National Survey on SUDDEN DEATH in Nigeria

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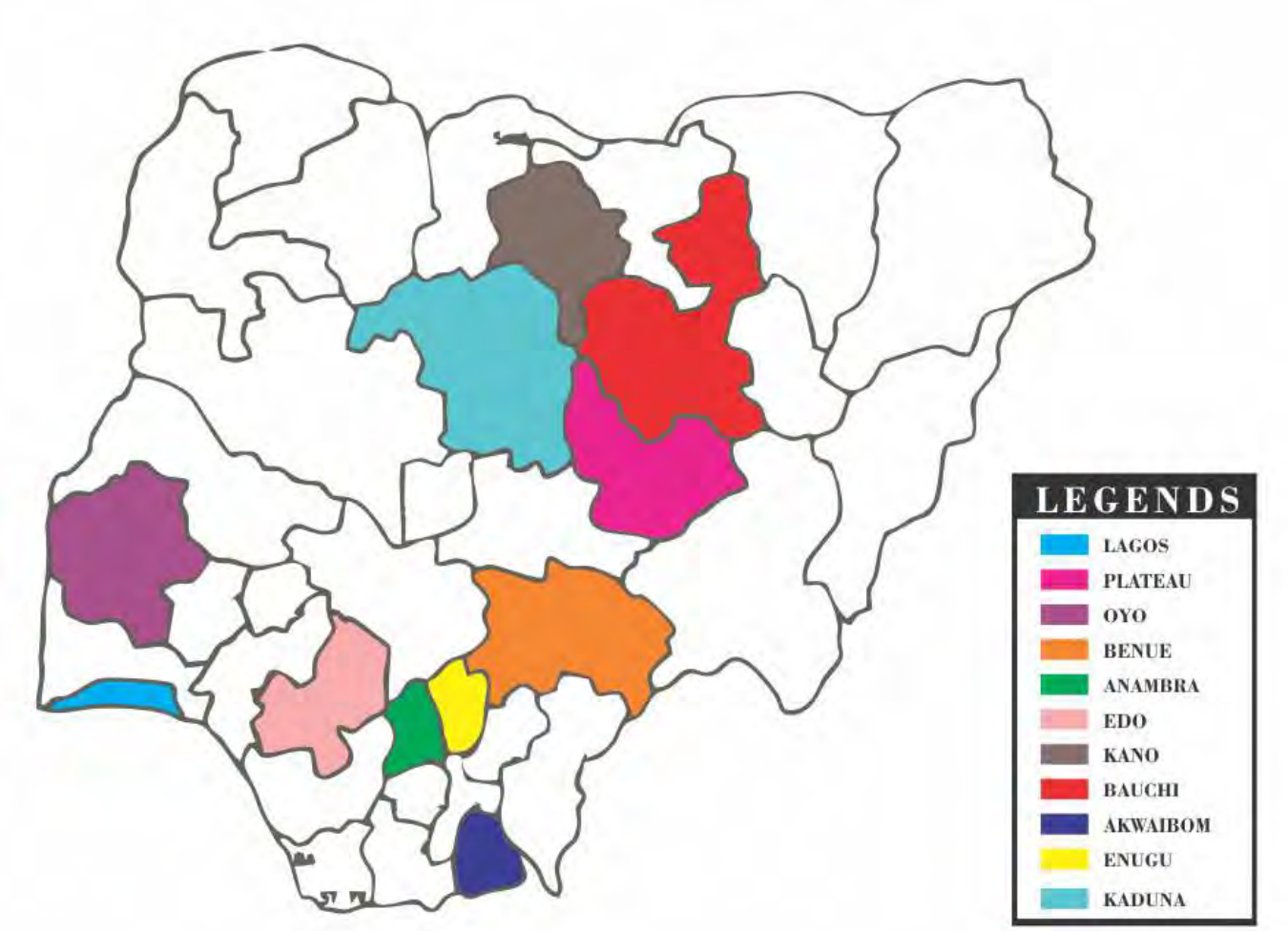
MAP OF NIGERIA SHOWING THE SURVEY SITES



FOREWORD

Sudden death (SD) has become a global health Challenge with a negative impact on the healthcare system and economy. Globally, cardiac causes are the leading causes of sudden death, accounting for over 7million deaths annually. Without appropriate interventions, this rate is expected to double by 2020 with 83% of sudden death cases occurring in developing countries.

Nigeria as a country is not spared as the incidence of sudden death has increased over the past ten years, coinciding with the rising prevalence of its risk factors such as hypertension, diabetes mellitus, obesity and smoking as well as their complications.

Nigeria is a country with a double burden of communicable and non-communicable diseases (NCDs) and is in a state of demographic and epidemiologic transition with sudden death appearing as an emerging phenomenon. Non communicable diseases have been implicated as a major cause of sudden death but was thought to be a disease of the affluent. However, studies have shown that both the rich and the poor are affected as no social class is spared of this predicament. Nigeria is ranked among the top five countries in Africa with high burden of hypertension, type 2 diabetes mellitus (T2DM) and Chronic Kidney Diseases (CKD). This is quite disturbing as these conditions are all non- communicable diseases in the wake of emerging and reemerging infectious diseases.

There is increasing incidence of sudden death in Nigeria as a result of the increasing trend in NCDs which in turn has a devastating impact on health outcomes and the economy. The 2010 WHO global status report on NCDs showed that in 2008, NCDs accounted for 63% of global deaths. In 2012, NCDs were responsible for 68% of global deaths with 40% of such deaths occurring in persons under 70 years. Over 75% of the CVD deaths occurred in low and middle income countries (LMIC). The cumulative economic loss due to NCDs in LMIC is estimated to be $ 7 trillion in 2011-2025. This outweighs the annual $11.2 billion cost of implementing a set of high impact interventions to reduce NCD burden. Addressing the challenge of NCDs will invariably help in curbing the menace of sudden death especially in LMIC.

Interestingly, a decline in the incidence of sudden death is experienced in developed countries and this has been attributed to availability of detailed research data for adequate intervention programs.

In Nigeria, pockets of studies on sudden death have been carried out in different regions and cardiovascular diseases were implicated as the commonest cause of sudden death in Nigeria. However, a detailed and integrated national data on incidence and distribution of sudden death in the six geopolitical zones of the country is lacking.

This study was carried out to provide a baseline data on the causes and risk factors of sudden death in Nigeria. This will enable the Nigerian government to make policies that will birth intervention programs aimed at prevention, early identification and effective management of risk factors and causes of sudden death in Nigeria.

Professor Babatunde Lawal Salako
Director General NIMR

PREFACE

The striking phenomenon of sudden death has been reported severally. It is defined as unexpected death that takes place within 24hours with or without onset of plausible conditions. In the field of sport, apparently healthy athletes have dropped dead in the course of training without pre-existing sickness. In homes and in work places, the grief associated with such unexpected and irreparable loss cannot be over emphasized.

Whereas there is a declining incidence of sudden death in developed countries due to availability of detailed research data culminating into adequate intervention programs. In developing countries, sudden death syndrome is on the rise and has become a formidable health challenge in need of urgent interventions. Over the years, several individuals in various institutions in Nigeria have tried to conduct research on causes of sudden death. However, their findings have not brought to fore nationally representative data that could help policy makers develop adequate intervention program.

On 24th April 2014, the Nigerian Institute of Medical research, Lagos Nigeria convened a stakeholders meeting bringing together, pathologists from the six geo-political zones of the country. The aim was to visit individual corona record archives and glean data on occurrence, causes and risk factors of sudden death and also determine the levels of knowledge, attitude and practice of sudden death amongst health workers at selected teaching hospitals across the six geopolitical zones in Nigeria.

We have been extremely gratified by the first phase of the study. Respective Chief Medical Directors (CMDs) and Pathologists have given immense support towards making the study a success. You will find the Report of our study presented concisely in tables, graphs and appendixes to illustrate the causes and risk factors of sudden death in Nigeria. It is our hope that this report will also serve as a valuable tool to researchers and the academic communities.

Challenges faced in the course of our study have been identified and we will work consciously with relevant authorities to address them. Multiple aetiologies and risk factors of sudden death were identified as well. Cardiovascular, respiratory and central nervous system disorders were the commonest causes with **hypertension** being the predominant risk factor. In due course, we will partner with like minds to inform Nigerians on ways of addressing them.

We are very grateful to all those who contributed towards the successful completion of the study. To all of them, we owe our many thanks.

Dr. Odunukwe, Nkiruka Nonyelum, *BM.CHB, FWACP, MNIM, MD.*
Director of Research & Head NCD Research Group

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This Technical Report is based on research work conducted in Nigeria to investigate the trend and incidence of sudden death over a ten-year period from 2008. We the entire members of the NIMR Non-communicable diseases Research Group (NCD) herby give thanks, adoration and praise to the Almighty God for His mercy, faithfulness, Love, Inspiration, grace and wisdom that we have always enjoyed especially during the course of this study. To Him alone be all glory for the successful completion of this work.

We have learnt so much from so many and without them, the successful completion of this work would not have been a reality. We appreciate the NIMR community especially the management committee, for the support and the conducive ambience from the beginning to the end of the study.

We are thankful to all staff of the morbid anatomy departments of the collaborating institutions for their assistance in going into the archives. We are grateful to all members of management of Lagos State University Teaching hospital, Ikeja; University College Hospital, Ibadan; Police clinic Edo; University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu; Aminu Kano Teaching Hospital, Kano; Nnamdi Azikiwe University Teaching Hospital, Nnewi; Jos University Teaching Hospital, Jos, Plateau state; Irrua Specialist teaching Hospital, Bauchi State Teaching Hospital, University of Uyo Teaching Hospital, Uyo, Akwa Ibom State and Benue State University Teaching Hospital, Benue, for giving us unrestricted access to their data.

Our profound gratitude goes to our sponsors, the federal ministry of health (FMoH) and Federal Government of Nigeria, we are sincerely grateful.

We cannot forget the unflinching support of the NIMR data department, especially Dr. AZ Musa, Mrs. Adedeji and Mr. Rasheed Oba for the statistical analysis, without whose efforts the process of data entry, cleaning and analysis will not have been possible. We appreciate Mrs. AT Asemota for secretarial assistance.

Also all our study subjects, though some post-humus, we respect their rights and appreciates their contributions.

However, for all who in one way or the other have contributed to the success of this work but not mentioned, we are equally grateful. Above all, we ascribe all glory to God Almighty for the success he gave us.

Non-communicable diseases Research Group,
NIMR.

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ACRONYMS

ABUTH	Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State
AKTH	Aminu Kano Teaching Hospital, Kano, Kano State
ATBUTH	Abubakar Tafawa Balewa University Teaching Hospital, Bauchi, Bauchi State
BCC	Behavioural Change Communication
BSUTH	Benue State University Teaching Hospital, Makurdi, Benue State
CKD	Chronic Kidney Disease
COPD	Chronic Obstructive Pulmonary Disease
CRF	Case Report Form
CSOs	Civil Society Organisations
CVD	Cardiovascular disease
DFID	Department for International Development
FCT	Federal Capital Territory
GDP	Gross Domestic Product
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
IDF	International Diabetes Federation
INGO	International Non-Government Organisation
IRB	Institutional Review Board
ISTH	Irrua Specialist Teaching Hospital, Irrua, Edo State
JUTH	Jos University Teaching Hospital, Jos, Plateau State
LASUTH	Lagos State University Teaching Hospital, Ikeja, Lagos State
LAUTECH	Ladoke Akintola University of Technology, Osogbo, Osun State
LGA	Local Government Area
LMIC	Low and middle income countries
LUTH	Lagos University Teaching Hospital, Idi-Araba, Lagos State
NAUTH	Nnamdi Azikwe University Teaching Hospital, Awka, Anambra State
NCD	Non Communicable disease
NDHS	National Demographic Health Survey
OAUTH	Obafemi Awolowo University Teaching Hospital, Ile-Ife Osun State

SD	Sudden death
SPSS	Statistical Package for Social Science
T2DM	Type 2 Diabetes Mellitus
TB	Tuberculosis
UCH	University College Hospital, Ibadan, Oyo State
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
USAID	United States Agency for International Development
USD	US Dollars
UNTH	University of Nigeria Teaching Hospital
UUTH	University of Uyo Teaching Hospital, Uyo, Akwa-Ibom State
WHO	World Health Organisation

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EXECUTIVE SUMMARY

Introduction: Sudden death has become a leading global health challenge. Over seven million people are estimated to die suddenly annually, representing 40% of the annual global deaths. Without appropriate interventions, this rate is expected to double by 2020 with 83% of sudden death cases expected to take place in developing countries. The declining incidence of sudden death in developed countries has been attributed to availability of detailed research data for adequate intervention programs. In Nigeria, sudden death remains on the rise and has become a formidable health challenge in need of urgent interventions. To address this challenge, adequate health system preparedness for effective sudden death surveillance and anti-sudden death action have become very crucial. Unfortunately, there is dearth of information on the actual burden, pattern and causes of sudden death in the country for proper planning.

Objective: This study was conducted to generate data on occurrence, causes and risk factors of sudden death as well as to determine the knowledge, perception, attitude, and behavioural practice on sudden death amongst health workers in Nigeria.

Method: The study was conducted using dual design of a retrospective review of autopsy reports (2007 – 2016) and interview of health workers (2015-2016) in the Morbid Anatomy department of eleven tertiary health institutions using a semi-structured questionnaire.

Results: A total of 642 autopsy reports were reviewed and 560 health workers interviewed during the period. The south west accounted for 70.9% of the total autopsies done during the period. Males (63.8%) accounted for the majority of sudden death cases with most deaths occurring between ages of 41 -60 years (43.1%). The commonest causes of death were of cardiovascular origin (41.4%), cerebrovascular accident (19.5%) and respiratory causes (14%). Hypertension (52%) was the commonest risk factor for sudden death in this study.

Majority of staff of the Morbid Anatomy were medical officers and paramedics. Pathologists accounted for only 18.4% of the staff. However, 76.5% of the staff had more than five years work experience with only 5.8% reporting having received training related to sudden death surveillance. The knowledge, perception, attitude, practice and behaviour interviewed were found to be

generally poor. Pathologists, staff with prior training related to sudden death surveillance and those that had more than five years' experience working in the Morbid Anatomy department were found to be independently associated with good knowledge, perception and practice behaviour among the study cohort.

Conclusion: The study showed that the number of autopsies conducted and number of Morbid Anatomists were abysmally low. The commonest causes of sudden death were cardiovascular diseases and cerebrovascular accidents with hypertension as the leading risk factor.
A regional disparity in the number of autopsies were noted with the North having lower number of autopsies and Morbid Anatomists than the Southern institutions. Only about a third had correct reporting format. Being a pathologist, having previous training related to sudden death and more than five years' experience were found to be independently associated with adequate knowledge, good perception and practice related to sudden death surveillance and reporting.

Recommendations: Therefore, based on our research findings, the following were recommended:

- Advocacy and public enlightenments on the importance of autopsy.
- Socio-cultural barriers to autopsies should be addressed.
- Incorporate Sudden death information in the Autopsy Registry
- Enforce implementation of Coroner law nationwide
- Support for the training of middle level manpower for autopsy especially in the zones with inadequate pathologists
- Institute programs for early identification and management of hypertension

CHAPTER ONE

INTRODUCTION

1.1 Background

Sudden death has become a leading global health challenge. Over seven million people are estimated to die suddenly annually, representing 40% of the annual global deaths. Without appropriate interventions, this rate is expected to double by 2020 with 83% of sudden death cases expected to happen in developing countries. The declining incidence of sudden death in developed countries has been attributed to availability of detailed research data for adequate intervention programs. In Nigeria, sudden death remains on the rise and has become a formidable health challenge in need of urgent interventions.

The incidence of sudden death in Nigeria has increased over the past ten years, coinciding with the rising prevalence of risk factors such as hypertension, diabetes mellitus, obesity and smoking as well as their complications such as coronary heart disease, chronic obstructive pulmonary disease (COPD) and chronic kidney disease (CKD). Nigeria is among the top five countries in Africa with high burden of hypertension, type 2 diabetes mellitus (T2DM) and CKD. To reverse this trend in sudden death, there is an urgent need to put in place an intervention program aimed at prevention, early identification and effective management of risk factors and causes of sudden death in the country. The introduction of this plan has unfortunately been hampered by the paucity of data on the burden and causes of sudden death. This project was designed to provide the evidence necessary for proper planning.

1.2 Country Profile

1.2.1 Geography

Nigeria is located within Latitude $4^0$1' and $13^0$9' North and Longitudes $2^0$2' and $14^0$13' East and is bordered in the North by Niger Republic, in the East by the Republic of Chad and Cameroon, in the West by the Republic of Benin and in the South by the Atlantic Ocean. It has a total surface area of 923,768 km^2 and a coastal line length of 800 km.

1.2.2 Population Size

Nigeria is the most populous country in Africa and the tenth in the world. In 1991, Nigeria's population was estimated to be 88.92 million (National Population Commission, 1998). By using a growth rate of 2.9% per year, the estimated population of Nigeria in 2017 will be 187 million. Nigeria remains at mid transition point of high fertility and declining mortality that has resulted in a relatively younger population with a median age of 17 years[1].

