DETERMINANTS OF RETURN TO WORK AFTER STROKE IN BENIN CITY, EDO STATE

BY

IMEOKPARIA JOSHUA OSE-IKHUENMOSE

(BMS2005100)

A PROJECT SUBMITTED TO THE DEPARTMENT OF PHYSIOTHERAPY, SCHOOL OF BASIC MEDICAL SCIENCE, COLLEGE OF MEDICAL SCIENCE, UNIVERSITY OF BENIN, BENIN CITY.

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF PHYSIOTHERAPY(B.PT) DEGREE

OCTOBER, 2025.

CERTIFICATION

This dissertation by IMEOKPARIA JOSHUA OSE-IKHUENMOSE is accepted in its presented form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences of the University of Benin.

DR NELSON EKECHUKWU ……………………………………………….

SUPERVISOR **SIGNATURE AND DATE**

PROF. U.A.C OKAFOR ……………………………………………….

EXTERNAL EXAMINER **SIGNATURE AND DATE**

APPROVED

…………………………………..

DR. (MRS.) CHIGOZIE O. OBASEKI

HEAD
DEPARTMENT OF PHYSIOTHERAPY

COLLEGE OF MEDICAL SCIENCES

UNIVERSITY OF BENIN, BENIN CITY

DEDICATION

I dedicate this dissertation to God Almighty for his love, grace, wisdom, knowledge and strength he bestowed upon me throughout this project work and this journey in University of Benin and to my wonderful parents Mr. and Mrs. IMEOKPARIA whose unwavering support and encouragement made this work possible.

ABSTRACT

Background: Stroke continues to be one of the world's leading causes of long-term disability and a major factor in the exclusion of working-age adults from the workforce. Although there is little data from Southern Nigeria, returning to work (RTW) following a stroke is a key sign of effective rehabilitation and reintegration.

Aim: This study aimed to determine the socio-demographic, clinical, and psychosocial determinants of return to work among stroke survivors in Benin City, Edo State, Nigeria.

Methods: 67 stroke survivors who were 18 years of age or older and undergoing physical therapy at the University of Benin Teaching Hospital and Edo Specialist Hospital participated in a cross-sectional study. The Mini-Mental State Examination (MMSE) for cognitive function, the National Institutes of Health Stroke Scale (NIHSS) for stroke severity, the Modified Rankin Scale (mRS) for disability, the Functional Independence Measure (FIM) for functional ability, the Rosenberg Self-Esteem Scale (RSES), the Social Support Questionnaire (SSQ), and the General Self-Efficacy Scale (GSE) were among the standardised tools used. Descriptive statistics were used to summarise the data, and Chi-square tests were employed for inferential statistics to ascertain the relationship between RTW and variables with $p < 0.05$.

Results: The majority of participants 50 (75%) returned to work following stroke. Significant associations were observed between RTW and age ($\chi^2 = 9.216$, $p = 0.027$), cognitive function ($\chi^2 = 8.544$, $p = 0.014$), disability level ($\chi^2 = 12.463$, $p = 0.002$), self-efficacy ($\chi^2 = 10.138$, $p = 0.019$), and social support ($\chi^2 = 9.804$, $p = 0.012$). While gender, marital status, stroke type, stroke laterality, stroke severity, and self-esteem were not significantly related. Younger survivors with better cognitive and functional abilities and higher self-efficacy and social support were more likely to return to work.

Conclusion: Functional independence, cognitive capacity, and psychosocial factors such as self-efficacy and social support are critical to post-stroke work reintegration. Rehabilitation programs should integrate vocational training, psychological empowerment, and family support to improve RTW outcomes.

Keywords: Stroke, Return to work, Cognitive function, Self-efficacy, Disability, Social support, Nigeria.

ACKNOWLEDGEMENTS

I am grateful to God for the successful completion of this work and for His protection and guidance throughout my stay on this campus.

Special thanks to my supervisor Dr. Nelson Ekechukwu for his assistance and guidance during the course of the research study. Despite the busy schedule, he devoted his time to listen to me, answer my questions, read through my work and also make corrections. May the good Lord reward you in hundred folds.

