be associated with a higher stroke incidence.³⁴ Thus people belonging to the higher socioeconomic group might be more likely to live long enough to develop stroke at a very old age.³⁴

Physical inactivity and obesity: Worldwide, physical inactivity causes about 1.9 million deaths annually⁵ while physical activity is still high in rural areas; it tends to decrease quickly in urban areas.⁵

Being inactive, obese or both increases one's risk for high blood pressure, high blood cholesterol, diabetes, heart disease and stroke.²⁴ Community and environmental changes have been associated with urbanization. The rates of urbanization are increasing globally, from 36.6% of the world inhabitants living in urban areas in 1970, to 44.8% in 1994.⁴ This fraction is expected to increase to 61.1% by 2025.⁴ With urbanization there is a noticeable increase in consumption of energy rich foods and a decrease in energy spending (through less physical activity).⁴ In addition to increased exodus of individuals from rural to urban areas, rural areas are themselves also being altered through increased use of vehicles leading to a reduction in physical activity.⁴

2.3 Risk factors for stroke that cannot be changed

Age: Advanced age is one of the most significant stroke risk factors.²⁸ The morbidity of stroke increases with age, thus one's chance of having a stroke more than doubles for each decade of life after age 55.^{19,24} Ninety –five percent of strokes occur in people aged 45years and older, and two-thirds of strokes occur in those over the age of 65years³⁵ However, stroke can occur at any age, including in fetuses.²⁹

Heredity (family history) and ethnic origin: African Americans have been found to be at increased risk compared with White Americans for death from both hemorrhagic and ischemic stroke, with ischemic stroke predominating in both groups.^{21,24} Family members may have a genetic tendency for stroke or share a lifestyle that contributes to stroke.²⁸ One's stroke risk is greater if a parent, grandparent, sister or brother has had a stroke.²⁴

Sex (gender): Men are 1.25 times more likely to suffer strokes than women, yet 60% of deaths from stroke occur in women²⁸ probably because women are older on average when they have their strokes and thus more often die. Some risk factors for stroke are peculiar only to women. Primary among these are pregnancy, childbirth, menopause and the treatment thereof with hormone replacement therapy.²⁴ Use of birth control pills and pregnancy pose special stroke risk for women.²⁴ However, among all ethnic groups and all ages in 1993, death rates due to stroke were higher in males (69 per 100,000) than in females (46.9 per 100,000) except at age 65 years and over, where the stroke mortality was higher in women than in men.³⁶

2.4 Stroke risk factors that are less well-documented

Geographic location: Strokes are more common in the Southeastern USA than in other areas in the USA. These are the so-called "stroke belt" states.²⁴ Despite the decline in stroke mortality, the relative increased risk of stroke death in the region has

remained constant from 1968 to 1999³⁵ with a greater than 40% excess risk of stroke mortality and more than 1200 excess stroke deaths annually.³⁵

Alcohol misuse: Alcohol misuse can lead to multiple medical complications, including stroke.⁴ A number of studies have suggested that heavy alcohol use, either habitual daily heavy drinking or binge drinking, is related to an increased incidence of stroke as a cause of death.¹⁸ Light or moderate alcohol consumption, however, has been related to a reduced risk of coronary heart disease.¹⁸

Drug misuse: Drug addiction, often a chronic relapsing disorder is associated with a number of societal and health-related problems.²⁴ Drugs that are misused, including cocaine, amphetamines and heroin, have been associated with an increased risk of stroke.²⁴

Sudden numbness or weakness of face, arm or leg, especially on one side of the body, sudden confusion, trouble speaking or understanding, sudden trouble seeing in one or both eyes, sudden trouble walking, dizziness, loss of balance or coordination, sudden severe headache with no known cause, double vision, drowsiness, and nausea or vomiting have been listed among early signs of stroke.^{19, 28}

Most of our knowledge about prevention and treatment is derived from studies conducted in developed countries and predominantly among European populations.¹² Consequently, there is a pressing need to institute suitable research studies, increase awareness of the stroke burden, and develop preventive strategies. The most cost-effective methods of reducing risk among an entire population such as population-wide interventions, combining effective policies and broad health promotion policies should be employed.

CHAPTER THREE - METHODOLOGY

3.0 STUDY METHODS AND DESIGN

This is a retrospective, descriptive study involving review of stroke patients' records.