Nigeria has been known to have a rural population with an estimated 54% living in rural areas of the country in 2000. However, this population distribution is expected to have changed over time due to the rising urbanization and expansion of slums or shanties in the country[2].

1.2.3 Administration

The Federal Republic of Nigeria is made up of 36 states and the Federal Capital Territory (FCT), Abuja. These states and Abuja were established for political administration and are further divided into 774 Local Government Areas (LGAs) and six geopolitical zones (North East, North West, North Central, South East, South West and South South). The states differ from one another in size, population, ecological characteristics, language, culture, settlement patterns, economic opportunities and historical background.

1.2.4 Social Characteristics

Nigeria consists of more than 250 distinct ethnic groups with Hausa, Ibo and Yoruba as the major ethnic groups. Christianity and Islam are the major religions. The national revenue is derived mostly from crude oil while other resources such as Agriculture, Solid minerals, tourism and trade contribute minimally to the economy.

Nigeria has a total life expectancy of 54.5 years giving the country a world life expectancy ranking of 215. The human development index (HDI) for Nigeria was 0.527. This is above an average of 0.523 for Sub-Saharan Africa as a whole and 0.497 for countries in the low human developmental group. In 2017, Nigeria had a Gross Domestic Product (GDP) per Capital of 2412.41 USD. The country's distribution of GDP per capital between 2008 and 2016 are shown below (Figure 1)

Figure 2. Nigeria GDP per capital 2008 -2016

1.2.5 Health Status

Until recently, the burden of non-communicable diseases was thought to be a problem affecting only affluent countries. However, emerging evidence have indicated that the problem affects developing countries including Nigeria more than the developed countries. With the decline in the prevalence of many infectious diseases and a steady increase in the cases of NCDs as major cause of death, Nigeria and other Sub-Saharan countries are undergoing epidemiological transition with double burden of communicable and non-communicable diseases. Globalisation, the changing demographic dynamics, affluence and the pattern of food consumption are responsible for this trend[3]. Despite this there is a national inertia at curtailing this rising trend as evidenced by absence of national program to manage this trend.

Cardiovascular and Metabolic diseases are the leading NCD related causes of morbidity and mortality in the country. Nigeria with approximately 180 million has an estimated proportional mortality attributed to cardiovascular diseases of 12%[3]. In 2008, the estimated mortality due to a combination of cardiovascular diseases and diabetes was put at 435.9/100000 and 475.7/100000 for males and females respectively[3]. Although Nigeria has not established a population wide data

collection on NCDs, hospital-based data on CVDs in Nigeria suggest a rising trend in CVDs risk factors such as hypertension. Also the morbidity and mortality of systemic hypertension, related complications are on the rise. Ischeamic heart disease, though previously considered to be rare in Nigeria have now been shown to be on the rise. Diabetes Mellitus (DM) is an increasing challenge in Nigeria with T2DM being most common. It is becoming more prevalent owing to the increasing rates of obesity, physical inactivity and urbanization. Similar to other developing countries, Nigeria is experiencing a rise in DM as shown by an increase from 2% in 1992 to 2.2% in 1997.

However the current projected prevalence estimate of DM in Nigeria based on the International Diabetes Federation figures is 4.04%[4]. Chronic respiratory diseases represent a spectrum of airway ailments ranging from reversible airway obstruction like bronchial asthma to irreversible airway disease like emphysema. Majority of the three million COPD related deaths globally occurs in developing countries including Nigeria. There are no population based surveys of COPD in Nigeria, thus most reports were hospital based in addition to estimates by extrapolation of data from other developed countries. Studies on respiratory disease prevalence in urban areas shows a prevalence of chronic bronchitis of 3%, with Bronchial asthma varying between 14 and 18% in Nigeria[5, 6]. Lower prevalence rates are reported from rural areas and thus can be used as surrogate indicators because rural localities are less exposed to industralisation.

Reports of cancer prevalence in Nigeria are scanty and mainly hospital based due to paucity of cancer registers. Commonly occurring cancers in Nigeria include Breast, Cervical, Prostate and Gastric cancers. A population-based survey carried out in Ibadan done in the sixties found 648 cases of cancer representing a crude annual incidence of 45/100000 of the population[, 7.] It is projected that by 2020, cancer incidence in Nigerian males would rise to 90.7/100000 and for females to 100/100000. A report show that only 10% of diagnosed cancer cases in Nigeria have access to care. Only 5% of the reported figures have resources to access centres with specialized human and material resources.

The relevant country health indices are shown in Table 1 below.

Basic Indicators	Figure
Total Population	180 million
Population proportion <15 years of age (2016)	44.1
Population proportion >60years of age (2016)	24.0
GDP per capita in USD billions (2017)	2412.41
Life expectancy at birth (2018)	54.5
Maternal mortality ratio (2015)	814
People below international poverty line of 1.25 USD per day (%), 2007 – 2011	54.4
Total expenditure on health as a percentage of GDP (2014)	3.67

Table 1: National Health Indices

1.3 Epidemiology of Sudden Death in Nigeria

Sudden death, which is defined as death that occurs unexpectedly between 1 and 24 hours after the onset of symptoms with or without known pre-existing conditions, has become a leading global health problem[8].

Sudden death was initially reported as sudden cardiac deaths in the literature as cardiac related causes were the prominent cases. As research improved, the nomenclature has been expanded to include other causes. The available reports of sudden death in the country are limited to health facilities with capacities for autopsy. Thus, the actual burden of sudden death in Nigeria is not known.

The recent upsurge of reports in the media of unexpected deaths of prominent Nigerians who were hitherto apparently healthy has brought Sudden death and its possible causes to the limelight.

A recent institutional study from Osogbo, Southwestern Nigeria reported sudden death to account for 29 (4.0%) of 718 deaths over a 9 year period. Hypertensive heart disease was responsible for 48.3% of the sudden death cases with risk of sudden death among males being six times that of

female[9]. A similar study from Southwestern city, Ile-Ife, also reported similar prevalence with hypertension accounting for 83.5% of sudden deaths, with a male preponderance (74.7%) [10].

The dearth of data related to sudden death cases in the other parts of the country outside the South-West may be attributed to low number of pathologists, non-implementation of existing coroner laws, poor infrastructure and religio-cultural beliefs to burial rites in most parts of the country. While some culture believe in reincarnation, thus bodies should not be mutilated, others because of religious beliefs must bury their dead within 24 hours. These beliefs and practices may adversely affect the reporting of sudden death in the country.

1.4 Rationale

The high burden of sudden death (SD) in developed countries have led to the recognition that SD is a major public health challenge and has led to the increased deployment of automatic external defibrillators in public places. The World Health Organisation (WHO) reports that non-communicable diseases (NCDs) are becoming a significant cause of morbidity and mortality in sub Saharan African countries[11]. Approximately fifty percent of this burden is attributable to cardiovascular diseases (CVDs). It is projected that from 1990 to 2020, the burden of CVD among African population will double, with majority of them being of middle-age[12]. In the same setting national public health policies on the detection, prevention and treatment of NCDs are inconsistent, mainly due to lack of epidemiological statistics. In Sub-Saharan Africa, the ever-increasing dual burden of communicable and non-communicable diseases in the region and the associated disabilities and premature deaths is now clearly evident [9, 10].

Although some reports of SD in Sub-Saharan Africa have been published[13]; with many of them reporting conflicting data regarding the prevalence[14,15]. In addition, studies specifically targeted to provide robust data regarding the epidemiology of SD in Africa are warranted. Missed diagnosis rather than misdiagnosis is a characteristic of unexpected cardiac death in sub Saharan Africa[16, 17].

Nigeria faces a huge health burden of mixed epidemic of communicable and non-communicable diseases. Showing a shift from a country known for infectious disease burden to an epidemiologic transition. Cardiovascular disease is now an important cause of mortality in Nigeria[15]. Unfortunately, comprehensive data on the epidemiology of sudden death in Nigeria is lacking, and where data exist the quality is generally poor. In Nigeria, the prevalence rate of diabetes and

coronary artery disease is on the rise, thereby propagating the seeds for the sprawling distribution of SD in this rapidly increasing population of patients with cardiovascular disease[18, 19]. Even though SD has been reported in Nigerians, its epidemiology remains unknown, due to the lack of nationwide surveys. Identifying the demographic and clinical profiles of Nigerians experiencing SD may provide opportunities for improving its prevention in Nigeria, where non communicable diseases are still neglected[9, 10, 20, 21]. Furthermore, understanding the epidemiology of SD allows for the introduction of a comprehensive strategy and implementation of appropriate actions in the fight against NCDs.

In Nigeria, pockets of studies on sudden death have been carried out in different regions but a detailed and or integrated national data on incidence and distribution of sudden death in the six geopolitical zones of the country is lacking. Also, the level of knowledge, attitude and misconception about sudden death among Nigerians is also not known. There is need for a detailed survey designed to determine the frequency, pattern, trend, causes, pathological findings and risk factors associated with sudden death in Nigeria.

This national SD survey is a collaborative study that is aimed at collecting comprehensive data on the prevalence, disease and patient characteristics of sudden death in Nigeria, as well as the factors influencing diagnosis and reporting of SD.

CHAPTER TWO

GOAL AND OBJECTIVES

2.1 Goal

The main goal of this national survey was to generate data on the prevalence, causes and risks factors of Sudden death amongst Adult Nigerians with the aim of raising awareness of its importance as a major public health challenge in the country.

2.2 Objectives

The specific objectives of this- survey were to;

2.2.1 Determine the prevalence and pattern of Sudden death in Nigeria.

2.2.2 Determine the risk factors associated with Sudden death among Adult Nigerians.

2.2.3 Determine the knowledge, perception and practice of healthcare workers in the Morbid Anatomy department to Sudden death in Nigeria.

2.2.4 Provide appropriate recommendations to guide future programmatic planning to prevent and reduce the burden of sudden death in Nigeria.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

The methodology adopted to implement the sudden death survey in the country is presented in this section. The process included sampling frame, technique of assessment, survey sites, training, supervisory visits, monitoring, data collection and analysis, report writing, and quality assurance. Before the commencement of field work quality assurance procedures were put in place to ensure credible data were generated. The survey protocols, guidelines and data collection instruments were reviewed by all the investigators in a meeting held in the Survey secretariat – Nigerian Institute of Medical Research Yaba Lagos. Practical trainings were also provided to field staff on how to elicit information and complete the survey data collection forms. The survey was conducted from 2013 to 2017**.**

Procedure.

3.2 Study Design

The study utilized mixed design to generate the data required to achieve the goal and specific objectives of the study. Cross-sectional methodology was used to collect information from health workers on their knowledge, perception and practice in relation to Sudden death. Retrospective study design was also used to collect information on the reports of autopsies performed in the selected health institutions over a 10- year period.

3.3 Site and Sites Selection Procedure

The study was conducted across the six geopolitical zones of Nigeria. A multi-stage random sampling technique was used to select two states per geopolitical zone. In each selected state, tertiary health facilities were mapped and used for the study. In total, thirteen tertiary health care hospitals from the 12 states were selected.

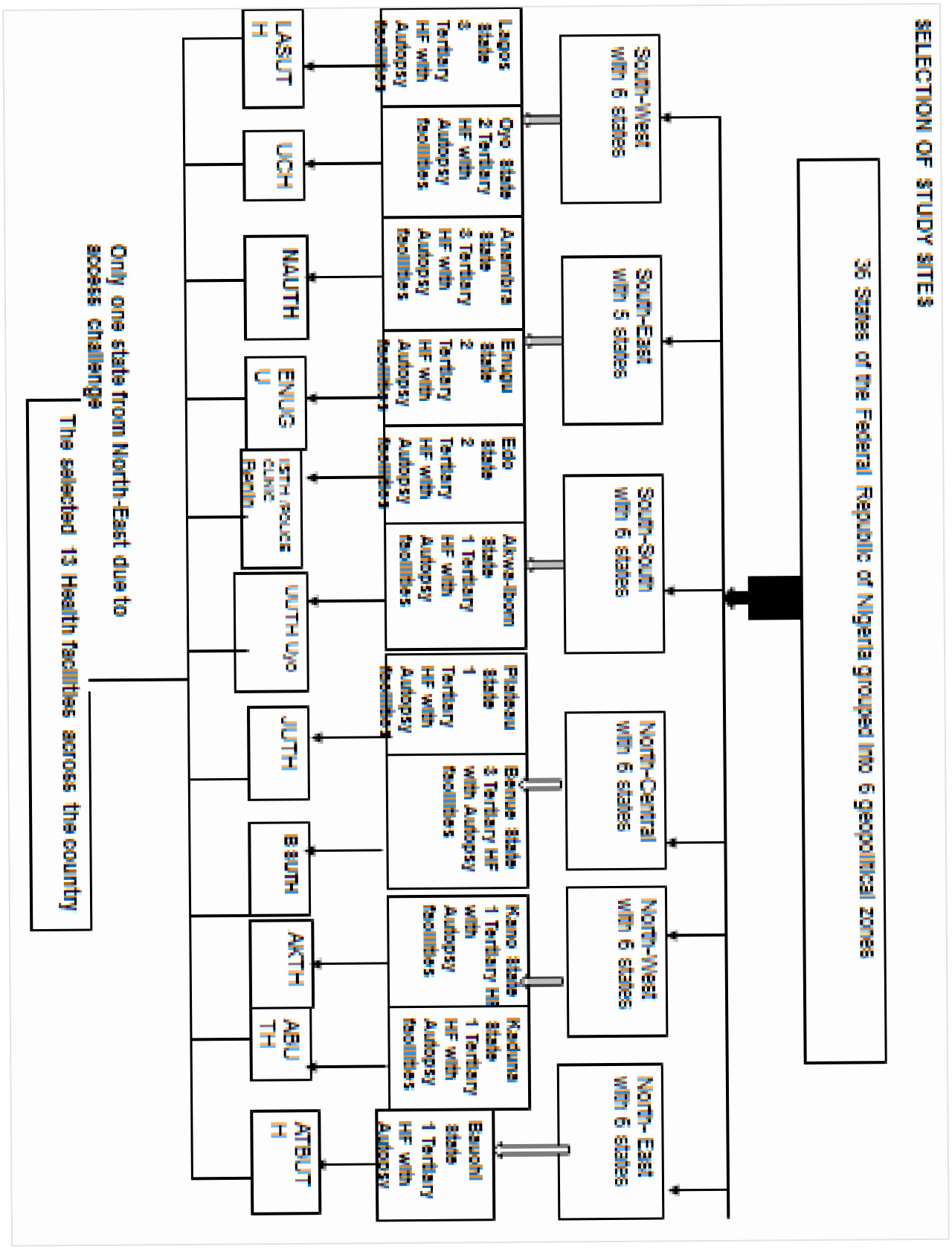


Figure 3: Selected states across the six geopolitical zones of the country

3.4.1 Sample Size

All available report of autopsies conducted in all the selected hospitals during the study period were included in the study. For the Staff Interview, a simple population proportion method was used to compute the sample size. Using the formula $N = (Z^2pq/d^2) \times D$ based on the assumption that at 95% confidence interval (z = 1.96), 82% of the respondents know the definition of sudden death (p = 0.82; q = 0.18) at an error rate of 5% (d = 0.05) with a power of 80%, an attrition of 10% and a design effect of 2 (D = 2. (N = 560).

3.4 .2 Inclusion and Exclusion Criteria

Inclusion Criteria

1. Deaths that occurred in hospitals with capacity for autopsies to be carried out.
2. Deaths that occurred in facilities selected from the 6 geopolitical regions of the country.
3. Deaths that occurred outside the selected health facilities and were brought into the health facility within 6 hours of death on account of questionable cause of death.
4. Deaths must meet the definition of sudden death to be included in the analysis. (Sudden death is defined as death that occurs unexpectedly between 1 and 24 hours after the onset of symptoms with or without known pre-existing conditions).

Exclusion Criteria

1. Deaths occurring following trauma, road traffic accidents, suicide or homicide, communal clashes and wars.
2. Deaths occurring in persons younger than 18 years of age.
3. Deaths with incomplete documentation regarding time of presentation and death, autopsy findings and age of deceased.
4. Deaths occurring in health facilities whose family members declined autopsy despite meeting criteria for Sudden death.

3.5 Data Management

3.5.1 Data Collection

Two data collection tools were designed for data collection. One for the retrospective review of autopsy report and a semi structured questionnaire for the interview of health workers.

The autopsy study case record form was structured to collect information on demographic, clinical, laboratory, medical history and autopsy data of sudden death victims. The semi-structured questionnaires were designed to interview staff of the Morbid Anatomy Department of the selected tertiary health facilities on their socio-demographics (age, sex, years of experience, profession/cadre, evidence of training), knowledge (e.7. correct definition of sudden death), perception (e.g. willingness to investigate a suspected sudden death case) and practice (e.g. participation in clinopathological meetings, reporting of sudden death cases etc.).

Both tools were validated at a stakeholder meeting with Pathologists from the six geopolitical zones in April, 2014.

Study of relevant information collected from the selected institutions using the data collection tools that was designed for this study.

3.5.2 Pilot study and pretesting of Tools

The study questionnaire was pretested among 15 staff of Morbid Anatomy for comprehensibility, appropriateness of language, sensitivity of questions and average duration of administration. The feedback received after this process was used to modify and finalize the study questionnaire.