I also appreciate the Head of the Department, Dr (Mrs) C. Obaseki, pioneer Head of the Department, Prof Kayode Oke and all the lecturers of the Department of Physiotherapy, University of Benin, Dr. Nicholas Oghumu, Prof Joseph Umunnah, Prof Obinna Ezeukwu, Dr. Nelson Ezekwu, Dr. Adebisi Hammed and Rev Sister Fawole who isn't here with us but I learnt greatly from her and all those who imparted knowledge on me during my stay in school. I wish to express my sincere gratitude to the Head of the Department of Physiotherapy, University of Benin Teaching Hospital, Mr. Taiwo Oyewumi, for his exceptional leadership and guidance. My heartfelt appreciation also goes to the directors, Mr. E. Okhuahesuyi, Mrs. C. Obaseki, and Mrs. S. Kubenje, as well as to the chief physiotherapists for their invaluable mentorship and for imparting knowledge that has greatly shaped my academic and professional growth. I am equally grateful to the interns and clinicians in the Department of Physiotherapy, University of Benin Teaching Hospital, for their support and for sharing their knowledge and practical skills during my studentship.

Special appreciation goes to the non-academic staff of the Department, particularly Mr. Nosa and Mrs. Juliet, for their constant assistance and contributions toward making my learning experience smooth and fulfilling. Special thanks goes to my parents, my friends, all my siblings and for their words of advice, encouragement, prayers and financial support throughout my stay as a student of University of Benin.

I will also like to appreciate some of my colleagues Toyin, Ebere, Rachael, Daniel,Aizenosa for their assistance during the period of my data collection.

I would also like to thank my friends Mahar, Shalom, Emmanuel, Hamilda, Tennyson, Nelly, Success, Nosayaba, Favor, Bazuaye, Promise, and Seyi for their positive contributions, support, love, encouragement, prayers and making my stay in school memorable and worthwhile.

My special thanks and gratitude to all the patient that volunteered to participate in my study. I appreciate my fellow project supervisees Rose, Mmasi, Josh, Martina, Samuel, Shalom, Clinton, Hope, David and all my classmates and others which the confines of this page will not permit me to state.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Globally, stroke has been identified as the most common neurological disorder and the leading cause of morbidity, mortality and disability. According to the World Health Organization, stroke is defined as a rapidly developing focal or global sign of neurological disturbance attributed to vascular origin last for more than 24 hours or leading to death (Feigin *et al.*, 2025). Recent literature estimates that there are approximately 9.53 million stroke survivors in the European Union, with projections indicating a significant increase to around 12.11 million by 2047 (Wafa *et al.*, 2020). In Africa, the incidence of stroke is reported at 316 per 100,000 individuals, while in Nigeria, it stands at 26 per 100,000 annually (Akinyemi *et al.*, 2021). Another study in Nigeria identified notable regional disparities in prevalence of stroke, with the highest prevalence of stroke survivors observed in the South-South region at 13.4 per 100,000 population, and among rural dwellers at 10.8 per 100,000 (Adeloye *et al.*, 2019). These variations may be linked to the high prevalence of stroke risk factors such as diabetes (Uloko *et al.*, 2018) among other contributing factors.

According to the Global Burden of Disease (GBD) 2021 study, the global disability-adjusted life years (DALYs) attributed to stroke rose from 144.0 million in 2010 to 160.4 million in 2021 (Ferreira *et al.*, 2024). This rise was largely driven by population growth and increased life expectancy. Additionally, the long-term consequences of stroke, along with the escalating costs of rehabilitation, are expected to result in substantial macroeconomic losses worldwide.

Although age-adjusted rates of stroke are projected to decline, the absolute global burden of stroke is anticipated to continue increasing between 2022 and 2050 (Feigin *et al.*, 2022). The high occurrence and prevalence of stroke is associated with various complication such as loss of balance, coordination, muscle weakness which can have an interactive effect on performance of activities of daily living, impaired function limitation, leisure restriction and restriction on family and work activities.

Return to work (RTW) refers to the process through which an individual resumes employment after a period of absence due to illness, injury, or disability (Peters *et al.*, 2013). Return to work (RTW) after stroke has been identified as one of the important outcomes of rehabilitation that is strongly desired by stroke survivors who are still active in their working age (Vestling *et al.*, 2003) and is influenced by medical, psychological, social, and workplace factors (Peters *et al.*, 2013; Han *et al.*, 2019; La Torre *et al.*, 2022; Orange *et al.*, 2024). According to Young *et al.* (2005) RTW is a process that begins with the early stages of functional recovery and culminates in the individual reaching their full vocational potential. RTW after stroke is a crucial goal, as it promotes higher self-esteem and life satisfaction (La Torre *et al.*, 2022). It also offers psychosocial benefits, supports independent living, and fosters a sense of social identity and inclusion (La Torre *et al.*, 2022).