The term stroke hospital admission refers to both first and recurrent events (all strokes).

The term adult refers to patients aged 25 years and above.

3.1 DATA COLLECTION TECHNIQUES AND TOOLS

Records staff from KATH who assisted in the conduction of the study were briefed about the objectives and purpose of the study. Records retrieval was done on daily basis but most files were retrieved on weekends when the hospital was relatively less busy, till all relevant data were obtained for the period under review. Collection of data was done in two steps.

1. Data was first obtained from tally sheets on all stroke cases that reported at KATH from January 2006 to December 2007. In all 1054 cases were seen. (Four cases were below 25 years). Information obtained included age, sex, length of hospital stay and outcome of management (dead/alive).

2. The next step involved review of 300 out of 1050 files retrieved from the medical records unit. Files were first sorted into dead and alive groups. One hundred and fifty files from each group were selected using systematic sampling method. To obtain a sampling interval for the alive cases, the total number of alive cases were divided by the number required ($594/150 = 3.96$). Thus the first alive case was randomly selected, after which every fourth folder was selected until a total of 150 files were obtained. The same procedure was followed for the selection of died folders but here the sampling interval was 3 ($456/150 = 3.04$). Each of the 300 files was studied and all relevant data on the patients carefully noted and recorded. These included the age of patient, sex, occupation, area of residence, religion, marital status, blood pressure on admission and the last blood pressure measurement before discharge or death, patient's knowledge of his/her hypertension status and the most common presenting features. Files that had

already been studied were differentiated from the others by tagging them with stickers to prevent duplication of information.

3.2 STUDY POPULATION

Stroke patients (25 years and above) who were admitted to the medical ward of KATH for treatment in 2006 and 2007 formed the population for the study.

3.3 STUDY VARIABLES

VARIABLE	OPERATIONAL DEFINITION	SCALE OF MEASUREMENT	OF TYPE OF VARIABLE
Age	Number of complete years one had lived as at the time he/she suffered	Range of years	Continuous

	the stroke.		
Sex	Gender of participant	Male or female	Binary
Occupation	Job or profession	Artisan, Farmer, Trader, Driver, Highly educated, Unemployed, retired	Ordinal
Marital status	Whether a participant was married, single, widowed or divorced	Single, married, divorced Widowed	Ordinal
Area of residence	Usual place of residence of the participant	Urban, semi- urban, rural	Ordinal
Outcome of management	Whether participant died from or survived the attack of stroke	Died or survived	Binary
Hemiplegia / Hemiparesia	Participant's experience with a sudden paralysis or weakness of one side of the body.	Right, Left, Both or Unspecified	Ordinal
Length of hospital stay	Number of days spent on admission before discharge or death	Range of numbers	Continuous
Hypertension	Systolic blood pressure of greater than or equal to 140 mmHg and a diastolic blood pressure of greater than or equal to 90 mmHg, or	Hypertensive, Non- hypertensive, Unspecified	Ordinal

	report of anti-hypertensive medication use.		
Knowledge about hypertension status	Participants knowledge of his /her hypertension status	Known, Unknown Unspecified	Ordinal
Presenting features	Impairment with speech, walking, vision ,consciousness or problems with headache, cough, palpitation, seizure, fever, diabetes dizziness, vomiting	Present, or absent	Binary
Previous episode of stroke	Whether participant had suffered a previous stroke	Yes, No	Binary

3.4 DATA HANDLING

Data collected on participants were given maximum confidentiality. They were kept under lock in a suitcase. Names of patients did not form part of data collected.

3.5 ETHICAL CONSIDERATIONS

Ethical approval was obtained from The Committee on Human Research Publication and Ethics (CHRPE) of The School of Medical Sciences, Kwame Nkrumah University of Science and Technology Kumasi and the Komfo Anokye Teaching Hospital, Kumasi. A special permission was also sought from the heads of the medical directorate and records department.

3.6 ASSUMPTIONS

The following are the assumptions made in this study.

1. That all patients diagnosed as stroke cases were true cases (it is important to note that despite the availability of CT scan in the centre; only about 5% - 10% of the patients had CT scan done, mainly due to cost).
2. That data collected on participants from hospital records were true and accurate.