A pilot study was conducted at the Lagos University Teaching Hospitals Morbid Anatomy department. It tested the logistics and gathered important information that assisted to improve the quality and efficiency of the study. It also revealed deficiencies in the design of data collection instrument and interview process, which were addressed before the commencement of study.

3.5.3 Autopsy Report Review.

At each study site, report of autopsy conducted over the study period (2007 - 2016) were retrieved from the morbid anatomy department medical records. Relevant information on the autopsy was extracted using the study CRF. These were complimented with information from the case notes of the deceased.

3.5.4 Health workers Interview

Health workers in the morbid Anatomy department were interviewed by 2 trained filed workers using the study questionnaire. A supervisor also ensured completeness of the questionnaire.

3.5.5 Data Entry

Data entry was done using SPSS with preprogrammed consistency checks. Questionnaires and CRF were doubly entered for quality control purposes. The data entry clerks were supervised by supervisors who reviewed and validated data entered.

3.5.6 Data Analysis

The obtained data were cleaned and analysed using the SPSS version 20.0 (SPSS Inc. Chicago, IL) statistical packages. Frequency counts were carried out to check for consistency and assess cleanness of the database. Variables were re-coded according to indicators to be measured. Denominators were standardised and composite indicators created. A clean database was used to generate the necessary tables in accordance with the preapproved data analysis plan. A p-value (two-tailed test) of <0.05 was considered significant.

3.6 Study quality assurance

The objective of study quality assurance was to ensure homogeneity, completeness of data collection and records from the field, reliability, accuracy, consistency and coherency. All fieldworkers, including supervisors and interviewers were trained to familiarize them with the study objectives and to enhance their understanding of their roles in the study, as well as the need for a good quality data. Every completed data collection tool is reviewed by a supervisor for completeness and appropriateness. Identified mistakes were corrected before the respondent left the interview room.

3.7 Ethical issues

Approval for the study was obtained from the Institutional Review Board, Nigerian Institute of Medical Research, Lagos Nigeria and other participating tertiary health institutions. Written informed consent was obtained from all health workers, before the interview.

CHAPTER FOUR

RESULTS

4.1 Part 1: Evaluation of Sudden death in Adult Nigerians

During the study, a total of 1144 cases were classified as sudden deaths and autopsy report retrieved from the medical records. However following review of the autopsy reports, only 642 (56.1%) cases met the case definition of sudden death and had enough documentation to fit in this study and were eligible for analysis. It is important to note that of the thirteen institutions mapped out for the study, two institutions had no autopsy reports despite the availability of Anatomic Pathologists.

4.1.1 Distribution of Sudden Death Autopsy by Geopolitical Zone

Figure 4 below shows the distribution of the autopsy for sudden death during the study period. The largest numbers of autopsies were conducted in the south west geopolitical zone, which accounted for 70.8% (455) of the total autopsy conducted during the study period. The contribution to the total pool of autopsy from other zones were South-South (17.6%; 113), South East (7.8%:49-), North-West (2.2%: 14) and North-Central (1.7%:11).

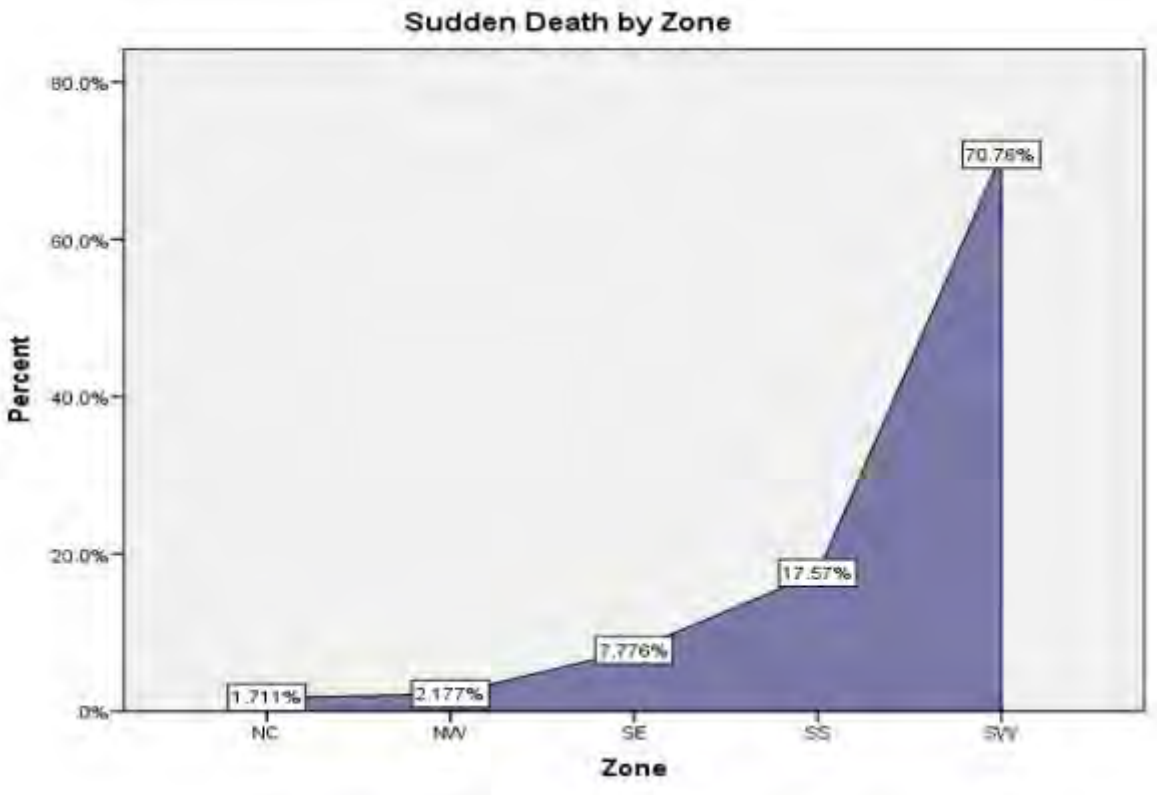


Figure 4: Zonal Distribution of Sudden Death Autopsy conducted during the study period

4.1.2 Distribution of Autopsy by Institution

The distribution of the autopsy for sudden death during the study period by Institution is shown in figure 5 below. Lagos State University Teaching hospital Ikeja had the highest number of autopsies for cases of sudden death (332; 51.6%). University College Hospital Ibadan had 123 (19.1%) autopsies for sudden death. This is followed by Police clinic Edo (109; 17%), University of Nigeria Teaching Hospital Ituku-Ozalla Enugu (37; 5.9%), Aminu Kano Teaching Hospital (14;2.2%), Nnamdi Azikiwe University Teaching Hospital Nnewi (12;1.9%), Jos University Teaching Hospital (9;1.4%), Irrua Specialist teaching Hospital (4;0.6%), and Benue State University Teaching Hospital (2 ;0.3%).

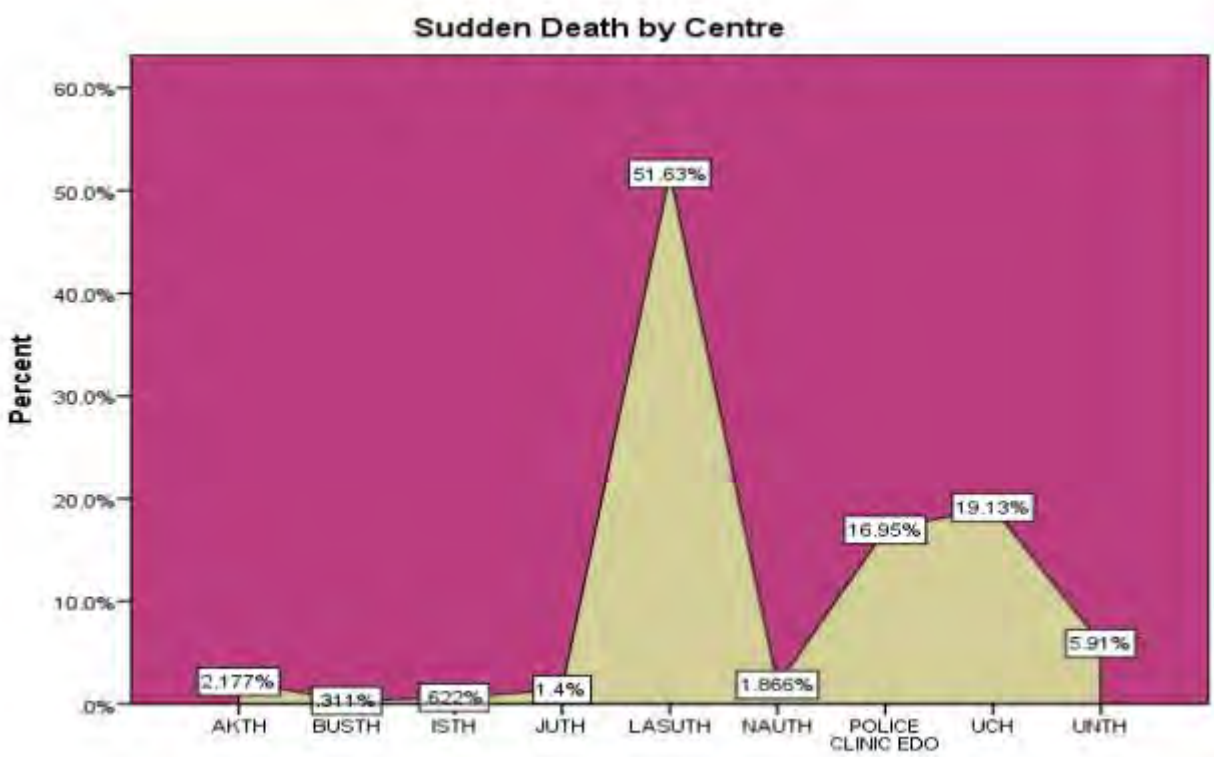


Figure 5: Distribution of Autopsies by Institution

4.1.3 Demographic Characteristics

The sociodemographic characteristics of the deceased in the cases of sudden death are shown in the table below. Table 2 showed that most SD deaths (62.6%) occurred among the males, with female accounting for only 37.4% of the deaths. Majority of the deaths (43.1%) were in

the age group 41 – 60 years, followed by age group 31– 40 years (17.4%). About the same number of deaths was recorded in the age groups 61 -70 years (15.1%).

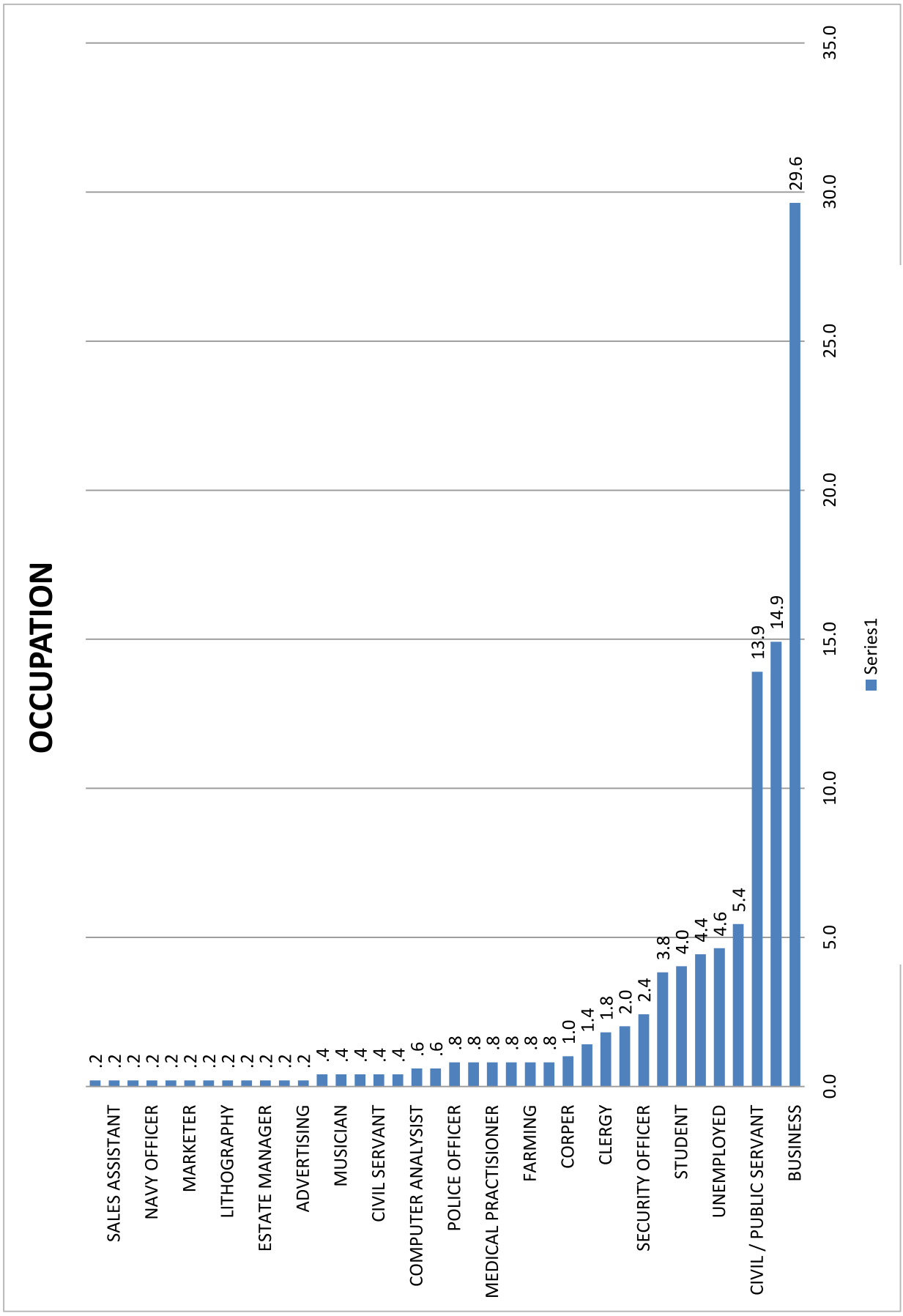
Table 2: Sociodemographic characteristics of deceased reported in the autopsies

Characteristics	Number of Deceased (%)
Sex	
Male	295(62.6)
Female	176(37.4)
Age (years)	
18-20	6 (1.3)
21 – 30	50 (10.6)
31 – 40	82 (17.4)
41 – 50	96 (20.4)
51 – 60	107 (22.7)
61 – 70	71 (15.1)
Above 70	59 (12.5)
Marital Status	
Single	24 (5.1%)
Married	438 (93.0%)
Separated	1 (0.2%)
Divorced	1 (0.2%)
Widowed	7 (1.5%)
Educational status	
No formal	7(6.5)
Primary	10(9.3)
Secondary	45(42.1)
Tertiary	45(42.1)

Over three quarter of the deaths (93.0%) occurred among those who were married and had at least a secondary education (84.2%).