Currently, around 40% of stroke survivors return to work, although reported rates vary widely, ranging from 11% to 85% (Han *et al.*, 2019), while another study reported that 50% of individuals who suffer stroke return back to work (Nascimento *et al.*, 2021). A previous study in Nigeria showed that 55% of individuals who suffered stroke returned to work (Peters *et al.*, 2013). Various factors have been identified that affect RTW after stroke (Han *et al.*, 2019;

Orange *et al.*, 2024). For instance, a systematic review of 39 studies identified several key prognostic factors influencing return to work after a stroke (Orange *et al.*, 2024). Hemorrhagic stroke and being aphasia were associated with a lower likelihood of returning to work compared to ischemic stroke, while male sex and white-collar occupations were linked to a higher probability of resuming employment (Orange *et al.*, 2024). Additionally, greater independence in daily living activities and lower stroke severity were strong predictors of successful return to work, emphasizing the importance of functional recovery and stroke impact on occupational outcomes (Orange *et al.*, 2024). Personal factors such as age, sex and living arrangement have also been identified as prognostic factors for RTW after stroke among a stroke population (Han *et al.*, 2019).

Working-age individuals who experience a stroke present a significant challenge for the workforce, as they often face a high risk of recurrent stroke, psychological stress, job downgrading, and changes in employment status even after a successful return to work (Han *et al.*, 2019). In Nigeria, Peters *et al.* (2013) showed that absence of disability and mild disability were the only significant predictors of RTW among a sample of stroke survivors in Nigeria. This reinforce previous literature that shows that the high the level of disability, the more difficult it is to return back to work (Nascimento *et al.*, 2021). Most stroke survivors return to work within 3 to 6 months following the stroke, while only a small proportion resume work more than a year after the event (Hartke *et al.*, 2011). However, previous studies on this topic have lacked standardization and offer limited consistent guidance to effectively support individuals who are willing to return to work after a stroke**.**

1.2 Statement of the Problem

Stroke remains a leading cause of morbidity, mortality, and long-term disability globally, with its burden rising significantly in recent years. Notably, regional disparities exist within Nigeria, with the South-South region recording the highest prevalence of stroke survivors at 13.4 per 100,000 population (Adeloye *et al.*, 2019), underscoring the urgent need for focused research and interventions in this region. For working-age stroke survivors, returning to work (RTW) is not only an important indicator of functional recovery but also a key factor in restoring self-esteem, psychosocial well-being, and economic independence. However, RTW after stroke remains a complex and often challenging process influenced by numerous factors including the type and severity of stroke, presence of disability, occupational role, and social support systems. While approximately 40%-55% of stroke survivors globally manage to return to work (Hans *et al.*, 209; Peters *et al.*, 2013), there is wide variability in outcomes, and many faces long-term barriers such as psychological stress, recurrent stroke risk, job downgrading, and changes in employment status. Despite its significance, existing studies on RTW after stroke are limited by a lack of standardization and consistency, particularly in low- and middle-income settings like Nigeria. Moreover, to the best of the researcher's knowledge evidence specific to the South-South region where stroke prevalence is highest is lacking. Hence, the need to conduct research to determine the factors that influence returning to working among stroke survivors.

1.3 Research Questions

i. What is the relationship between socio-demographics (age, gender, marital status, type of stroke) and returning to work after stroke?

ii. What is the relationship between clinical variables (stroke severity, stroke laterality, cognitive function, disability, functional ability) and returning to work after stroke?

iii. What is the relationship between psychosocial (self-esteem, social support and self-efficacy) and returning to work after stroke?

1.4 Aim of Study

To determine the socio-demographics, clinical and psychosocial variables of return to work after stroke in Benin city Edo state.

1.5 Specific Objectives

i. To identify the socio-demographic factors (e.g., age, gender, marital status, type of stroke) influencing returning to work after stroke.

ii. To examine the impact of clinical variables (e.g., stroke severity, stroke laterality, cognitive function, disability, functional ability) impacting return to work after stroke.

iii. To evaluate the role of psychosocial variables (e.g., self- esteem, social support, self-efficacy) in facilitating returning to work after stroke

iv. To determine the relationship between socio-demographics (age, gender, marital status, type of stroke) and returning to work after stroke.

v. To determine the relationship between clinical variables (stroke severity, stroke laterality, cognitive function, disability, functional ability) and returning to work after stroke.

vi. To determine the relationship between psychosocial (self-esteem, social support and self-efficacy) and returning to work after stroke?