CHAPTER FOUR – RESULTS

4. I *Generals stroke morbidity and outcome:* Stroke constituted 1.3% of total hospital admissions and 6.3% of total hospital deaths within the period under review (Table 4.211). From medical ward perspective, 9.1% of total medical adult admissions and 13.2% of the total medical adult mortality were ascribed to stroke. Stroke was the

first cause of death at the medical directorate in 2006 and 2007(KATH 2006 and 2007 annual reports).

From table 4.212, one thousand and fifty (1050) cases of adult stroke made up of 537 (51.1%. 95% CI=48.1-54.2) males and 513 (48.9%. 95% CI=45-51.9) females were seen. The male to female ratio was 1:0.96. A total of 456 (43.4%. 95% CI=40.4%-46.5%) patients died from stroke of which 244 (53.5%) were men. The Relative risk was 1.10 (95% CI=0.96%-1.23%).The mean age of stroke patients was 63.68 years (Table 4.215).Those who died were significantly older than those who survived.

4.2 Stroke morbidity, mortality and length of hospital stay.

The average length of hospital stay for stroke patients was 6.23 days (Table 4.215) Patients, who survived, significantly stayed longer on the ward compared to those who died. Sixty patients (13.2%. 95% CI=10.3% -16.7%) died in less than 24 hours on admission, but majority of deaths 283 (62.1%. 95% CI=57.4% -66.5%) occurred within the first seven days of admission (Table4.214).

4.3 Most common presenting features.

Of the 300 files that were further reviewed (Table 4.217), hemiplegia/hemiparesia was present in 274 (91.3%. 95% CI=87.6%-94.3%). Hypertension was present in 261 (87.0%. 95% CI=82.7%-90.6%). As many as 109 patients (36.3%. 95% CI=30.9%-42.1%) were unaware of their hypertension status.

4.4 Mean admission and discharge / death blood pressure.

The mean blood pressures on admission and before discharge or death for stroke patients were 170.23/100 and 134.2/82.9 (Table 4.215). The mean admission systolic blood pressures of those who died was about the same as that of survivors, however those who died had mean admission diastolic pressure, last measured systolic and diastolic blood pressures that were significantly higher than those of survivors.

4.5 Socio-demographic background of sample.

One hundred and eighty-six (62.0%. 95% CI=56.2%-67.5%) of sample were urban dwellers, 81(27.0%. 95% CI=22.1%-32.4%) semi-urban dwellers, whereas thirty- three (11.0%. 95% CI=7.7%-15.1%) were rural dwellers. Their employment statuses were as shown in table 4.216 below.

Table 4.211 (2006 AND 2007 ANNUAL HOSPITAL ADMISSIONS AND DEATHS RECORDS)

VARIABLE	NUMBERS / %
TOTAL HOSPITAL ADMISSIONS	81180
TOTAL HOSPITAL DEATHS	7324
TOTAL ADULT MEDICAL ADMISSIONS	11596
TOTAL ADULT MEDICAL DEATHS	3456
TOTAL STROKES	1054
TOTAL ADULT STROKES	1050
TOTAL STROKE DEATHS	458
TOTAL ADULT STROKE DEATHS	456
% TOTAL STROKES ADMISSION	1.3%
% TOTAL STROKE DEATHS	6.3%
% ADULT MEDICAL STROKE ADMISSION	9.1%

% ADULT MEDICAL STROKE DEATHS 13.2%

FIRST TEN CAUSES OF DEATHS AT THE MEDICAL WARD 2006

CVA	225
HIV	167
LIVER DISEASE	117
DIABETES	111
PNEUMONIA	84
OTHER CVDS	81
HYPERTENTION	53
SEPTICAEMIA	41
ANAEMIA	34
RENAL FAILURE	100

FIRST TEN CAUSES OF DEATHS AT THE MEDICAL WARD 2007

CVA	252
PNEUMONIA	120
DIABETES	101
ANAEMIA	99
OTHER CVDS	81
RENAL FAILURE	70
CANCER OF THE GIT	57
HYPERTENTION	50
TB	39
SEPSIS	32

Table 4.212 (GENERAL STROKE STATISTICS)

Stroke Morbidity			
	(Frequency	%	95% CI (%)
Sex			
Aged > / = 25 years)			
Male	537	51.1	48.1 – 54.2
Female	513	48.9	45.8 – 51.9
Total	1050	100	