The occupation of the deceased in this study is shown in figure 6. Over one third of the deaths were among business men (29.6%), followed by civil/public servant (14.9%) and retiree (13.9%)

Figure 6: Occupational distribution of the deceased



4.1.4 Causes of death among the deceased

The causes of deaths according to the autopsy reports are shown in figure 7. The commonest causes of death were of cardiovascular origin accounting for 41.4% of cases, followed by cerebrovascular accident with 19.5% and respiratory causes with 14%. Other causes are perforated gastrointestinal tract 5.5%, pregnancy related-4.1%, infectious-2.5%, renal-0.5% and liver failure accounted for 0.3% of cases

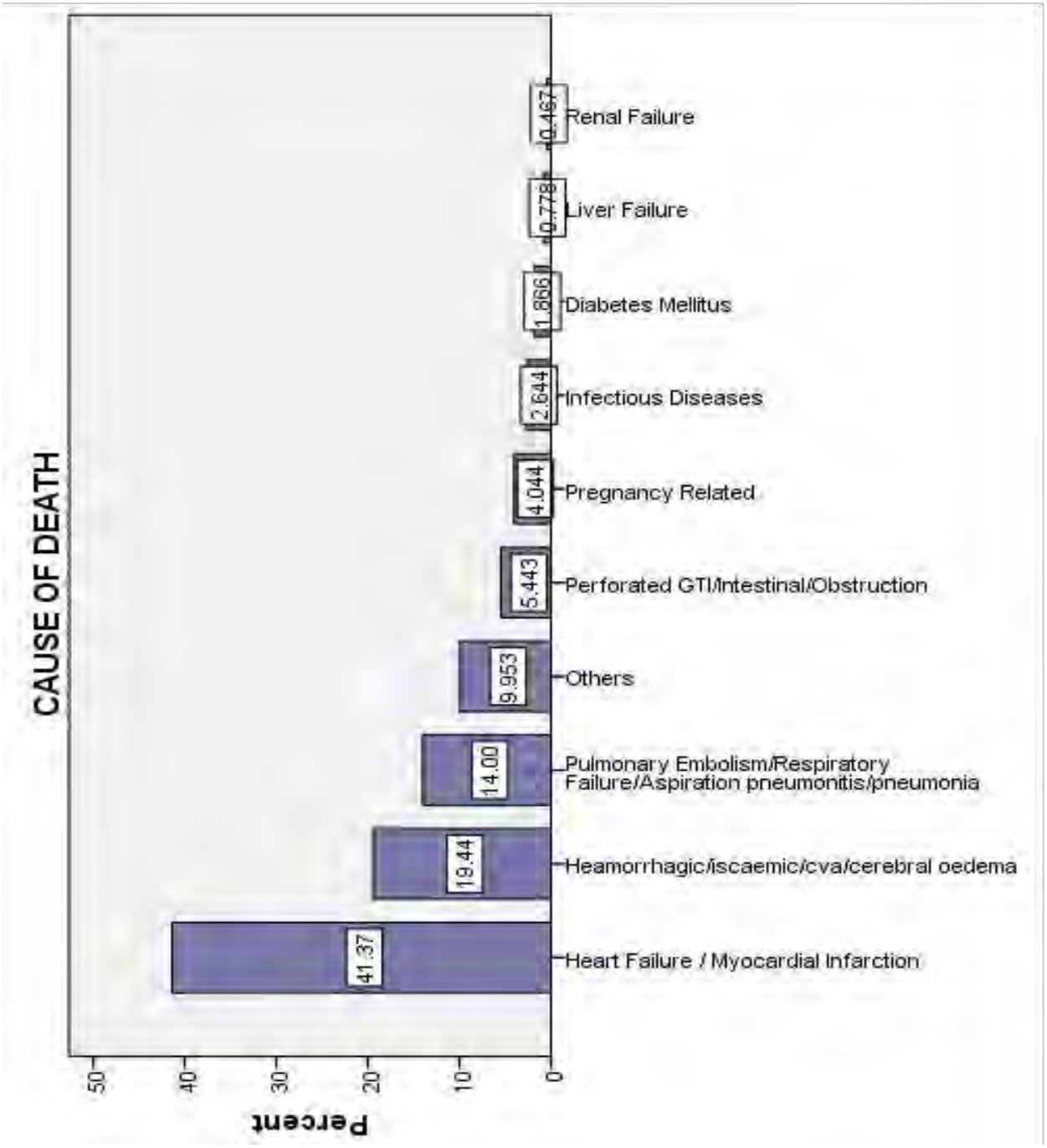


Figure 7: Distribution of causes of sudden death during the study period

4.1.5 Risk Factors for Sudden death

Figure 8 shows the medical conditions found to be associated with sudden death in our cohort. Approximately fifty percent of the cases of sudden death in this study were reported to have had hypertension (49.1%). Other common risk factors were pulmonary edema (11.2%), myocardial infarction (8.2%) and pregnancy (5.1%).

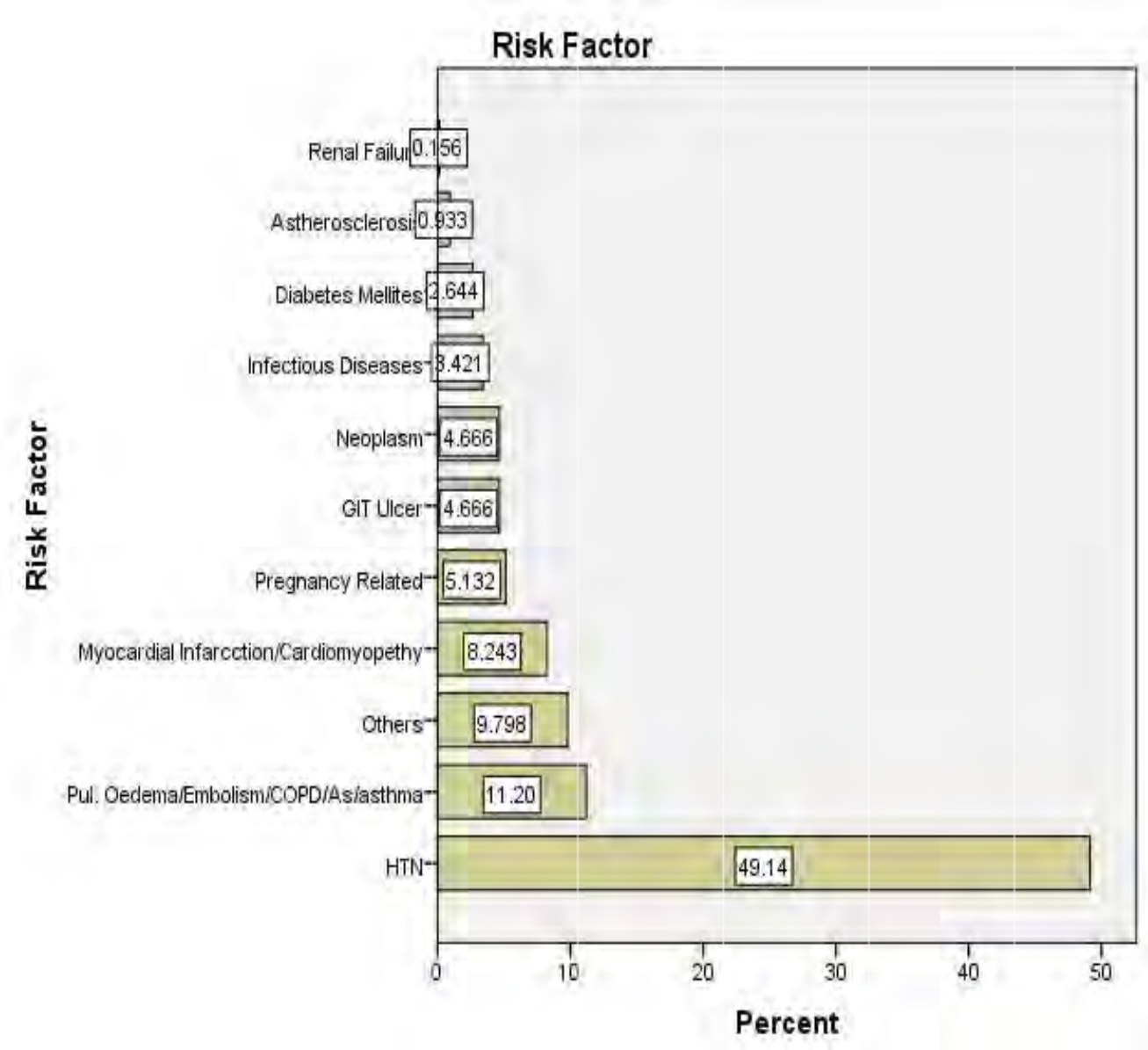


Figure 8: Risk factors for Sudden death in the study

4.2 Part II: Knowledge, Perception and Practice of Health workers on Sudden Death in Nigeria.

A total of five hundred and seventy one staff of morbid anatomy departments in the thirteen hospitals were approached for interview. Of these eleven (1.9%) declined and five hundred and sixty accepted to be interviewed (98.1%).

4.2.1 Sociodemographic Characteristics of the respondents

The sociodemographic characteristics of the 560 respondents in the study are shown in Table 3 below.

Table 3: Sociodemographic characteristics of respondents

Characteristics	No of respondents (%)
Mean Age (±SD)	35.4 (±10.3)
Age group (years)	
< 25	20(3.6)
25 -39	291(52.0)
40 - 59	249 (44.4)
Sex	
Male	334
Female	212
Category of staff	
Paramedical	149(26.6)
Medical Officer	308 (55.0)
Pathologist	103 (18.4)
Work Experience(Years)	
≤ 5	134 (23.9)
>5	426(76.1)
Training	
Yes	32(5.8)
No	528(94.2)
Location of Institution	
North-West	83(14.8)
North-Central	53(9.5)
North-East	31(5.5)
South-South	146(26.1)
South-West	63(11.3)
South-East	184(26.9)

Most of the respondents were males (59.6%; 334), medical officers (55.0%; 308), aged 25 -39 years (52.0%; 291), had no training (94.2%; 528) and had more than five year's job experience (76.1%; 426). The mean age of the respondents was 35.4 ± 10.3 years (range 23– 63years). Majority of the respondents were employees of Institutions in the south-south and south-east geopolitical zones of the country (330; 59.0%). The mean training duration was 6.8 ± 3.9 years (range 1-31years).

4.2.2 Health workers Knowledge

The knowledge of staff as it relates to sudden death diagnosis and reporting was determined by eight questions with average of correct responses calculated to establish the cut-off score to define good knowledge (above the mean score) and poor knowledge (below the mean score). Of the 560 staff of Morbid anatomy department interviewed during the study, 266(47.5%) had good score, while the remaining 294 (52.5%) had poor knowledge score (figure 9)

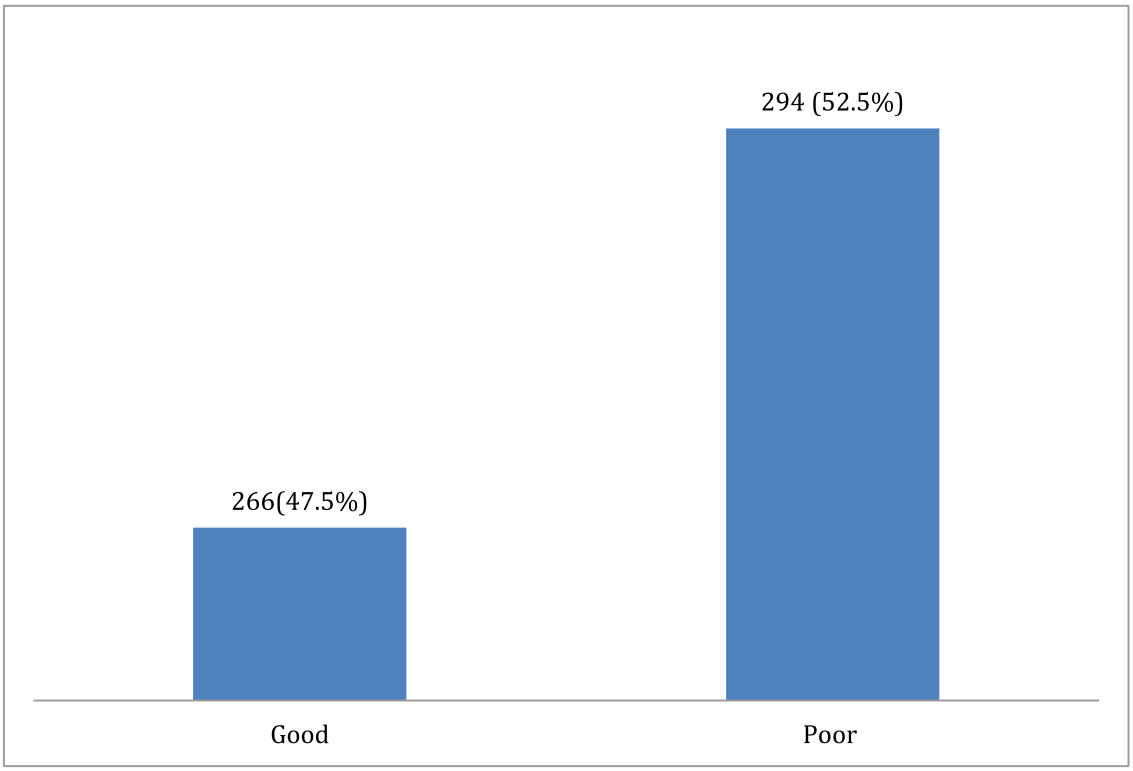


Figure 9: Distribution of staff knowledge on diagnosis and reporting of sudden death

The response of the staff to the question on the definition of sudden death is shown in table 4. Only 37.8% of the respondents knew the correct definition of sudden death.

Table 4: Distribution of staff responses to 'Which of the following accurately define sudden death?'

Response	No of respondents (%)
A death case	92(16.5)
An apparently stable obese patient that dies within 24 hrs. of unstable condition	54(9.7)
A diabetic or hypertensive patient on treatment who dies within 24 hrs. of presentation at the hospital	47(8.4)
A stroke patient who dies within a day of clinical care and investigation	46(8.2)
Hypertensive patient of unknown cause of death	44(7.9)
Cancer patient who dies of unknown cause within 24 hrs. of discomfort in the hospital	30(5.4)
HIV/AIDS patient who becomes unconscious and dies a few hours later	34(6.1)
Death occurring unexpectedly and from 1 to 24 hrs. after the onset of symptoms	212(37.8)

Table 5 shows the relationship between health workers sociodemographic characteristics and their knowledge of sudden death investigation and reporting. Respondents with previous training on sudden death, Pathologists, staff with more than 5 years' work experience and those from institutions in the southern part of Nigeria were found to have good knowledge about Sudden death investigation and reporting. The independent association were maintained after adjusting for confounding variables at multivariate logistic regression analysis (table 5). Age and female gender were found not to influence respondent's knowledge about sudden death investigation and reporting.

Table 5: Relationship between respondents' sociodemographic characteristics and level of knowledge on sudden death investigation and reporting

Demographic characteristics	Crude OR (95% CI)	Adjusted OR (95% CI)
Age (years)		
25 -39		
40 - 59	20.3(5.7-91.3)	21.9(0.9-89.2)
Gender		
Male	Ref	Ref
Female	0.4(0.2-0.8)	0.5(0.3-1.4)
Staff category		
Non Pathologist	Ref	Ref
Pathologist	7.1(3.1-13.3)	6.7(3.7-12.1)
Work Experience		
< 5years		
>5years	P<0.001	
Zone		
North	Ref	Ref
South	3.6(2.1-6.1)	3.3(1.9-5.8)
Training		
Yes	2.2(8.2-73.1)	2.4(8.9-63.1)
No	Ref	Ref

4.2.3 Health Workers Perception of Sudden Death

The perception of staff on sudden death diagnosis and reporting was determined by ten questions with average of correct responses calculated to establish the cut-off score to define good perception (above the mean score) and poor perception (below the mean score). Of the 560 staff interviewed during the study, only 125 (22.3%) had good perception core, the remaining 435 (77.7%) had poor knowledge score (figure 10)

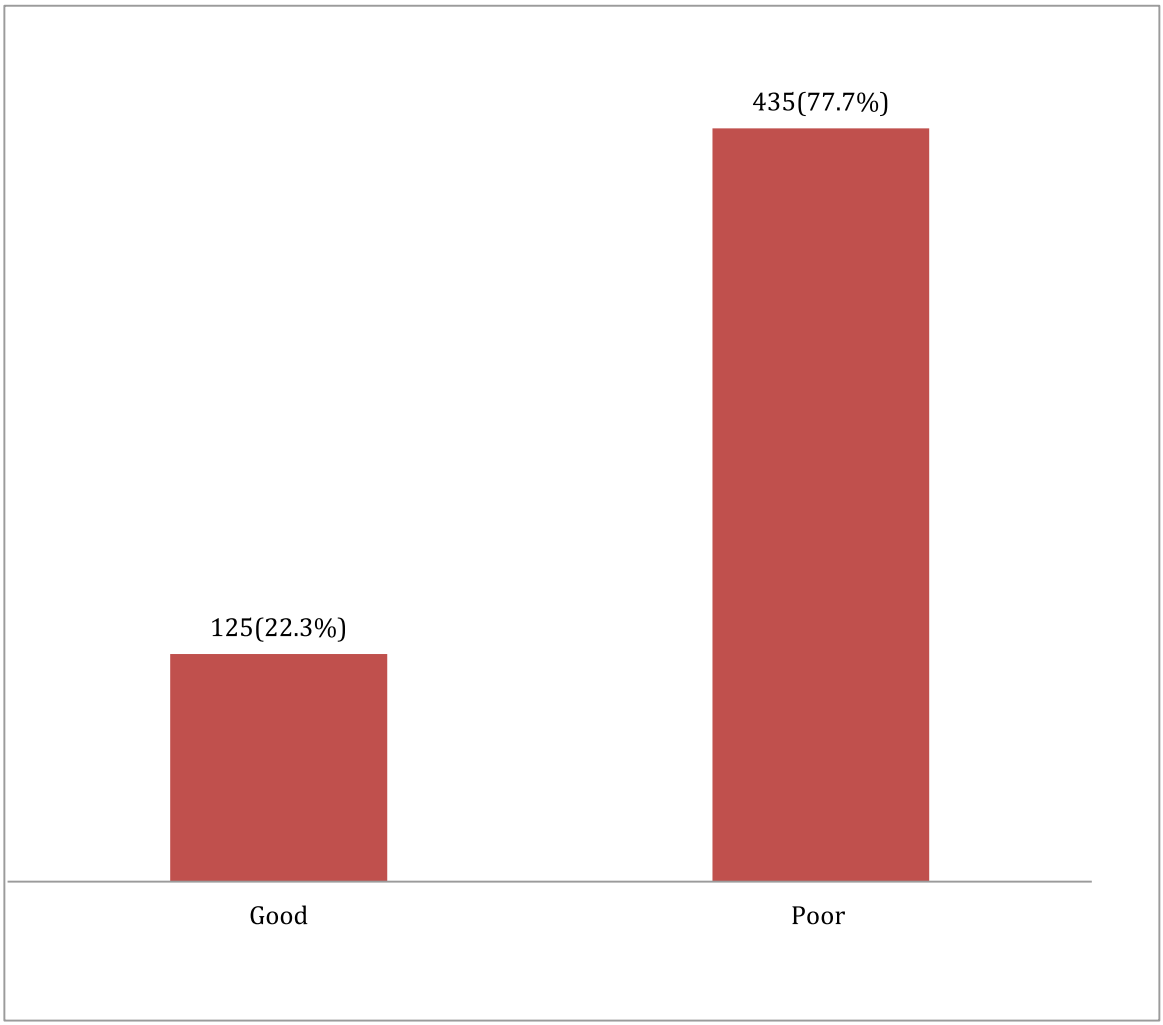


Figure 10: Distribution of staff perception on diagnosis and reporting of sudden death

The response of staff to each question on perception about sudden death and its surveillance is shown in table 6. The perception of respondents was generally poor in all the domains of perception questioned. Only 12.8%, 7.9% and 4.9% of the respondents respectively believe sudden death is a public health priority in Nigeria, feel motivated to detect and investigate sudden death and believe sudden death investigation should involve post-mortem examination. Only 13.7% were willing to investigate sudden death for suspected cases, yet 23.5% believe that sudden death reporting will inform policy review on NCD

Table 6: Respondents' perception of sudden death

Perception on sudden death	No of respondents (%)
Believe sudden death is a public health priority in Nigeria	72(12.8)
Willing to investigate sudden death for suspected cases	77(13.7)
Believe sudden death investigation will improve knowledge about sudden death determinants	44(7.9)
Feel motivated to detect and investigate sudden death	57(10.2)
Believing sudden death investigation should involve post-mortem examination	27(4.9)
Believe sudden death investigation should involve verbal autopsy	7(1.2)
Believe sudden death investigation should involve reviewing the clinical history of the victim.	73(13.0)
Believe sudden death investigation should involve review of family history of the victim	83(14.8)
Believing that sudden death reporting will inform policy review on NCD	132(23.5)
Believing that sudden death surveillance will enable identification high risk patients	153(27.3)

Table 7 shows the relationship between health worker sociodemographic characteristics and their perception of sudden death investigation and reporting. Respondents with previous training on sudden death, pathologists and those from institutions in the southern part of Nigeria were found to have good perception of Sudden death investigation and reporting. The independent association were maintained after adjusting for confounding variables at multivariate logistic regression analysis. Age, female gender and years of experience were found not influence respondents knowledge about sudden death investigation and reporting.