1.6 Hypotheses

1.6.1 Main hypotheses

i. There will be no significant relationship between socio-demographic factors, clinical variables, psychosocial factors and returning to work after stroke.

1.6.2 Sub Hypotheses

i. There will be no significant relationship between age and return to work among stroke survivors.
ii. There will be no significant relationship between gender and return to work among stroke survivors.
iii. There will be no significant relationship between marital status and return to work among stroke survivors.
iv. There will be no significant relationship between type of stroke (ischemic or hemorrhagic) and return to work among stroke survivors.
v. There will be no significant relationship between stroke laterality (left- or right-sided stroke) and return to work among stroke survivors.
vi. There will be no significant relationship between stroke severity and return to work among stroke survivors.
vii. There will be no significant relationship between cognitive function and return to work among stroke survivors.
viii. There will be no significant relationship between disability level and return to work among stroke survivors.

ix. There will be no significant relationship between functional ability and return to work among stroke survivors.

x. There will be no significant relationship between self-esteem and return to work among stroke survivors.

xi. There will be no significant relationship between social support and return to work among stroke survivors.

xii. There will be no significant relationship between self-efficacy and return to work among stroke survivors.

1.7 Significance of the Study

i. **To Stroke Survivors:** The findings of study could direct the creation of individualised rehabilitation programs by identifying important variables that affect stroke survivors' capacity to resume employment.

ii. **To Policy Makers and Health Practitioners:** The findings may provide evidence-based insights for healthcare professionals and policymakers to design effective return-to-work policies, rehabilitation services, and community support systems tailored to the needs of stroke survivors. This can help reduce economic dependency and improve reintegration into the workforce.

iii. **To the Body of Literature:** This study may contribute to the limited body of research on return-to-work outcomes among stroke survivors in low- and middle-income countries, especially within the Nigerian context. It may fill a critical knowledge gap by exploring how socio-demographic, clinical, and psychosocial variables uniquely influence recovery and employment reintegration in Benin city, Edo state.

1.8 Scope and Delimitation

The study is delimited to:

A. Patients

i. Male and female stroke survivors receiving outpatient care in University of Benin Teaching Hospital, Benin City, Edo State.

ii. Stroke survivors of 18 years and above.

B. Instruments

i. Mini mental state examination to assess cognitive function.

ii. National Institutes of Health Stroke Scale for stroke severity

iii. Functional Independence Measure (FIM) to assess functional independence.

iv. Modified Rankin Scale (mRS) for disability level after stroke.

v. Rosenberg Self-Esteem Scale to assess self-esteem.

vi. Social Support Questionnaire (SSQ) to assess social support.

vii. General Self-Efficacy Scale to assess self-efficacy.

1.9 Definition of Terms

i. Stroke: According to the World Health Organisation, it is a clinical syndrome characterised by rapidly developing clinical signs of a focal or global disturbance of cerebral function that lasts longer than 24 hours or results in death and has no apparent cause other than a vascular origin.

ii. Return to work (RTW): refers to the process through which an individual resumes employment after a period of absence due to illness, injury, or disability (Peters *et al.*, 2013).

iii. Determinants: factors or variables that influence an outcome; in this study, socio-demographic, clinical, and psychosocial factors affecting return to work after stroke.

iv. Stroke Survivor: an individual who has experienced a stroke and has lived beyond the acute phase of the condition.