Stroke Mortality			
Outcome	Frequency	%	95% C I (%)
Died	456	43.4	40.4 – 46.5
Survived	594	56.6	53.5 – 59.6

Total	1050	100
	Died	%
Male	244	53.5
Female	212	46.5
Total	456	100

Table 4.213 (STROKE MOBILITY AND MORTALITY BY AGE GROUPS)

	Age / Morbidity	Stroke	
Age (years)	Frequency	%	95% CI (%)
≤25	1	0.1	0.0 - 0.6
26 -35	30	2.9	2.0 - 4.1
36 - 45	107	10.2	8.5 - 12.2
46 - 55	192	18.3	16.0 - 20.8
56 - 65	229	21.8	19.4 -24.5
66 - 75	274	26.1	23.5 - 28.9
76 - 85	155	14.8	12.7 - 17.1
86 - 95	54	5.1	3.9 - 6.7
96 -100	5	0.5	0.2 - 1.2
>100	3	0.3	0.1 - 0.9
TOTAL	1050	100.0	

	Age / Stroke Mortality		
Age (years)	Frequency	%	95% CI (%)
=25	1	0.2	0.0 – 1.4
26 -35	13	2.9	1.6 – 5.0
36 – 45	35	7.7	5.5 - 10.6
46 – 55	77	16.9	13.6 - 20.7
56 – 65	95	20.8	17.3- 24.9
66 – 75	118	25.9	22.0 – 30.2
76 – 85	82	18.0	14.6 - 21.9
86 – 95	30	6.6	4.6 – 9.4
96 -100	3	0.7	0.2 – 2.1
>100	2	0.4	0.1-1.8
TOTAL	456	100	

Table 4.214 (LOHS, STROKE MORBIDITY AND MORTALITY)

	LOHS And Stroke Morbidity		
Days	Frequency	%	95% CI (%)
=0	66	6.3	4.9 – 8.0
1-7	628	59.8	56.8 – 62.8
8-14	300	28.6	25.9 -31.4
15-21	41	3.9	2.9 -5.3
22-28	8	0.8	0.4 – 1.6
> 28	7	0.7	0.3 – 1.4
TOTAL	1050	100	

	LOHS And Stroke Mortality		
Days	Frequency	%	95% CI (%)

=0	60	13.2	10.3 – 16.7
1-7	283	62.1	57.4 – 66.5
8-14	93	20.4	16.8 – 24.4
15-21	13	2.9	1.6 – 5.0
22 -28	5	1.1	0.4 – 2.7
> 28	2	0.4	0.1 – 1.8
TOTAL	456	100	

Table 4.215 (MEAN LOHS, AGE, PRESSURE AND STROKE OUTCOME)

Category	Mean LOHS	SD
Overall	6.23	5.36
Died	5.13	5.97
Survived	7.07	4.66
p- value	0.0000	
Mean admission systolic BP		
Overall	170.2	41.5
Died	170.3	46.0
Survived	170.2	37.0
Mean discharge/death systolic BP		
Overall	134.2	25.1
Died	139.9	32.4
Survived	129.5	15.5
p- value	0.0043	
Mean admission diastolic BP		
Overall	100.0	23.4
Died	99.8	25.61
Survived	100.1	21.14

	Mean discharge/death diastolic BP	
Overall	82.9	13.7
Died	84.6	15.5
Survived	81.5	11.9
p- value	0.0446	
	Mean Age	
Overall	63.68	14.86
Died	65.37	15.05
Survived	62.38	14.60
p- value	0.0008	
Men	62.02	14.36
Women	65.41	15.19
p- value	0.0004	

**Table 4.216 SOCIO DEMOGRAPHIC INFORMATION ON SAMPLE
(N=300)**

MARRITAL STATUS	Frequency	%	95% Confidence Interval (%)
Married	168	56.0	50.2 – 61.7
Widowed	60	20.0	15 .6 – 25.0
Divorced	39	13.0	9.4 - 17.3
Single	25	8.3	5.5 – 12.1
Unspecified	8	2.7	1.2 – 5.2
TOTAL	300	100	
OCCUPATION			
Unemployed/ Retired	124	41.3	35.7 – 47.1
Farmer	52.	17.3	13.2 – 22.1
Trader	42	14.0	10.3 – 18.4
Artisan	32	10.7	7.4 – 14.7
Highly Educated	27	9.0	6.0 – 12.8
Driver	23	7.7	4.9 – 11.3