Table 7: Relationship between respondents' sociodemographic characteristics and their perception of sudden death investigation and reporting

Variable, n = 560	Crude OR(95% CI	Adjusted OR(95% CI
Age, years		
<40	Ref	
≥ 40	10.7(1.1-81.3)	10.2(0.9-76.5)
Sex	Ref	
Male	0.3(0.7-0.9)	0.3(0.7-1.1)
Female		
Profession		
Non pathologist	Ref	Ref
Pathologist	5.9(3.3-12.9)	6.9(3.9-11.4)
Work Experience		
< 5years	Ref	Ref
>5years	1.9(1.1-6.7)	1.7(0.8 - 5.9)
Geopolitical Zone		
North	Ref	Ref
South	3.0(1.3-4.3)	3.3(1.9-5.8)
Training		
Yes	23.4(8.6-63.2)	23.7(8.7-63.1)
No	Ref	Ref

4.2.4 Health workers practice on sudden death surveillance

The practice of staff about sudden death surveillance and reporting was determined by twelve questions with average of correct responses calculated to establish the cut-off score to define good practice (above the mean score) and poor practice behaviour (below the mean score). Of the 560 staff interviewed during the study, only 130 (23.2%) had good practice score, the remaining 430 (76.8%) had poor practice score (figure 11). The response of staff to each question on practice about sudden death and its surveillance is shown in table 8. The practice

of respondents based on their response to question 'How do you investigate sudden death cases in your hospital?' is shown in table 8. Among the respondents in this study, 30.5%, 23.7% and 21.1% respectively reported using relevant sudden death forms, multiple data sources to ascertain cause of sudden death and performs postmortem examination routinely. Only 2.5% and 4.4% of respondents respectively perform verbal autopsy or use sudden death guidelines.

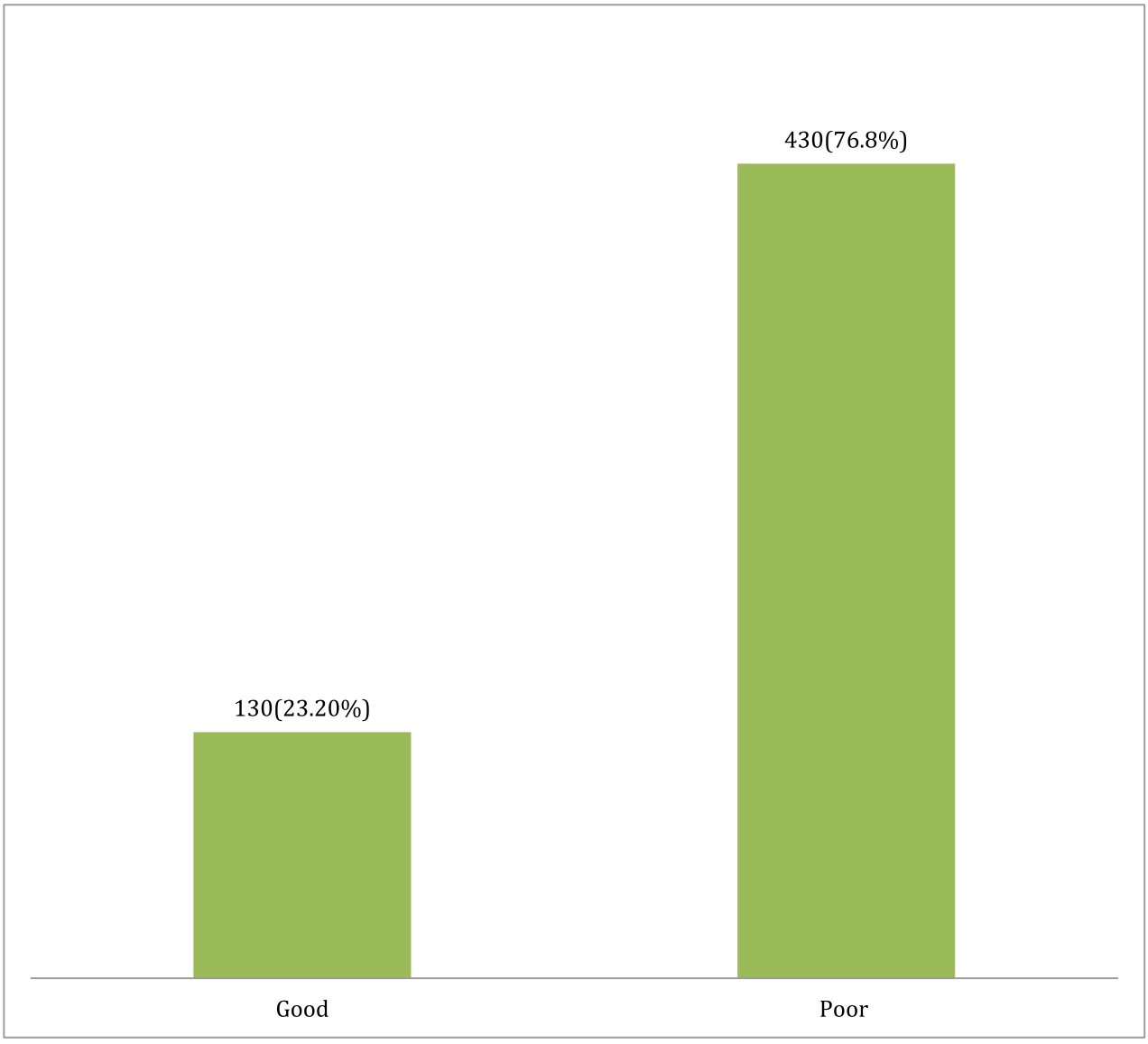


Figure 11: Distribution of staff practice on sudden surveillance

Table 8: Response to practice questions 'How do you investigate sudden death cases in your hospital?'

Practice characteristics	No of respondents (%)
Post-mortem examination	118 (21.1)
Verbal autopsy	14(2.5)
Evaluation of lab results of victims	20(3.5)
Review of clinical history of victims	15(2.7)
Review of family history of victims	22(3.9)
Eliminating violent and traumatic deaths	34(0.6
Sudden death reporting guidelines	22(4.4)
Ever reported sudden death cases to a coroner	34(1.0)
Participate in clinicopathological cases review meeting	78(14.0)
Use the national policy as a guide to Sudden death surveillance in the hospital	30(5.3)
Use multiple data sources to ascertain sudden death cases	133(23.7)
Use relevant sudden death reporting form	171(30.5)

Table 9 shows the relationship between health worker sociodemographic characteristics and their practice on sudden death investigation and reporting. Respondents who are pathologists, had more than 5 years' working experience, those from institutions in the southern part of Nigeria and those who had previous trainings on sudden death, were found to have good practice towards Sudden death investigation and reporting. The independent association were maintained after adjusting for confounding variables at multivariate logistic regression analysis (table 9). Age and female gender were found not to influence respondents' practice about sudden death investigation and reporting.

Table 9: Relationship between health worker sociodemographic characteristics and their practice on sudden death investigation and reporting.

Characteristics	Crude OR (95%CI)	Adjusted OR (95%CI)
Age		
<40	Ref	Ref
≥ 40	10.9 (1.9-83.1)	10.7 (0.9-80.7)
Profession	19.6(9.1-46.7)	16.1(7.9-41.3)
Non Pathologist	Ref	Ref
Pathologist		
Sex		
Female	Ref	Ref
Male	1.3(4.3-12.9)	1.6(0.3-11.4)
Geopolitical zones	Ref	Ref
Northern Nigeria	4.2 (2.4-7.3)	4.2 (2.4-7.3)
Southern Nigeria		
Work Experience	Ref	Ref
<5years	9.1(6.1-23.4)	8.9(6.8-20.1)
≥ 5 years		
Training	30.2 (8.7-161.1)	37.2 (8.7-158.6)
Yes	Ref	Ref
No		

CHAPTER FIVE

5.1 Discussion

A nation-wide study of sudden deaths was conducted consisting of a retrospective autopsy audit and a cross-sectional study involving the use of semi-structured questionnaire to determine the knowledge, perception and practices of staff working in Morbid Anatomy Department as it relates to the investigation and reporting of sudden death. A total of 642 autopsied cases of sudden death were identified from the selected tertiary institutions located in the six geopolitical zones of Nigeria and 560 health workers were also interviewed.

5.1.1 Autopsy Study

South western institutions produced the highest number (70.8%) of autopsy reports during the study period. The North central and North West had the least autopsy reports with 1.7% and 2.2% respectively. This large disparity could be as a result of differences in religious and cultural beliefs between these regions as well as fewer numbers of pathologists in the Northern zone. Northern Nigeria is mainly populated by persons of Islamic belief which according to their religion must bury their dead within 24 hours. It is therefore very unlikely that the few pathologists in the zone would keep to the time limit. It is therefore not surprising that most deaths are buried without autopsy reports. Another possibility could be due to the fact that the tertiary institutions in the south western part of Nigeria have long been established and equipped with both personnel and infrastructure before the tertiary institutions in the north came to be. Within the southern zone, a disparity was also noted between the south-western and others, with the south-west having significantly higher rates than the Southeast and south-south zones. Apart from the fewer number of Anatomic Pathologists in Southeast and South-south zones compared to the Southwest, the general belief of reincarnation with missing organs in the zones may have accounted for the lower rates of autopsy. It is noteworthy that only

Lagos state is implementing the coroner law[22], and that may be attribute to the great disparity with other site. Some site with very few number of autopsy cases claimed that lack of funding to acquire appropriate autopsy tables was a major setback in their site. Since there is a coroner law in the country which should be operational in all parts of the country, non-implementation of the existing coroner law rather than the religious-cultural reasons should be the main cause for the low rates in zones reporting fewer autopsies.

In this study, men were found to be six times more likely to die of sudden deaths than their female counterparts, as men accounted for more than two-thirds of sudden death cases. The increased predilection to sudden death among males in this study is similar to previous reports from Ile-Ife and Jos, Nigeria which showed that men account for about 70% of sudden deaths cases[9, 10,21]. The observed gender difference in these studies may be related to the cardio-protective effect of estrogen in women before menopause and the testosterone-induced increase in cardiovascular risk in men[23]. Also a number of reports have shown a better health-seeking behaviour among female compared to men. Furthermore, pregnancy and the attendance of antenatal care avail women of opportunity of medical care where some of the predisposing factors to sudden death may be diagnosed at early stages and managed.

About three quarter (73.2%) of identified cases were married. The age group most affected was between 41 and 60 years of age (43.1%). This is in agreement with findings in a study conducted by Amakiri in Ibadan where the peak age incidence of cases of sudden death occurred in the fourth decade of life[24]. The age group 30- 60 years accounted for 60% of cases of sudden death. This age group is the most productive group and thus important for any significant national development, as such aggressive health education and early detection of underlying conditions is very important to curb this trend especially in this age group. Majority (85.4%) had at least secondary education. It has been observed that the more educated individuals become, the more likely they are to adopt the western lifestyle which ranges from

a move to urbanization, dietary modifications and sedentary lifestyles. All forms of occupation were affected, with business and civil servants affected more (44.4%), this could be as a result of the sedentary life styles adopted by both occupational groups and also the stressful nature of carrying out business in our setting. In addition, their affluent nature may afford them the western lifestyle. Furthermore, they may be too busy to attend regular medical checks, exercise or seek treatment when ill. Other occupations reported include retirees and civil servants with 11.5% and 11% respectively. The least affected were security personnel and farmers with 0.3% and 0.6% respectively. This is not surprising as farmers and security personnel are known to be very active while performing their duties.

The causes of sudden death vary in different parts of the world and it is known to reflect the disease pattern of that location. It has been established from other studies that major causes of sudden death are cardiovascular, respiratory and central nervous system. In this study, sudden deaths of cardiovascular origin accounted for majority (41.4%) of the cases followed by cerebrovascular diseases (19.5%). It is therefore not surprising that systemic hypertension was found to be the leading risk factor in this study. Since hypertension at the onset presents with minimal or no symptoms, there is an urgent need for public enlightenment and education on the importance of regular medical check-ups. These have the potentials to prevent, early identification of causes of sudden death and opportunity to manage them before complications occur. The findings that cardiovascular disease accounted for the highest proportion of sudden death causes corroborate the reports of studies conducted in Cameroun[14], Ile-Ife[10, 24,] and Benin-City[25], Nigeria which revealed that causes of sudden deaths are mainly of cardiac origin. Also the verbal autopsy report corroborate the finding[26]. Respiratory disorders (14%) was the third common cause of sudden death followed by renal disorders (0.5%). The increased urbanization and pollution in most cities in Nigeria and the emerging trend of citizens using non prescribed medical concoctions may have accounted for this. Although infections

accounted for only 2.5% of sudden death in this study, it shows that despite all attention, infections still cause sudden deaths. The low contribution of infections in this study confirms that infections most times linger and become chronic. Other causes of sudden death were pregnancy related, diabetes mellitus and liver failure.

Apart from systemic hypertension which was implicated in 49.1% of sudden death cases in this study, other risk factors were pulmonary diseases (11.2%) and renal failure (0.2%). Hypertension as the commonest risk factor is not surprising as an increase in the prevalence of hypertension has been reported in our setting and it is the most prevalent non communicable disease in Africa[15]. Other studies have also reported hypertension as the commonest risk factor to sudden death[17, 27]. Several studies have reported association of hypertension with cardiac abnormalities leading to sudden death in Nigeria[28, 29, 30]. However this study is the most recent, more elaborate and covered all the zones of Nigeria with autopsy results. This could be reflective of the rate of undiagnosed or poorly control of hypertension in our setting. Thus, early diagnosis and good control of hypertension may help in mitigating this problem of sudden death. Cancers, diabetes mellitus, pregnancy, GIT ulcers, infectious diseases, and cardiomyopathies are other risk factors of sudden death in this study. Interestingly, hypertension as the most prevalent risk factor accounting for 49.1% of the entire risk factors which is greater than 48% of all other risk factors put together. However, this finding contradicts what obtains in the developed countries which reports ischemic heart disease as the most prevalent cardiac cause of sudden death[31].

Infections accounted for only 4.1% of all the risk factors while non- infectious risk factors accounted for 95.9% of risk factors. This finding further drives home the current epidemiologic transition of the burden of diseases in Sub Saharan Africa from communicable to non-communicable. Also the visible prominence of Non communicable diseases in cause of sudden death, supports the paradigm shift away from communicable diseases.

5.1.2 Cross-sectional Health workers Study

The average age of health workers involved in sudden death related activities is 35.4 years, showing that those who conduct autopsies in the country are relatively young. However it is important to note that over forty percent of those interviewed where at least 40 years of age. This high number of those above 40 years may have accounted for the large number of staff with more than 5years experience. Unfortunately these years of experience working in the Morbid Anatomy Department did not impact on the number of autopsies performed. It may be concluded that attitudes and religio-cultural issues are the major causes of the low autopsy rates rather than the number and experience of health workers. Training is therefore important to address attitudinal issues, importance of autopsies to national development as well as the need to implement existing laws rather than differing to religio-cultural sentiments. In areas where corpses have to be buried within 24hours of death, there is urgent need to train middle level manpower who can assist the pathologists in conducting urgent autopsies.