1.10 List of Abbreviations

i. **DALYs**- Disability-Adjusted Life Years

ii. **FIM**- Functional Independence Measure

iii. **GBD**- Global Burden of Disease

iv. **mRS**- Modified Rankin Scale

v. **MMSE**- Mini-Mental State Examination

vi. **NIHSS**- National Institutes of Health Stroke Scale

vii. **RTW**- Return to Work

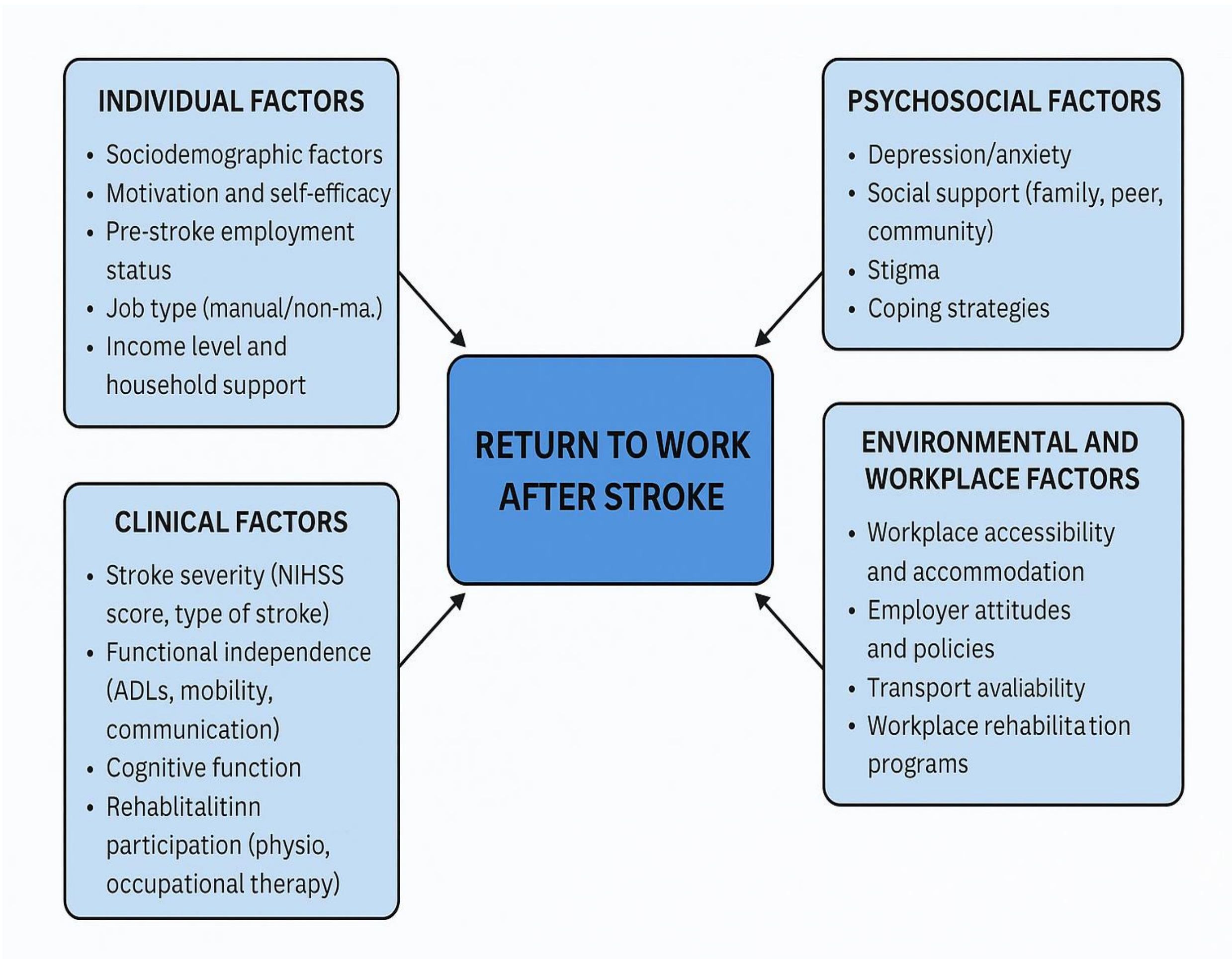
viii. **SSQ**- Social Support Questionnaire

ix. **WHO**- World Health Organization

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual framework



This framework is based on a biopsychosocial approach, acknowledging that returning to work (RTW) is not just a medical result but is also shaped by a combination of personal, clinical, social, and environmental influences (Watson, 20155). At the heart of the framework is the RTW outcome, which is affected by four main categories: Demographic Factors, Clinical Factors, Psychosocial Factors, and Workplace/Environmental Factors (Watson, 2015; Brannigan et al., 2017).

Demographic factors consist of characteristics such as age, gender, educational attainment, and socioeconomic background. These traits influence the chances of returning to work by affecting resilience, adaptability, job types, and the availability of healthcare and rehabilitation services. For instance, younger individuals might show better recovery and adaptability to new job roles.