TOTAL	300	100
-------	-----	-----

RESIDENCE

Urban	186	62.0	56.2 – 67.5
Semi – Urban	81	27.0	22.1 – 32.4
Rural	33	11.0	7.7 – 15.1
TOTAL	300	100	

RELIGION

Christian	220	73.3	67.9 – 78.3
Moslem	40	13.3	9.7 – 17.7
Unspecified	36	12.7	8.5 – 16.2
Traditional	4	1.3	0.4 – 3.4
TOTAL	300	100	

Table 4.217 (MOST COMMONLY PRESENTING FEATURES)

Presenting Features	Frequency	%	95% CI (%)
Hemiplegia / Hemiparesia	274	91.3	87.6 – 94.3
Hypertension	261	87.0	82.7 – 90.6
General Bodily Weakness	102	34	28.7 – 39.7
Speech Impairment	89	29.7	24.6 – 35.2
Headache	87	29.0	23.9 – 34.5
Sudden Collapse	85	28.3	23.3 – 33.8
Walking Impairment	84	28.0	23.0 – 33.4
Loss Of Consciousness	82	27.3	22.4 – 32.8
Diabetes	58	19.3	15.0 – 24.3
Previous Episode Of Stroke	54	18.0	13.8 – 22.8
Fever	50	16.7	12.6 – 21.4
Vomiting	42	14.0	10.3 – 18.4
Palpitation	38	12.7	9.1 – 17.0
Seizure	25	8.3	5.5 – 12.1
Dizziness	22	7.3	4.7 – 10.9
Blurred Vision	11	3.7	1.8 – 6.5

Hemiplegia/ Hemiparesis

Side Of Body	Frequency	%	95% CI (%)
Right Side	130	43.3	37.6 – 49.1
Left Side	128	42.7	37 – 48.5
Both sides	16	5.3	3.1 – 8.5
Not Stated	26	8.7	5.7 – 12.4
TOTAL	300	100	

Hypertension Status	Frequency	%	95% CI (%)
Known	151	50.4	44.5 – 56.1
Unknown	109	36.3	30.9 – 42.1
Unspecified	40	13.3	8.5 – 16.2
TOTAL	300	100	

5.0 CHAPTER FIVE – DISCUSSION

5.1 The stroke burden

Stroke morbidity and mortality from both hospital and medical admission perspectives within the period under review were quite high. These figures could even be higher if all strokes within the Ashanti region were to report at KATH. This is because in our setting stroke is commonly considered a spiritual illness which requires spiritual intervention rather than treatment in a hospital and therefore could be under-reported. In a similar study conducted in Usmanu Danfodiyo University Teaching Hospital, Sokoto Nigeria a total of 93 stroke cases were seen in a period of five years (1994-1998).⁸ In the current study as many as 1050 adult stroke were seen in two years. These findings confirm the argument that morbidity and mortality from stroke could be increasing in the West African region and perhaps Africa as a whole. As suggested by

Lemoguo⁷ reducing the stroke burden will require developing among others: public health programs, education and health policies to increase awareness on the preventable nature of stroke, educate on the modifiable risk factors of stroke, adoption of healthy lifestyles, educating the public and healthcare workers about the warning signs of stroke and the need for rapid response, strengthen risk factor reduction among persons at high risk, and developing population-based surveillance systems.

5.2 Sex, stroke morbidity and outcome

Both males and females were affected. Although the females were on average older than the males, the proportion of males that died was marginally greater than females (contrary to expectation). This could probably be for the reason that, the incidence of compounding risk factors such as smoking, excessive alcohol consumption, drug misuse and hormone replacement therapy (which have been listed as risk factors) ^{18, 24, 28} is likely to be low among women in our setting.

5.3 Age, stroke morbidity and outcome

A greater number of stroke patients, 76.4% were between 35 and 75 years. This is in agreement with findings among African decent populations and at variance with findings among European populations, where majority of their patients are 70 years and above.²⁰ Lack of knowledge of the risk factors for stroke and failure to control risk factors when they are identified might have contributed to this observation.