In this study the low percentage of Pathologists (18.4%) among staff working in the Morbid Anatomy Department in the study institutions is worrisome. It was therefore not surprising of the low number of autopsies performed. There is need to increase effort to train and support more Pathologists. The northern zone of the country was the most affected both by low number of Pathologist and autopsies performed; followed by southeast and south-south zones. Efforts should be put in place to remedy the situation in these zones through training, re-training and provision of incentives for the intending Pathologist-trainees from these zones. The current effort of West African Post-Graduate Medical College of producing middle level specialist cadre should be encouraged and adopted as a policy in the country. This has potential to bridge the gap in the number of Pathologists to perform autopsies in the zones dearth of Pathologists.

The poor knowledge, perception and practice of sudden death in this study is not surprising because of the large number of Non-pathologists in Morbid Anatomy Departments. This finding corroborate the autopsy study which showed higher number of autopsies in centres with more Pathologists. This may be one of the reasons for low number of autopsies in the north. Another issue may be the religious-cultural reason of having to bury the dead almost immediately. The current state of low number of Pathologist may not cope with this and thus most deaths are not investigated.

Previous training on sudden death investigations, being a pathologist and from the institutions in southern part of the country are factors associated with good knowledge, perception and practice of sudden deaths investigation and reporting in the country. This confirms the urgent need for training and retraining of the staff to ensure that cause of sudden deaths in the country is well investigated.

5.1.3 Challenges

Despite the fact that this study was a nation-wide survey involving the various geo-political Zones apart from the North East which was engulfed in the Boko Haram insurgency at the time of the study, it was expected to provide a near accurate data on the causes of sudden death in Nigeria. However, there were limitations experienced in the course of this study. The results presented is representative of only cases of sudden death that had autopsies performed and also met the inclusion criteria. Missed cases rather than misdiagnosis was thus a major challenge in this study.

Poor documentation and non-use of official post-mortem forms in some institutions involved in the study was also a challenge. To ameliorate these challenges, the information on the autopsy reports were complimented from information derived from case notes and other sources where they were available.

In two out of the thirteen institutions selected for the study, autopsies were not performed at all during review period. Reasons adduced were poor infrastructure and religious reasons. Religion and cultural inhibitions to autopsies in some geopolitical zones of Nigeria contributed to the remarkable disparity in cases of sudden death reported by the institutions involved.

Militancy/social unrest in the north-eastern parts of the country prevented our team from conducting the study fully in the North East zone.

5.2 Conclusion

Sudden death is common in Nigeria with multiple etiologies and risk factors. Cardiac causes accounted for 41.4% of cases of sudden death with hypertension being the commonest risk factor to sudden death in Nigeria. Hence the need to intensify advocacy for preventive measures to hypertension as well as institute adequate management practices for hypertension. National public health policies regarding detection, prevention and treatment of non-communicable diseases (NCDS) especially hypertension should be put in place.This will help in preventing the occurrences of sudden death and reverse this trend. Proper documentation at all levels should be encouraged for the sake of accurate data reporting which could translate to improved and strengthened health care system.

Findings from this study indicate inadequate knowledge, perception and practice on sudden death related activities in Nigeria. There is need to improve autopsy practices in Northern Nigeria, develop nationally adopted guidelines and health policy and strengthen human capacity on sudden death surveillance in the country.

5.3 Recommendations

Therefore based on our research findings the following were recommended:-

- Advocacy and public enlightenment on the importance of autopsy.
- Socio-cultural barriers to autopsies should be addressed.

- Incorporate Sudden death information in the Autopsy Registry
- Enforce implementation of Coroner law nationwide
- Support for the training of middle level manpower for autopsy especially in the zones with inadequate pathologists
- Institute programs for early identification and management of hypertension

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Appendices

Appendix 1 IRB Approval

Appendix 2 Data collection tool booklet including the informed consent (attached)

Appendix 3 KAP study Questionnaire (attached)

APPENDICES

INSTITUTIONAL REVIEW BOARD

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2ND FEB, 2015

PROJECT TITLE: **MORTALITY SURVEY IN NIGERIA: INVESTIGATING AND IDENTIFYING THE CAUSES OF SUDDEN DEATH IN ADULT NIGERIANS**

NIMR- Institutional Review Board
Protocol No: IRB/14/263
Effective: 5/2/15
Expiration: 4/2/16
Sign:

PROJECT №: IRB/14/263

APPROVAL LETTER

The above named proposal has been adequately reviewed, the protocol and safety guidelines satisfy the conditions of NIMR-IRB, policies regarding experiments that use human subjects.

Therefore the study under its reviewed state is hereby approved by Institutional Review Board, NIMR.

PROF. F. E. OKONOFUA
Name of IRB Chairman

5/2/15
Signature of IRB Chairman & Date

MRS. O. A. NWOGBE
Name of IRB Secretary

5/2/15
Signature of IRB Secretary & Date

This approval is given with the investigator's Declaration as stated below;
By signing below I agree/certify that:

1. I have reviewed this protocol submission in its entirety and that I am fully cognizant of, and in agreement with, all submitted statements.
2. I will conduct this research study in strict accordance with all submitted statements except where a change may be necessary to eliminate an apparent immediate hazard to a given research subject.
   - I will notify the IRB promptly of any change in the research procedures necessitated in the interest of the safety of a given research subject.
   - I will request and obtain IRB approval of any proposed modification to the research protocol or informed consent document(s) prior to implementing such modifications.

3. I will ensure that all co-investigators and other personnel assisting in the conduct of this research study have been provided a copy of the entire current version of the research protocol and are fully informed of the current (a) study procedures (including procedure modifications); (b) informed consent requirements and process; (c) potential risks associated with the study participation and the steps to be taken to prevent or minimize these potential risks; (d) adverse event reporting requirements; (e) data and record-keeping; and (f) the current IRB approval status of the research study.

4. I will respond promptly to all requests for information or materials solicited by the IRB or IRB Office.

5. I will submit the research study in a timely manner for IRB renewal approval.

6. I will not enroll any individual into this research study until such time that I obtain his/her written informed consent, or, if applicable, the written informed consent of his /her authorized representative (i.e., unless the IRB has granted a waiver of the requirement to obtain written informed consent).

7. I will employ and oversee an informed consent process that ensures that potential research subjects understand fully the purpose of the research study, the nature of the research procedures they are being asked to undergo, the potential risks of these research procedures, and their rights as a research study volunteer.

8. I will ensure that research subjects are kept fully informed of any new information that may affect their willingness to continue to participate in the research study.

9. I will maintain adequate, current, and accurate records of research data, outcomes, and adverse events to permit an ongoing assessment of the risks/benefit ratio of research study participation.

10. I am cognizant of, and will comply with, current federal regulations and IRB requirements governing human subject research including adverse event reporting requirements.

11. I will make a reasonable effort to ensure that subjects who have suffered an adverse event associated with research participation receive adequate care to correct or alleviate the consequences of the adverse event to the extent possible.

12. I will ensure that the conduct of this research study adheres to Good Clinical Practice guidelines

Dr. Odunukwe Nkiruka
Principal Investigator's Name

10/02/15
Principal Investigator's Signature and Date

Mortality Survey in Nigeria:
Investigating and identifying the causes of sudden death in adults

RESEARCH PROPOSAL

SUMMARY:

Sudden death has become a leading global health problem. Over 7 million people are estimated to die suddenly from cardiac etiology annually, representing 40% of the annual global cardiovascular mortality. Without appropriate interventions, this rate is expected to double by 2020 with 83% of sudden death cases occurring in developing countries.

The declining incidence of sudden death in developed countries has been attributed to availability of detailed research data for adequate intervention programs. In Nigeria and most developing countries, sudden death remains on the rise and has become a formidable health challenge in need of urgent interventions.

This study is to determine prevalence and risk factors of sudden death in adult Nigerians and identify biomarkers of disease severity in those at risk for possible prevention of sudden death. This study will be conducted across the six geopolitical zones of Nigeria. Ethical approval and all necessary permissions will be obtained for this survey from NIMR IRB and collaborating Institutions.

Data will be analysed using SPSS version 20 software. It is expected that this study will generate detailed data that will inform policy on sudden death preventive programs.

BACKGROUND

Sudden death is defined as death that occurs unexpectedly and from 1 to 24 hours after the onset of symptoms with or without known preexisting conditions and has become a leading global health problem (1). Over 7 million people are estimated to die suddenly from cardiac etiology annually, representing 40% of the annual global cardiovascular mortality (2). Without appropriate interventions, this rate is expected to double by 2020 with 83% of sudden death cases occurring in developing countries (3). Currently in the USA, 300,000 lives are lost annually to sudden death alone, representing an overall annual incidence estimate of 0.1-0.2%. In Wales and England, sudden deaths in the young has been estimated to occur with an annual incidence rate of 1.8 per 100,000 per year (4), same as the incidence rate reported from a national survey in Hong Kong in 1997 (5).

The symptomatology of sudden death has been characterized into four components: (ii) prodromal, comprising chest pain, palpitations and dyspnea; (ii) acute cardiovascular collapse, (iv) sudden death and biological death- the first three of which are reversible (6).

In the western world, sudden death cases have been attributed to multiple aetiologies, which show variations with age, race and geographical locations. They include coronary artery disease (CAD), the most frequent cause of sudden cardiac deaths (SCD) in the middle age and elderly, while genetic syndromes and congenital heart diseases are responsible for the majority of SCD cases in young adults (7). In infants, respiratory disorders and infectious diseases are leading causes of sudden death (8). They are also involved in sudden death manifestation in children in the company of other aetiologies, including structural heart defects and sudden arrhythmic syndromes (SAS) of long QT,

short QT, atrioventricular blocks, Brugada syndrome and Wolff-Parkinson White syndrome (9, 10). These arrythmias often represent the phenotypes of genetic aetiology of sudden death, which are usually missed at postmortem examination, making such deaths unexplainable. Cardiovascular disease factors that have also been found to cause 2 -4 fold increased risk of sudden death include Diabetes mellitus, hypertension, hypercholesterolemia, hypertriglyceridemia, obesity, smoking and physical inactivity(11, 12).

Available evidence from developed nations of the world further indicates that 20 -25% of SCD cases occur as first clinical manifestation in victims who are apparently healthy or with silent or unrecognized heart disease (11). A large proportion of sudden death cases are unwitnessed and occur outside the hospital environment (12).

However, unlike in developing countries, the incidence of sudden death is declining in developed countries. This has been attributed to availability of public health measures, which include improved awareness of cardiovascular disease risk factors, screening of the general population for cardiovascular risk factors and underlying asymptomatic heart defect, improved access to antihypertensive and anti-arrhythmic drugs by high risk individuals, improvement of medical services for cardiopulmonary resuscitation and prompt intervention with implantable cardio-converter and external automated defibrillators among sudden death victims (13).

In Nigeria, the cases of sudden death remain on the rise and have become a formidable health challenge in need of urgent interventions for reduction of the disease burden in the country. However, evidence based data to use for planning and implementing cost-effective and scalable interventions in the country are grossly inadequate. A 10-year review of sudden death cases aged 27 – 80 years in Ile-Ife (1987-1997) revealed that only

30.3% of these cases were previously diagnosed as hypertensive heart disease (83.5%), ischemic heart disease (6.3%) and cardiomyopathies (6.3%) (14). An autopsy study of 50 cases by Rotimi *et al* (15) also found only 18% of these cases to be previously diagnosed as hypertensive heart disease with 4% of cases revealed as myocardial infarction at autopsy. In a prospective study of coroner's autopsies in Benin City, Nigeria over a two year period (1997-1998), the most common cause of sudden unexpected death was found to be cardiovascular in origin and having hypertension as a precursor (16). An autopsy report of 279 medico-legal cases over a period of 8 years in north-Central Nigeria also revealed hypertension as the most common cause of sudden death in affected victims (17). Between years 1989-2010, there have been a few cases of sudden cardiac deaths occurring in Nigerian athletes aged between 22-30 years and evidence has shown that early detection and management of underlying asymptomatic heart would be beneficial in terms of averting sudden deaths among Nigerians. (18)

Justification

There is a paucity of data as regards the symptomatology, and underlying medical conditions and proportions of Nigerians that die suddenly. There is evidence that the epidemiology of out-of-hospital sudden death is largely unknown in Nigeria. Despite the fact that the few available reports on sudden deaths in Nigeria have all implicated cardiovascular diseases and underlying heart defects as major etiologies, the contribution of other recognized causes of sudden deaths from other causes such as neurological, respiratory, and endocrine have not been well documented.

In the context of target interventions and integration of health services as a standard of care, the usefulness of genetic markers to identify disease severity in Nigerians at risk of

sudden death has not been exploited in Nigeria. This is at variance with practices in developed countries where the burden of sudden death is declining (19).

In Nigeria and most developing countries, the cases of sudden death remain on the rise and have become a formidable health challenge in need of urgent interventions.

However, evidence based data for planning and implementing cost-effective and scalable interventions in the country are grossly inadequate.

There has not been nationwide study that systematically describes the frequency, pattern, etiologies, pathological findings and risk factors associated with sudden death across the six geopolitical zones of the country

Information regarding the level and pattern of care of patients with cardiopulmonary abnormalities to inform treatment guidelines is also not available. The level of knowledge and misconception about sudden death among Nigerians is also not known.

There is need for a detailed survey designed to determine the frequency, pattern, trend, causes, pathological findings and risk factors/biomarkers associated with sudden death in Nigeria.

OBJECTIVES

General objective

To determine the burden and risk factors of sudden death in adult Nigerians

Specific objectives

1. To determine the prevalence, pattern and distribution of sudden death in the six geopolitical zones of Nigeria.
2. To determine the risk factors of sudden death among adult Nigerians.
3. To assess the knowledge, attitude and practice of health care providers, regarding sudden deaths in adult Nigerians.
4. To determine the knowledge, attitude and prevention practices of the general population about sudden death in adult Nigerians.
5. To identify biomarkers of sudden deaths in adult Nigerians.

METHODOLOGY

Study designs

A retrospective hospital–based study to provide definitive information on causes of sudden death and assessment of risk factors/biomarkers associated with the occurrence of sudden deaths in Nigeria.

SELECTION OF STUDY SITES

This study will be conducted across the six geopolitical zones of Nigeria. A multi-stage random sampling technique will be used to select two states per geopolitical zone. States for the coroner survey will be purposively selected across the 6 geopolitical zones. In each selected state, tertiary health facilities will be mapped and used for the coroner survey.

To pre-test the coroner case form for the coroner study, LUTH will be used. For the community survey, in each selected state, one (1) Local Government (LGA) will be randomly selected from the list of LGAs and one (1) community will be randomly selected in such community.

Study sites:

The study will be conducted in the six geo-political zones in the country. A retrospective study design, coroner survey, using coroner case form will be used to obtain 10-year autopsy data of sudden death victims at tertiary health care level from selected states that will represent the 6 geopolitical zones of Nigeria. These states will be selected by the standard stratified random sampling technique. (see Appendix i). The coroner case form (appendix ii) will be used to obtain demographic, clinical, laboratory, hereditary, medical history and pathological data of sudden death victims in the selected states. The Morbid Anatomists at the tertiary health facilities will serve as zonal/state coordinators working with NIMR research staff and pre-trained health workers in the selected states. For the list of participating Morbid Anatomists (see appendix iii). For easy logistic distribution, the

commencement of this study will be in stages. Stage 1: South West, South South and South East.

Stage 2: South Central, North West and North East.

Sample size determination

The sample size for coroner survey will be the total number of coroners in the selected states across the six geopolitical zones of the country. This is indicated below:

GEOPOLITICAL ZONE	SELECTED STATE	NO. TERTIARY HEALTH FACILITIES	EXPECTED NO. Morbid Anatomists
SW	LAGOS/OYO	3	3
SS	AKWA IBOM /EDO	2	2
SE	ENUGU/ANAMBRA	2	2
NC	BENUE/PLATAEU	2	2
NW	KADUNA/KANO	2	2
NE	TARABA/GOMBE	2	2
TOTAL	**12**	**13**	**13**

Sample size = an estimated 13 tertiary Health facilities

DATA COLLECTION

Data collection will be used to collect information on sudden deaths at the different selected Health facilities.

ETHICAL ISSUES:

Ethical approval and all necessary permissions will be obtained for this survey from NIMR IRB and collaborating Institutions.

EXPECTED OUTCOMES

The expected outcome of this study will include the following

The prevalence of sudden death over 10 year period per zone will be established. The pattern of sudden death in the last 10 years per zone will be determined.