Clinical factors include the severity of the stroke, its type, the extent of disability (such as hemiparesis or cognitive issues), existing comorbid conditions, and the time elapsed since the stroke occurred. These elements have a direct effect on physical and cognitive abilities, impacting work capacity. The accessibility of post-stroke rehabilitation and compliance with therapy are also relevant, underscoring the significance of medical support systems.

Psychosocial factors address the individual's mental health status, levels of motivation, self-efficacy, availability of social support, and coping strategies. Conditions like depression and anxiety, or a lack of confidence, can severely obstruct the reintegration process into the workforce. Conversely, robust support from family or the community can aid recovery and promote a return to fulfilling roles.

Workplace/Environmental factors pertain to the job's nature (such as manual labor versus desk jobs), the availability of workplace accommodations, support from employers, transportation options, and policies that favor individuals with disabilities. Roles that require considerable physical effort may pose difficulties for stroke survivors, while conducive work environments and understanding employers can facilitate the transition back to employment.

2.2 Stroke Overview

2.2.1 Definition of Stroke

Another name for Stoke is a cerebrovascular accident. The World Health Organisation defines stroke as rapidly developing clinical signs of focal (global) disturbance of cerebral function, with symptoms lasting at least 24 hours or resulting in death, and with no apparent cause other than vascular origin. When symptoms persist for less than twenty-four hours, it is referred to as a mini stroke or transient ischaemic attack (TIA). According to Murphy and Werring (2020), a transient episode of focal neurological impairment that lasts less than 24 hours and is not linked to a permanent cerebral infarction is known as a transient ischaemic attack. A rupture or blockage of the blood vessels supplying the brain causes a stroke, which is usually accompanied by cerebral artery stenosis, displacement embolism, thrombus formation, and bleeding in the brain parenchyma (Campbell et al., 2019). However, the American Heart Association/American Stroke Association decided that this classification was no longer suitable in the interim. These definitions are no longer applicable in clinical practice for the reasons listed below:

2.2.2 Epidemiology of Stroke

Stroke remains the second most common cause of death overall and the third most common cause of death plus disability, according to the latest estimates of the Global Burden of Disease (GBD) 2019 stroke burden. It causes 44 million disability-adjusted life years lost and about 5.5 million deaths worldwide each year. According to projections, over 23 million people will have experienced their first stroke by 2030 in the absence of effective treatments, resulting in an estimated 7.8 million deaths (Mukherjee & Patil, 2011). In 2019, there were 12·2 million (95% UI 11·0–13·6) stroke incident cases, 101 million (93·2–111) prevalent cases, 143 million (133–153) stroke-related DALYs, and 6·55 million (6·00–7·02) stroke-related deaths (Feigin et al., 2021). Stroke is the second most common cause of death and disability worldwide, and its effects are most severe in low- and middle-income nations. Low- and middle-income nations account for 70% of strokes worldwide, as well as 87% of stroke-related deaths and disability-adjusted life years. In low- and middle-income nations, the incidence of stroke has more than doubled over the last forty years. In high-income nations, the incidence of stroke has decreased by 42% over the past few decades (Feigin et al., 2014). Stroke is more common in older people (those over 65). More than four out of five deaths from cardiovascular illnesses are caused by stroke, and over one-third of deaths from these conditions occur in individuals under the age of 70 (WHO, 2019).

Africa has the highest rate of hypertension, the strongest and most common modifiable risk factor for stroke, according to research on the epidemiology of stroke in the continent (Owolabi et al., 2018). Stroke is the second most common cause of death in Africa and has the highest death rate among cardiovascular diseases. According to a study by Adeloye et al. (2019), the pooled crude incidence of stroke in Nigeria was 26.0/100,000 person-years; this was higher for men (34.1/100,000) than for women (21.2/100,000). In Nigeria, the pooled crude prevalence of stroke survivors was 6.7/1000, with men having a higher prevalence (6.4/1000) than women (4.4/1000). Furthermore, the South-South region had the highest prevalence of stroke survivors (13.4/100,000) and rural residents (10.8/100,000), according to regional differences noted by Adeloye et al. (2019).

2.2.3 Etiology/Risk Factors

Like many other brain disorders, stroke is a complicated disease with multiple underlying causes rather than one. Both modifiable and non-modifiable risk factors are included in this category. According to Velez *et al.* (2020), dysfunctions in the cerebral blood circulation that are either ischemic or hemorrhagic may be the pathophysiological basis for stroke. With varying etiologies and prognoses, stroke is a symptom of an extensive array of illnesses.