5.4 LOHS, stroke morbidity and outcome

About 98.6% of patients died within the first twenty-one days of admission. According to Njoku and Adujolu⁸ the trend of mortality seen in this study within 24 hours, seven days and after twenty-eight days agrees with the trend seen in the aggregated data from a WHO study published in 1980. It has been stated that the high mortality in the

first one-week may be due to raised intracranial pressure and that most deaths after one week are from preventable causes.⁸ Further studies, however, are required to identify these preventable causes.

5.5 Hypertension and stroke morbidity.

Hypertension was found to be the major risk factor of stroke among the patients present in 87.0%. Many of the subjects were unaware of their hypertension status. Epidemiological studies suggest that even a small blood pressure reduction (5 to 6 mmHg systolic, 2 to 3 mmHg diastolic) would result in 40% fewer strokes.²⁸ However,

hypertension awareness, treatment and control rates as low as 16.4%, 6.9%, and 1.7%, respectively have been found in the Ashanti region of Ghana.³⁸ It has been shown in literature that simple, effective management of high blood pressure alone can reduce stroke incidence by as much as 70%.¹⁹

5.6 Other presenting features

Diabetes was present in 19.3% of patients. Diabetes has been identified as one of the risk factors of stroke that can be controlled.^{18,24,28} However, prevention and control of diabetes is said to be a major public health priority in all countries.⁴

Other presenting features including general bodily weakness, headache, fever, vomiting, palpitation and dizziness also happen to be among the most commonly presenting symptoms of malaria³⁹ which is very common in our environment. These preceding signs are thus likely to be mistaken for symptoms of malaria (commonly managed at home with over the counter drugs or herbs). Thus early intervention may not be sought until more worrying signs such as sudden collapse, loss of consciousness, seizure,

hemiplegia/hemiparesia, speech and or walking impairment set in. Public education on health issues generally must be intensified.

5.7 Socio-economic background

About forty-one percent of sample were either unemployed or on retirement whereas 58.5 % were employed. Only 9% were highly educated. Using educational background and employment statuses as indicators of better socio-economic standing, it could be inferred that the prevalence of stroke was higher among patients of low socio economic background.

The economic impact of stroke is felt both as cost to the country's health system as well as the loss of income and production of those affected either directly by the disease or as caregivers to those with stroke, who cease to work as they should. The creation of centers where stroke patient can receive the needed rehabilitation and care should be part of government's agenda.

5.8 Area of residence

The stroke patients were mostly urban and semi- urban dwellers. Loss of traditional living styles and migration from rural to urban regions have been found to further increase the prevalence of diabetes mellitus, dyslipidemias, and hypertensive diseases, all of which will contribute to the increasing incidence of stroke.^{7,13} The emergence of fast food shops and the associated consumption of more calories among urban dwellers, pressures of city life among others could be some of the reasons why the incidence of stroke was higher among urban dwellers but this also needs further studies.

5.9 Limitations of the study

The findings in this report are subject to at least three limitations. First, as a hospital-based study, the observations made may not be representative of all strokes occurring in the community. Second, this study did not examine the data on the subtype of stroke suffered by the study participants. Lastly, what happened to those who survived the attack after they had been discharged is unknown since they were not followed up.

CHAPTER SIX - CONCLUSION AND RECOMMENDATIONS

CONCLUSION: The study findings indicate that stroke is an important health problem with alarmingly high fatal outcomes at the Komfo Anokye Teaching Hospital. Both males and females are affected. Hypertension was found to be the major risk factor for stroke. Diabetes was also found as a stroke risk factor. Majority of stroke patients (75%) that will either die or remain permanently disabled belong to the active segment of the population. Attention therefore, needs to be focused on patient, health personnel and public education with the intention of reducing as many risk factors as possible.

RECOMMENDATIONS: Stroke can affect people physically, mentally, emotionally, or a combination of the three thereby decreasing their employability and productivity.²⁸ The major cost or impact of a stroke is the loss of independence that occurs in survivors. What was once a self-sustaining and pleasant everyday life may lose most of its quality after a stroke and other family members may find themselves in a new role as caregivers. From this study, the majority of stroke patients (75%) that will either die or remain permanently disabled belong to the active segment of the population. Greater

attention therefore needs to be focused on preventive measures to save the active population from this disabling disease and to forestall premature deaths.