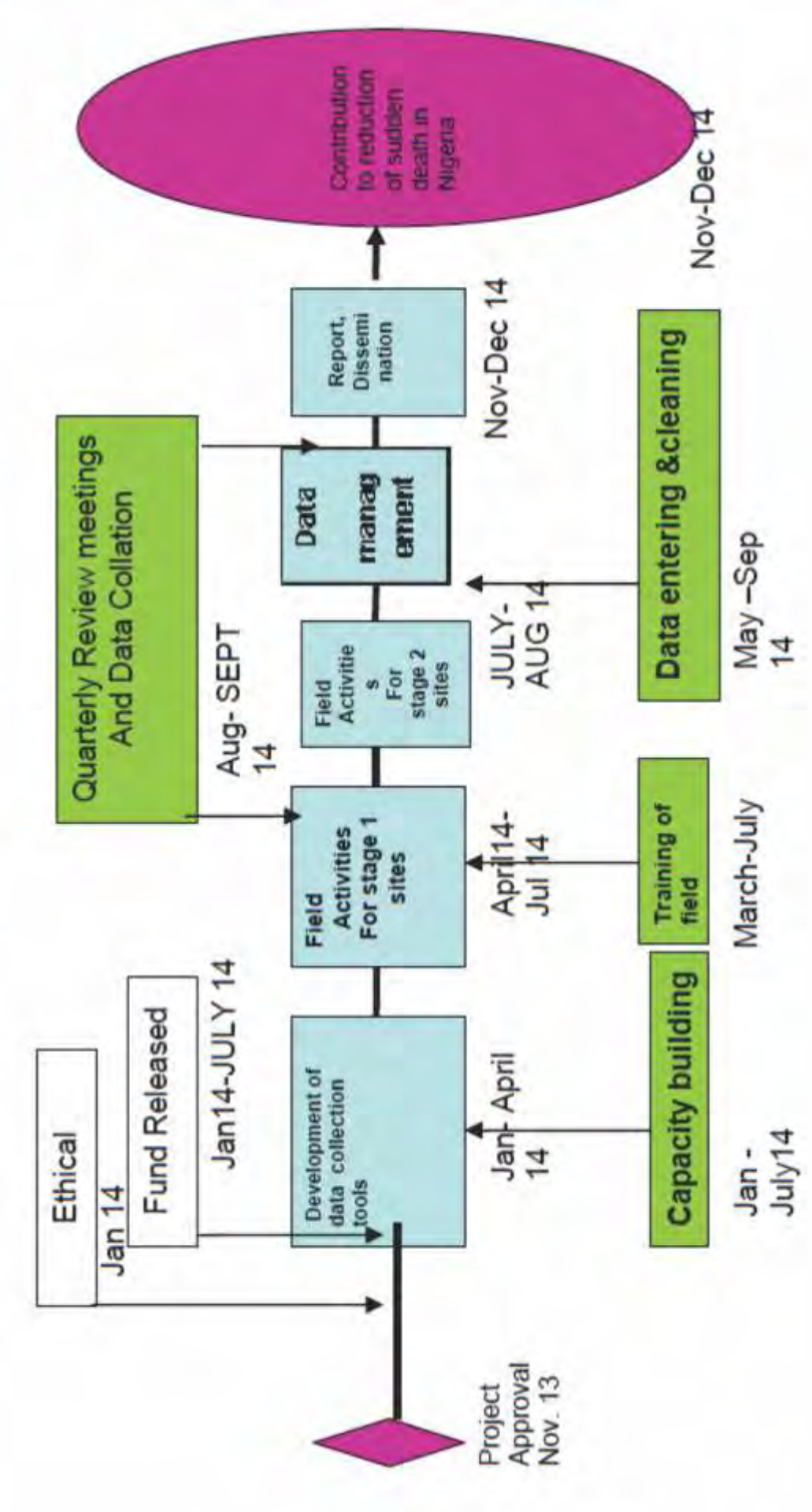
The risk factors/biomarkers associated with the occurrence of sudden deaths identified.

Data management and statistical analysis

Data will be analysed using S P S S version 20 software.

Data of variables in the CCF will be double entered into Microsoft excel and SPSS data spreadsheets, edited, cleaned and validated. Analysis will entail descriptive statistics of numeric variables and their measures as mean, median, interquartile range, 95% confidence interval, numbers and percentages. Comparison of data between rural and urban areas, males and females will also be done for mean and median values using parametric and non-parametric tests. Percentages will be analysed using chi-square (2) or Fischer exact test, while association between variables will be evaluated using odd ratio statistics. Statistical outcomes with P value < 0.05 will be considered to be significant.

WORK PLAN FOR PHASE 1 STUDY



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Appendices

Appendix 1

The proposed study sites are:

Benue State University Hospital, Makurdi

Jos University Teaching Hospital

Lagos University Teaching Hospital,

Lagos State University Teaching Hospital,

University College Hospital Ibadan

University of Nigeria Teaching Hospital, Enugu,

Nnamdi Azikiwe University Teaching Hospital, Nnewi.

Aminu Kano University Teaching Hospital, Kano

Amadu Bello University Teaching Hospital, Zaria.

University of Uyo Teaching Hospital, Uyo

University of Benin teaching Hospital, Benin

Federal Medical Centre, Jalingo (Taraba State)

Federal Medical Centre, Gombe,

Appendix 2

LIST OF CONTACTED MORBID ANATOMISTS

S/N	Name	Workplace	Phone number	Email
1	Dr. Soyemi	LASUTH Lagos	08023286720	soyemisunday@yahoo.com
2	Dr. Akinfewa Atanda	AKUTH Kano	08035975951	akinzo123@gmail.com
3	Dr. Agabus Manasseh	JUTH Jos	08065740663	nanfwang@hotmail.com
4	Dr. Al-Mustapha	ABUTH Zaria	08050247763 08125438766	mustyliman@yahoo.com
5	Dr. Clement Okolo	UCH Ibadan	08023080867	clemabuokolo@yahoo.ca
6	Prof. Fatimah Abdulkareeem	LUTH Lagos	08023093852	biade64@yahoo.co.uk
7	Dr. Ngbea Joe	BUSTH Markudi	08053663201	joenor2013@gmail.com
8	Dr. Olusina Bankole	UNTH Enugu	08063386500 08075022531	dbolusina@yahoo.com
9	Dr. Ukah Cornelius	NAUTH Nnewi	08067049761	ukahcornelius@yahoo.com
10	Dr. Adesuwa Olu-edo	BUTH Benin	08091936078	adebaris2004@yahoo.com

ID NO _____ _____ _____ _____

State _____

Zone _____

Facility _____

PN _____

MORTALITY SURVEY IN NIGERIA:

INVESTIGATING AND IDENTIFYING THE CAUSES OF SUDDEN DEATH IN ADULT NIGERIANS

DATA CAPTURE TOOL

Study conducted by

NIGERIAN INSTITUTE OF MEDICAL RESEARCH, YABA LAGOS

INFORMED CONSENT DOCUMENT

Study proposal: Mortality Survey in Nigeria: Investigating and identifying the causes of sudden death in adults.

Sudden death has become a leading global health problem. Studies in the developed world have shown that the most common cause of sudden death in adults worldwide is sudden cardiac deaths. Studies from developed countries have shown reduction in the estimated annual burden of sudden cardiac deaths from 7 million to 4-5 million cases per year. This has been attributed to availability of screening, prevention and interventional procedures.

In Nigeria and most developing countries, sudden death remains on the rise and has become a formidable health challenge in need of urgent interventions. The incidence of sudden deaths in adults in Nigeria is largely unknown and can be attributed to a lack of cumulative data, religious bias as regards autopsies as well as unreported deaths.

Although there have been pockets of research on sudden deaths in various parts of the country, there is clearly a gap in cumulative data regarding causes of sudden death in Nigeria which has necessitated the need for a nationwide survey.

This will provide not only a national database but also general information that will aid in putting preventive and screening measures in place.

This study which will be conducted across the six geopolitical zones of Nigeria is to determine prevalence and risk factors of sudden death in adult Nigerians.

This aspect of the study is coroner-based which will require detailed autopsy reports by the pathologists as regards sudden death (non -traumatic) in adults seen in their respective centers.

We hope to get your full support in the course ofthis study.

CERTIFICATE OF CONSENT

I have been invited to participate in this study. I agree that the above proposal and information has been by me and that I have been able to ask questions about this study. voluntarily consent to participate in this study.

Name of

Pathologist:..... .. Center

.....

Signature: ..... Date:

.....

SECTION !:BACKGROUND INFORMATION OF THE DECEASED FROM THE HOSPITAL (for hospital-based cases)		
1.1	Address of household	
1.2	Name of deceased	
1.3	Sex of deceased	Male -1Female-2
1.4	Date of death	[ ] [ ] [ ] [ ][ ] [ ] (ddlmm /yy)
1.5	Age at time of death	[ ] [ ] [ ]
	Date of Birth	[ ] [ ] [ ] [ ][ ] [ ] (ddlmm /yy)
1.6	Marital status	Single.....I Married.....2 Divorced.....3 Separated.....4 Widowed.....5
1.7	Level of education	No formal education.....1 Primary.....2 Secondary.....3 Post- secondary.....4 Arabic.....5 Other (please specifY).....6
1.8	Occupation	Unemployed..... 1 Student. ..... 2 Housewife..... 3 Farming..... 4 Trading ..... 5 Artisan..... 6 Others (please specify)..... 7

1.9	Drug history	Long term drug use: Yes( ) No(). If Yes list the drugs…… …… Recent drug used (within 48 hours): Yes( ) No(). If Yes list the drugs…… ……
1.10	Food allergy /Alcohol	Yes () No ( ). If Yes list. …… ……

1.10	Date of presentation in the hospital	[ ]/ [ ]/[ ] (dd /mm /yy)
1.11	Time of presentation at the hospital	[ ]: [ ]am/pm
1.12	Diagnosis at presentation (If known)	
1.13	Date of death	[ ]/[ ]/[ ] (dd /mm /yy)
1.14	Time of death	[ ]: [ ]am/pm

Part1c1pants Copy

SECTION 2: CAUSE OF DEATH(please tick as appropriate)			
A. CARDIOVASCULAR			
I	Myocardial infarction		[ ]
II	Hypertrophic cardiomyopathy		[ ]
III	Dilated cardiomyopathy		[ ]
IV	Valvular Heart disease		[ ]
v	Ventricular fibrillation		[ ]
VI	Prolonged QT syndromes		[ ]
VII	Pre-excitation syndromes		[ ]
VIII	Asystole		[ ]
IX	Massive pulmonary embolism		[ ]
X	Cardiac tamponade		[ ]
XI	Severe aortic stenosis		[ ]
XII	Ruptured aortic aneurysm		[ ]
XIII	Aortic dissection		[ ]
XIV	Acute Heart Failure		[ ]
XV	Others (please specifY)		
Known pre-existing_ conditions for cause of death?			(1) Yes (2)No
If yes, please specify		1. 2.	

	3.	
B. NEUROLOGICAL		
I	Cerebrovascular accident	[ ]
II	Aneurysms/Arterio -venous malformations	[ ]
III	Sudden unexpected deaths in epilepsy	[ ]
IV	Cerebral oedema	[ ]
v	Others (please specifY)	
Known pre-existing conditions for cause of death?		(1) Yes (2)No
If yes, please specify	1. 2. 3.	
C. RESPIRATORY		
I	Pulmonary Embolism	[ ]
II	Acute severe asthma	[ ]
I	Pneumothorax	[ ]
V	Others (please specify	[ ]
Known pre-existing conditions for cause of death?		(1) Yes (2)No
If yes, please specify	1. 2. 3.	

D. GASTROENTEROLOGY		
I	Acute massive upper gastrointestinal bleeding	[ ]
II	Acute pancreatitis	[ ]
III	Acute fulminant hepatitis	[ ]
IV	Mesenteric artery thrombosis	[ ]
V	Others (please specify)	
Known pre-existing conditions for cause of death?		(1) Yes (2)No
If yes, please specify	1. 2. 3.	
E. ENDOCRINOLOGY		
I	Diabetes ketoacidosis	[ ]
II	Hyperglycemic hyperosmolar ketoacidosis	[ ]
III	Hypoglycemia	[ ]
IV	Thyroid storm	[ ]
V	Adrenocortical insufficiency	[ ]
VI	Others (please specify)	
Known pre-existing conditions for cause of death?		(1) Yes (2) No
If yes, please specify	1. 2. 3.	

F. HAEMATOLOGY		
Acute hemolytic crisis from:		
I	Sickle cell crisis	[ ]
I	Malaria	[ ]
I	Micro-angiopathic hemolytic anemia	[ ]
V	Thrombotic thrombocytopenic purpura (TIP)	[ ]
V	Disseminated intravascular coagulation	[ ]
V	Others (please specify)	
Known pre-existing conditions for cause of death?		(1) Yes (2) No
If yes, please specify	1. 2. 3.	
G. ELECTROYTE DISTURBANCES		
Please specify _____		
Known pre-existing_ conditions for cause of death?		(1) Yes (2)No
If yes, please specify	1. 2. 3.	
H. OTHER CAUSES NOT LISTED ABOVE		
Please specify		
Known pre-existing conditions for cause of death?		(1) Yes (2)No

If yes, please specify	1. 2. 3.
AUTOPSY FINDINGS	
Autopsy done?	(1) Yes (2)No
Findings autopsy positive?	(1) Yes (2)No
If autopsy negative please indicate why	
Undetermined cause of death despite autopsy	
Results/ conclusion/summary of autopsy report (if positive) (please specify)	

Signature of pathologist (with date) _____

Mortality Survey in Nigeria:

Investigating and identifying the causes of sudden death in adults

Verbal Autopsy Form

[To be completed when autopsy or hospital record is not available.]

INFORMATION FOR STUDY PARTICIPANTS

Research study: **Mortality survey in Nigeria: investigating and identifying the causes of sudden deaths in Nigeria**

Sudden death occurs unexpectedly within 24 hours in an individual with or without an underlying medical condition.

The news of sudden unexpected death is always traumatic especially when those left behind by the deceased discover that the cause of the death is a condition that could be treated and that the death is indeed preventable. In this study, we aim to determine the knowledge of the general population about the causes / risk factors of sudden death in adult Nigerians to determine the burden of sudden death in the last 10 years nationwide.

All that is required from you is information on the medical history (if known) and circumstances surrounding the death of your relative.

Your participation in this research study is voluntary.

There will be no monetary compensation for this study. The information obtained will be used only for the purpose of this research project. Your name will not be used on any study form or in any report resulting from this study. The benefit of this study to you is to increase your awareness about sudden death, possible causes and prevention.

The findings of this study will help us determine the causes of sudden death in our environment and inform policy makers about the necessity for enlightenment and screening programmes, as well as adequacy of health facilities to avert these causes.

We hope to get your full support in the course of this study.

Research study: **Mortality survey in Nigeria: investigating and identifying the causes of sudden deaths in Nigeria**

Name of participant.....

I have been fully informed verbally and in writing about this study and understand that my confidentiality will be well preserved.

I understand that this study is to be carried out solely for the purpose of medical research and Iagree of my own free will to participate in this study to volunteer information about my relative.

Name..... .....

Signature/Thumb print..... .....

Date.....

I.....
have explained to the participant,the study on Mortality survey in Nigeria: investigating and identifying the causes of sudden deaths in Nigeria

Investigator/ Interviewer

Signature.....

Date.....

Information to be provided by relative of the deceased]

Date of interview	[ ][ ][ ] 201..
Name of interviewer/Investigator	
Name of Supervisor	
Narne of Person providing Information	
LGA	
State	
Geopolitical Zone	

1. Read questions as written and record answers carefully.
2. Begin by first introducing yourself and conveying your condolences
3. Discuss the purpose of the interview and how it will assist to reduce further death. [Say that you are interested in the illness that led to death]
4. Politely obtain an express permission to conduct the survey and ask to speak to the person who was the deceased's relative [If this is not possible, arrange a time to revisit the household when this person will be available]
5. Begin the Survey by saying "Now I am going to ask you some questions relating to the sudden death of your father/mother/husband/wife/brother/sister/relative/friend
6. Explain what is meant by "sudden death"

Information about the interview

Language in which interview was conducted . . . . . .