In America, The American heart association (AHA) is working tirelessly to promote the application of research findings to the daily lives of individuals with, or at risk for, cardiovascular diseases, and to get their message into homes, schools and the workplace¹¹ the development of clinical practice guidelines, the creation of quality improvement programs that foster adherence to these guidelines, and the dissemination of public and patient education programs and materials have been vital components of the AHA's strategy. These approaches could be tested and duplicated in our setting also.

In most countries where stroke services and systems are organized, there has been a significant reduction in the mortality and morbidity from strokes¹⁹ hence, investing in public education, local and emergency medical service is very crucial.

A healthcare reform system that embraces changes needed to make the healthcare system work for every Ghanaian, including: improving patient access to affordable health care and coverage; addressing healthcare disparities that limit the equitable delivery of health care; organizing healthcare delivery systems to ensure the highest quality and most efficient care; educating and empowering patients with relevant and up to date information; supporting the personnel needed for both healthcare delivery and research; and investing sufficiently in biomedical research should be the priority of governments.

In addition, the public's attention could be drawn to the findings of this research and be made aware that, hope is not all lost because stroke can be prevented by ;

1. Avoiding smoking

2. Avoiding or reducing alcohol intake
3. Exercising on regular basis
4. Maintaining normal blood pressure, cholesterol and sugar levels
5. Eating local diets that are rich in fruits and vegetables instead of fast foods.

Perhaps with the current reform of our healthcare system, including health insurance systems the lives of individuals who have (or who are at risk for developing) stroke will be improved. Increased research, national and international commitment for the prevention and control of stroke in Ghana and Africa as a whole is emphasized.

REFERENCES

1. Leeder S, Raymond S, Greenberg H. Heart disease in South Africa. *South African Medical Journal* 1996; 86:679-84.
2. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. *Circulation*.1998; 97:596- 601.
3. Van der Sande MAB. Cardiovascular disease in sub-Saharan Africa: a disaster waiting to happen. *Journal of Medicine*.2003; 61(2):32-36.
4. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001; 104:2746-53.
- 5.WHO, Cardiovascular diseases in the African Region – current situation and perspective (AFR/RC55/12), Brazzaville, World Health Organization, Regional Office for Africa 2005.
6. Capuccio FP.Epidemiological transition, migration and cardiovascular disease. *International Journal of Epidemiology* 2004; 33(2):387-8.

7. Lemogoum D, Degaute JP, Bovet P. Stroke prevention, treatment and rehabilitation in Sub-Saharan Africa. *The American Journal of Preventive Medicine*.2005; 29(51):95-101,
8. Njoku CH, Adujolu AB. Stroke in Sokoto, Nigeria: A five year retrospective study. *Annals of African Medicine*.2004; 3(2):73-76.
9. Wiredu EK, Nyame PK. Stroke-related mortality at Korle Bu Teaching Hospital. Accra, Ghana. *East African Medical Journal* 2001; 78:180-4.
10. Plange-Rhule J, Phillips R, Acheampong JW, Saggar-Malik AK, Cappuccio FP, Eastwood JB. Hypertension and renal failure in Kumasi, Ghana. *Journal of Hypertension* 1999; 13:37-40.
11. Gibbons RJ, Jones DW, Gardener TJ, Goldstein LB, Moller JH, Yancy CW. The American Heart Association's 2008 Statement of Principles for Healthcare Reform. *Circulation* 2008; 118:2209-18.
12. Ebrahim S, Davy SG. Exporting failure? Coronary heart disease in developing countries. *International Journal of Epidemiology* 2001; 30:201-5.
13. Breithardt G, Eckardt L. The global burden of cardiovascular diseases. *XXIst Annual Congress of the European Society of Cardiology* 1999.
14. World Health Organization: *The World Health Report 2002*. Geneva. World Health Organization; 2002.
15. Connor MD, Walker R, Modi G, Warlow CP. Burden of stroke in Black populations in Sub-Saharan Africa. *Lancet Neurology* 2007; 6(3):269-78.
16. Aho K, Harmsen P, Hatano S, Marquardsen J, Smirnov VE, Strasser T. Cerebrovascular disease in the community: results of a WHO collaborative study. *Bull World Health Organ* 1980; 58:113-130.

17. Sudlow CLM, Warlow CP. Comparing stroke incidence worldwide: what makes studies comparable? *Stroke* 1996; 27:550–558.
18. Stroke in perspective: Risk factors. *Internet Stroke Center*. [Available at http://www.strokecenter.org/education/ais_risk_factors/recurrent.htm-19K] accessed 21st March 2007.
19. Zumo AL. What is stroke? How to recognize, prevent and treat stroke. *The Perspective* 2006. [Available at <http://www.theperspective.org/articles/0223200601.html-21K>] accessed 21st March 2007.
20. Gillum RF. Risk factors for stroke in blacks: A critical review. *American Journal of Epidemiology* 1999; 150(12):1266-74.
21. Gillum RF. Stroke mortality in blacks – Disturbing trends. *Stroke* 1999; 30:1711-15.
22. Koju R. Preventive cardiology: a brief review from developing country viewpoint. *Kathmandu University Medical Journal* 2004; 2(1):67-68.
23. Ogun SA, Ojini FI, Ogungbo B, Kolapo KO, Danesi MA. Stroke in south west Nigeria: A 10 year review. *Stroke* 2005; 36:1120-22.
24. The American Heart Association. (2007), Stroke Risk Factors. [Available at <http://www.strokeassociation.org/presenter.jhtml?identifier=4716-44k>] accessed 3rd March 2008.
25. Thorogood M, Connor M, Tollman S, Hundt GL, Fowkes G, Marsh J. Cross-sectional study of vascular risk factors in a rural South African population: Data From The South African Stroke Prevention Initiative. *BMC Public Health* 2007; 7:326doi:10.1186/1471-2458-7-326.

26. Garbusinski JM, Van der Sande MAB, Bartholome EJ, Dramaix M, Alieu Gaye A, Coleman R, Nyan OA, Walker RW, McAdam KPWJ, Walraven EG. Stroke presentation and outcome in developing countries: A prospective study in the Gambia. *Stroke* 2005; 36:1388–99.
27. Agyemang C. Rural and urban differences in blood pressure and hypertension in Ghana, West Africa. *Public Health* 2006; 120: 522-33.
28. Stroke. *Wikipedia: The Free Encyclopedia*. [Available at <http://www.en.wikipedia.org/wiki/stroke-281k>] accessed 20th March 2007.
29. Brain Basics: preventing strokes: National Institute of Neurological Disorders and stroke. [Available at http://www.ninds.nih.gov/disorders/stroke/preventing_strokehtm-69]
30. Kalra L, Perez I, Melbourn A. Risk assessment and anticoagulation for primary stroke prevention in arterial fibrillation. *Stroke* 1999; 30:1218-22.
31. Honge CW, De Wet CJ, Schectman KB, Davila-Roman VG. The importance of prior stroke for the adjusted risk of neurological injury after cardiac surgery for women and men. *Anesthesiology* 2003; 98:823-9.
32. Deanfield JE. Clinical Trials: Evidence and Unanswered Questions – Hyperlipidaemia. *Cerebrovasc Dis* 2003; 16 (Suppl.3):25-32
33. Nusselder WJ, Looman CWN, Marang- van de Mheen JP, Van de Mheen H, Machenbach JP. Smoking and the compression of morbidity. *J Epidemiol Community Health* 2000; 54:566-74.

34. Avendano M, Kawachi I, Lenthe FV, Boshuizen HC Mackenbach JP, Vanden Bos GAM, Fay ME, Berkman LF. Socioeconomic status and stroke incidence in the US elderly: The role of risk factors in EPESE study. *Stroke* 2006; 37:1368-73.
35. Howard G, Evans GW, Pearce K, Howard VJ, Bell RA, Mayer EJ, Burke GL. Is the stroke belt disappearing? An analysis of racial, temporal, and age effects. *Stroke* 1995; 26:1153-1158.
36. Fang J, Madhavan S, Alderman MH. The association between birthplace and mortality from cardiovascular causes among Black and White residents of New York City. *New England Journal of Medicine* 1996; 335:1545-51.
37. Cappuccio FP, Micah FB, Emmett L, Kerry SM, Antwi S, Martin-Peprah R, Phillips RO, Plange-Rhule J, Eastwood JB. Prevalence, detection, management, and control of hypertension in Ashanti, West Africa. *Hypertension* 2004; 43: 1017- 22.
38. Standard treatment guideline. 2000. Ghana National Drugs Programme, Ministry of Health. Ghana. Pages 31, 250