Date of interview	_ _/_ _ /_ _	Date and time arranged for second interview	__/__ /__ __
Date form checked by supervisor	_ _ /_ _ /_ _	Date and time arranged for third interview attempt	_ _ /_ _ /_ _
Date entered in computer	_ _ /_ _ /_ _	Date and time arranged for fourth interview	__/__ /__ __

SECTION 1: BACKGROUND INFORMATION OF THE DECEASED FROM THE HOSPITAL (for hospital-based cases)		
1	Address of household	
2	Name of deceased	
3	Sex of deceased	Male -1 Female-2
4	Date of death	[ ] [ ] [ ] [ ][ ] [ ] (dd/mm /yy)
5	Age at time of death	[ ] [ ] [ ]
	Date of Birth	[ ] [ ] [ ] [ ][ ] [ ] (dd/mm /yy)
6	Marital status	Single.....I Married.....2 Divorced.....3

		Separated……4 Widowed……5
1.7	Level of education	No formal education……1 Primary……2 Secondary……3 Post- secondary……4 Arabic……5 Other (please specify)……6
1.8	Occupation	Unemployed……1 Student. ……2 Housewife……3 Farming……4 Trading ……5 Artisan……6 Others (please specify)……7
1.9	Drug history	Long term drug use: Yes( ) No(). If Yes list the drugs…… Recent drug used (within 48 hours): Yes( )No(). If Yes list the drugs……

SECTION 2: BACKGROUND INFORMATION FROM RELATIVE		
2.1	"What is your name?"	
2.2	"What is your relationship with the deceased?"	
2.3	"Who was with the deceased during the final hours?"	
2.4	*Record whether other persons are present at the interview or not*	Yes, other persons present. ..... 1 No, only the respondent is present. .. 2
2.5	What is the deceased age (years)	[ ][ ][ ] *Don't know = 999*
2.6	How many years of school did the deceased complete?"	years *Don't know= 999*
2.7	What is deceased occupation?"	
2.8	What is the deceased ethnic group?	
2.9	Date of death	[ ][ ] /[ ][ ] /[ ][ ](dd/mm/yy)
2.10	Place of death?	Home.....1 Health Facility.....2 Others.....3
2.11	What did the respondent think that the deceased died of/ (Allow the respondent to tell you about the illness in his or her own words. Do not prompt them except to ask whether there was anything else.):	

SECTION 3 : DECEASED PAST MEDICAL HISTORY			
3.1 Had a doctor ever stated that the deceased had the following diseases/deceased taking medication for any of the following			
Disease	**Y**	**N**	**Unknown**
Hypertension	1	2	3
Heart diseases	1	2	3
Sickle Cell Disease	1	2	3
Stroke	1	2	3
Diabetes Mellitus	1	2	3
Tuberculosis	1	2	3
HIV/AIDS	1	2	3
Tumour (Type………………….)	1	2	3
Asthma	1	2	3
Others ………………	1	2	3

32	How will you describe the body build of the deceased?	Normal…………………………………………..1 Thin ……………………………………..…..2 Muscular……………………………………..3 Fat…………………………………..………4 Obese………………………………………..5
33	During the last year did the weight of the deceased change significantly?	About same…………………………………….1 Yes, gained significantly …………………………..2 Yes lost significantly……………………………...3 Unknown…………………………………………..4
34	Was the deceased taking any medication regularly during the last five years	Yes... …………………………………………..1 No...…2 Unknown... ……… …… …… …… ………3
5	If yes to **Q** 4 , write the name of the drugs	1………………………………………….. 2... ………………………………………….. 3……………………………………….. 4... …………………………………………..

RESPONDENT ID……
DATE:……...

NATIONWIDE SURVEY QUESTIONNAIRE ON KNOWLEDGE, ATTITUDE AND PRACTICE OF NIGERIANS ABOUT SUDDEN DEATH AND ITS PREVENTION

NON-COMMUNICABLE RESEARCH PROGRAMME NIGERIAN INSTITUTE OF MEDICAL RESEARCH (NIMR), LAGOS

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

RESPONDENT ID……
DATE:……...

You are welcomed to the questionnaire section of this survey on sudden death. Please feel free to ask and answer questions to the best of your ability. Let me start by knowing you as a respondent. Please the mark '√' will be used for your answer.

1. What is your gender?
   - o Male
   - o Female

2. What is your age?
   - o 15 – 24 years
   - o 25 – 34 years
   - o 35 – 44 years
   - o 45 years or older

3. What is the highest level of education you have completed?
   - o No education
   - o Primary education
   - o Secondary education
   - o More than secondary education

4. What is your current marital status?
   - o Unmarried
   - o Married
   - o Separated
   - o Divorced
   - o Widow/Widower

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

RESPONDENT ID……
DATE:……...

5. Which of the following best describes your current employment status?

- Housewife
- Clergy
- Business
- Trader/Artisan
- Farmer
- Salary earner
- Pensioner
- Student
- Unemployed

6. What is your tribe?

- Hausa
- Ibo
- Yoruba
- Others:/……(Please specify)

7. Which of the following best describes the area you live in?

- Rural
- Urban
- Periurban

8. If you are working, what is your monthly household income in Naira?

- <10,000
- 10,000 – 19,999
- 20,000 – 49,999
- 50,000 – 74,999

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

RESPONDENT ID……
DATE:……...

- 75,000 – 99,999
- 100,000 – 149,999
- 150,000 and above

9. Which of the following best describes the house you live in?
   - No roof, unplastered wall, uncemented floor
   - Roofed, plastered wall, uncemented floor
   - Roofed, plastered wall, cemented ffloor
   - Unroofed, plastered wall, cemented floor

Sudden death, a type of death that happens on a short notice of 24 h maximum, is also a health problem in developing and developed countries. Your answer of 'Yes' or ;No' to the questions below will be circled.

10. Have you heard of sudden death before?	oYes	oNo
11 If question No. 10 is 'Yes', is it from		
a. the news of someone who died suddenly?	oYes	oNo
b. close relative of yours who died suddenly?	oYes	oNo
c. a late member of your community who died suddenly?	oYes	oNo
d. a radio programme?	oYes	oNo
e. a television programme?	oYes	oNo
f. the newspaper or magazine?	oYes	oNo
g. books by reading?	oYes	oNo
h. a community member who told you?		
12. Would you like to get more information about sudden death?	oYes	oNo
13. Can diabetes cause sudden death?	oYes	oNo
14. Can hypertension cause sudden death	oYes	oNo

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

RESPONDENT ID……
DATE:……...

15. Can being too fat (obesity) cause sudden death?	oYes	oNo
16. Can having an underlying heart condition cause sudden death?	oYes	oNo
17. Can infants die suddenly?	oYes	oNo
18. Can children below 5 years die suddenly?	oYes	oNo
19. Can a person with stroke die suddenly?	oYes	oNo
20. Can having an infection cause sudden death?	oYes	oNo
21. Can heavy cigarette/tobacco smoking cause sudden death?	oYes	oNo
22. Can excessive alcohol consumption cause sudden death?	oYes	oNo
23. Do you sleep in the same bed with your newborn baby? (Mothers only)	oYes	oNo
24. Do you have access to a health facility?	oYes	oNo
25.Would you like to report a case of sudden death?	oYes	oNo
24. Would you like to check you blood sugar?	oYes	oNo
25. would you like to check you blood pressure?	oYes	oNo
26. would you like to take check your weight and height?	oYes	oNo

Your answers to the questions below will be graded and circled appropriately
0Never 1 once per year 2 twice per year 3 once per 2 years

27. In the past 2 years how often do you do a medical checkup?

0 Never

1 once per year

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

2 twice per year

3 once per 2 years

28. In the past 2 years how often do you do measure your blood sugar?

0 Never

1 once per year

2 twice per year

3 once per 2 years

29. In the past 2 years how often do you do measure your blood pressure?

0 Never

1 once per year

2 twice per year

3 once per 2 years

30. In the past 2 years how often do you do check your weight and height?

0 Never

1 once per year

2 twice per year

3 once per 2 years

31. Do you smoke tobacco or cigarette?

- Never
- Everyday

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

- Occasionally
- Stopped as smoking 6 months ago
- Stopped smoking a year ago.

32. As a regular smoker, what quantity of cigarette or tobacco do you smoke?

- 1 – 5 sticks per day
- 6 – 10 sticks per day
- 1 pack per day
- 2 or more packs per day

33. Do you drink alcoholic beverage?

- Never
- Everyday
- Occasionally
- Stopped recently
- Stopped drinking alcohol a year ago

34. As a regular drinker, what quantity of alcoholic drink do you take at a sitting?

- 1 – 2 bottles
- 3 – 4 bottles
- 5 – 6 bottles
- 7 and more bottles

For more enquires about this survey questionnaire, please call any of the following numbers 08083860366; 08033215053 and 08023357646. The lines are opened 24 hours in a day.

NIMR/DGO/LC/41 14th November 2017

Sir,

INVITATION TO ATTEND A DISSEMINATION SEMINAR ON CAUSES OF SUDDEN DEATH IN NIGERIA

The non-Communicable Disease Research Group, NIMR on behalf of the Nigerian Institute of Medical Research (NIMR) cordially invites you to a one-day symposium on Sudden Death in Nigeria, featuring media briefing, national survey data dissemination and expert opinion.

In recent times, increased incidence of sudden death among adult Nigerians has been reported severally, yet, no supporting national scientific data is available. Considering the socio-cultural beliefs and unfounded myths; unexplained attacks, jinxing by the enemy and associated cryptic mythologies as such, there is a need for scientific explanation to this occurrences.

The Nigerian Institute of Medical Research (NIMR), a Parastatal of the Federal Ministry of Health established with the mandate to conduct research into health problems in the country in has in collaboration with researchers in various geopolitical zones conducted a national survey on the causes of sudden death in the country.

You are hereby cordially invited to attend a dissemination seminar together with 10 selected market women from your location.

Date: 21st November, 2017

Time: 10:00am

Venue: NIMR Auditorium.

Your presence at this seminar is necessary since there is urgent need to inform and educate all and sundry on causes, risk factors and preventive strategies on sudden death in Nigeria.

Thank you for your anticipated co-operation.

Yours faithfully,

Dr Odunukwe, NN *(BM.CHB, FWACP, MNIM, MD)*

Director of Research/Head of Non-Communicable Diseases Research Group
Tel:+234-08033218053; E-mail:nkiruodunukwe@gmail.com

NIGERIAN INSTITUTE OF MEDICAL RESEARCH

NON-COMMUNICABLE DISEASES RESEARCH

SYMPOSIUM ON SUDDEN DEATH IN NIGERIA

"PUBLIC DISSEMINATION OF NATIONAL SURVEY FINDINGS"

Date: Tuesday 21st November, 2017.

Programme for the symposium

10.00 -10.20 am (1) Registration of Participants

10.20- 10.25 am (2) Introduction of Guests

10.25-10.30 am (3) National Anthem

10.30-10.35 am (4) Welcome Address- **Dr N.N. Odunukwe** (Head, NCD Research Group, NIMR)

10.35-10.40 am (6) Chairman's Address-**Prof. Andre Kengne**

10.40-10.45 am (7) Special Guest of honour-His Excellency**, Governor Akinwunmi Ambode**

10.45-10.50 am (8) Introduction of Speakers

(9) The Symposium: **Sudden Death in Nigeria "Public Dissemination of national survey findings"**

10.50-11.15 am (a) Challenges of Autopsy in Nigeria

11.15- 11.40 am (b) Multi-Center Evaluation of Sudden Death in Adult Nigerians

11.40- 12.05 pm (c) Knowledge, Perception and Practice of sudden Death

12.05-12.15 pm (10) Comments, remarks and questions

12.15-12.20 pm (11) Official Handing over of the Sudden Death Technical Report to the D-G, NIMR

12.20-12-30 pm (12) Director General's closing Remarks **- Prof. Babatunde Lawal Salako**

12.30 -1.00 pm (13) Refreshments

The programme should attract 3 point – CME (NIMR is accredited as CPD provider by MDCN)

WELCOME ADDRESS BY DR. NKIRUKA N. ODUNUKWE (HEAD-NIMR NCD RESEARCH GROUP) AT THE SYMPOSIUM ON SUDDEN DEATH IN NIGERIA "PUBLIC DISSEMINATION OF NATIONAL SURVEY FINDINGS"IN NIGERIAN INSTITUTE OF MEDICAL RESEARCH (NIMR) – 21st NOVEMBER 2017.

Protocol

It is my pleasure to welcome you all to this **SYMPOSIUM ON SUDDEN DEATH IN NIGERIA" PUBLIC DISSEMINATION OF NATIONAL SURVEY FINDINGS",** taking place here in Nigeria's foremost Medical Research Institute.

Sudden death has become a leading global health issue. The declining incidence of sudden death in developed countries has been attributed to availability of detailed research data for adequate intervention programs. In Nigeria and most developing countries, sudden death remains on the rise and has become a formidable health challenge in need of urgent interventions. We should not rely on western data to formulate intervention programs for health problems in Nigeria. On this stand, the Non-communicable diseases research group (NCDRG) in collaboration with 13 tertiary health institutions in the six geopolitical zones of the nation, embarked on this national sudden death survey.

This dissemination symposium is packaged to engage, educate and empower the youth and the general public on the outcome of our study which include the causes, risk factors, and possible prevention of sudden death in Nigeria.

This activity organized by NIMR- NCDRG today could be described as steps taken towards actualization of the vision, mission and mandate of the institution to reach out to the community with medical research findings. On this note, I formally welcome you all to this symposium.

Ekabo! Nnoo nu!! Bareka de zua.

Dr Odunukwe, Nkiruka Nonyelum, (MBchB, FWACP, MNIM, MD)
(NCD Research Group Leader)
Director Research /Consultant Haematologist

NIGERIAN INSTITUTE OF MEDICAL RESEARCH

OFFICE OF THE DIRECTOR - GENERAL

Prof. Babatunde L. Salako
MBBS (Ib), FWACP, FRCP (Edin), FRCP (Lond), MNIM
Director-General/CEO

6, Edmund Crescent,
(Off Murtala Mohammed Way)
P.M.B. 2013, Yaba, Lagos,
Lagos - Nigeria.
Tel: +234-9092133886,09092133881
E-mail: info@nimr.gov.ng
Website: www.nimr.gov.ng

Our Ref: NIMR/DGO/LC/41

Date: 7th Nov., 2017

The Chief Medical Director
Aminu Kano Teaching Hospital
Kano

ATTN: **Dr. Akinfenwa Taoheed Atanda**

Sir/Ma

INVITATION TO ATTEND A DISSEMINATION SEMINAR ON CAUSES OF SUDDEN DEATH IN NIGERIA

The Non-Communicable Disease Research Group, NIMR on behalf of the Nigerian Institute of Medical Research (NIMR) cordially invites you to a one-day symposium on Sudden death in Nigeria, featuring media briefing, national survey data dissemination and expert opinion.

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The Nigerian Institute of Medical Research (NIMR), a Parastatal of the Federal Ministry of Health established with the mandate to conduct research into health problems in the country has in collaboration with researchers in various geopolitical zones conducted a national survey on the causes and risk factors of sudden death in the country.

You are hereby cordially invited to attend a dissemination seminar on causes of sudden death in Nigeria.

Date: 21st November, 2017
Time: 10.00a.m.
Venue: NIMR Auditorium

The NIMR Non-Communicable Disease Research Group team that anchored this research was set up in year 2015 and the result obtained from the study is highly informative for awareness creation, knowledge sharing, policy and future research.

Your presence at this seminar is necessary since there is urgent need to inform and educate all and sundry on causes, risk factors and preventive methods of sudden death in Nigeria. The right time to do it is now.

Thank you for your anticipated cooperation.

Yours faithfully,

Prof. Babatunde Lawal Salako
Director-General/CEO.

NIGERIAN INSTITUTE OF MEDICAL RESEARCH

OFFICE OF THE DIRECTOR - GENERAL

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Our Ref: NIMR/DGO/LC/41

Date: 7th Nov., 2017

Chief Medical Director
ATBUTH
Bauchi

ATTN: Dr. Adogu Ibrahim

Sir/Ma

INVITATION TO ATTEND A DISSEMINATION SEMINAR ON CAUSES OF SUDDEN DEATH IN NIGERIA

The Non-Communicable Disease Research Group, NIMR on behalf of the Nigerian Institute of Medical Research (NIMR) cordially invites you to a one-day symposium on Sudden death in Nigeria, featuring media briefing, national survey data dissemination and expert opinion.

In recent times, increased incidence of sudden death among adult Nigerians has been reported severally; yet, no supporting national scientific data is available. Considering the socio-cultural beliefs and unfounded myths; unexplained attacks, jinxing by the enemy and associated cryptic mythologies as such, there is a need for a scientific explanation to this occurrences.

The Nigerian Institute of Medical Research (NIMR), a Parastatal of the Federal Ministry of Health established with the mandate to conduct research into health problems in the country has in collaboration with researchers in various geopolitical zones conducted a national survey on the causes and risk factors of sudden death in the country.

You are hereby cordially invited to attend a dissemination seminar on causes of sudden death in Nigeria.

Date: **21st November, 2017**
Time: **10.00a.m.**
Venue: **NIMR Auditorium**

The NIMR Non-Communicable Disease Research Group team that anchored this research was set up in year 2015 and the result obtained from the study is highly informative for awareness creation, knowledge sharing, policy and future research.

Your presence at this seminar is necessary since there is urgent need to inform and educate all and sundry on causes, risk factors and preventive methods of sudden death in Nigeria. The right time to do it is now.

Thank you for your anticipated cooperation.

Yours faithfully,

Prof. Babatunde Lawal Salako
Director-General/CEO.

DISSEMINATION PICTURES AND STAKE HOLDERS PICTURES

Participants of sudden death development tools

Participants of Sudden Death Dissemination Seminar

WHO ARE WE

The nation's foremost institute of medical research
Established in 1977
HQ is located in Yaba, Lagos, Nigeria.
Carry out research in Nigeria and for use both in Nigeria and beyond
Several collaborations with other institutions both locally and internationally
Has attracted some of the brightest and best brains in the country

VISION

To be an institution of excellence in basic, applied and operational research for the promotion of National Health and Development in Nigeria.

MISSION

To conduct research into diseases of public health importance in Nigeria and develop structures for the dissemination of research findings while providing the enabling environment and facilities for health research and training in cooperation with the federal and state ministries of health and in collaboration with universities, allied institutions and organized private sector nationally and internationally

NIMR CORE VALUES

Honesty, Integrity
Leadership
Excellence
Respect, Fairness, Dignity
Teamwork, Innovation
Relevance
Handwork
Fair Reward and Recognition
Accountability and Transparency
Communication: Internal and External
Equity

CONTACT

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