2.2.3.1 Modifiable risk factors

i. **Hypertension:** The most common stroke risk factor is hypertension. it plays a crucial role in both hemorrhagic and ischemic stroke (Wajngarten & Silva, 2019). Hypertension is defined by the American Heart Association as systolic blood pressure readings higher than 140 mm Hg or diastolic blood pressure readings higher than 90 mm Hg. Excessive pressure on cerebral vessels caused by persistently elevated blood pressure frequently results in lacunar infarctions or intracerebral bleeding (Pandian *et al.*, 2018). The risk of stroke is greatly decreased by effective hypertension control (O'Donnell *et al.*, 2016). Hypertension is a well-documented risk factor for both ischemic and hemorrhagic stroke(Andersen *et al.*, 2009).

ii. **Diabetes**: Stroke disease is common in people with diabetes. A persistently elevated glucose level is a clinical disease known as diabetes. It can go undetected in people who don't have any symptoms, but it still increases the chance of having a stroke (Hewitt *et al.*, 2012). Uncontrolled diabetes puts subjects at risk for both ischemic and hemorrhagic strokes. In both ischemic and hemorrhagic strokes, hyperglycemia during the initial period is linked to unfavorable outcomes (Chen *et al.*, 2016).

iii. **Obesity:** Body mass index (BMI), which is weight in kilograms divided by height in meters squared, is used to identify obesity. A BMI of 30 kg/m^2 or more is used to classify individuals as obese (Weir & Jan, 2024).

iv. **Sedentary lifestyle:** Its prevalence has dramatically increased in recent decades, making it a major global public health concern. There is a clear link between obesity and heart conditions like stroke. A sedentary lifestyle has been linked to an increase in obesity and has been linked to the risk of strokes (Bhat *et al.*, 2008).

v. **Smoking:** Reliability to smoking remains a significant risk factor for cardiovascular disease (CVD) and the primary preventable cause of death globally (Kondo *et al.*, 2019). In patients who are already at risk, smoking has been linked to an increased risk of ischemic stroke (Sakinah & Nugroho, 2022). Smoking could cause cerebral infarct leading to stroke by activating platelet aggregation, atherosclerosis and eventually occlusion of vessels (Watila *et al.,* 2012).

vi. **Alcohol intake:** The association between alcohol consumption and stroke is not apparent; distinct forms of stroke are linked to moderate and heavy drinking. A mendelian randomized study performed by Larsson *et al.* (2020), showed that genetically predicted alcohol consumption was consistently associated with stroke and peripheral artery disease across the different analyses. Haemorrhagic stroke has been directly linked to alcohol use. Excessive alcohol use may increase the risk of stroke by raising blood pressure (Ohira, 2009). Cutting back on alcohol is one of the most important ways to reduce the risk of having a stroke for the first time. Reducing alcohol intake has a substantial impact on lowering the chance of stroke.

vii. **Hyperlipidemia:** A well-known risk factor for stroke is hyperlipidemia, which is defined by high blood levels of triglycerides and cholesterol. A systematic review performed by Sakinah & Nugroho (2022) showed that most studies confirmed that hyperlipidemia is a risk factor for stroke and correlated in patients with CVD.

viii. **Physical Inactivity and Sedentary Lifestyle:** Higher levels of physical activity are associated with lower stroke risk (Kuriakose & Xiao, 2020).Several studies indicate that a sedentary lifestyle may increase the risk of stroke. According to McDonnell *et al.* (2013), there is a correlation between physical inactivity and a higher risk of stroke incidents. Any impact of physical activity can reduce the conventional risk factors for stroke.

2.2.3.2 Non-Modifiable Risk Factors

i. **Race/Ethnicity:** According to statistics, African Americans are far more likely than Caucasians to die from a stroke (Peters *et al.*, 2013).

ii. **Gender:** Differences in gender affect the risk of stroke. Men often have a higher risk when they are younger, and women's risk rises after menopause. This variation is caused by variations in risk factors and hormonal fluctuations (Glymour *et al.*, 2009). Gender differences in stroke risk and outcomes have been associated with multiple factors, including differences in hormone levels, genetic predispositions, and lifestyle choices such as physical inactivity and smoking (Petrea *et al.*, 2009). In particular, males are more likely than women to smoke and engage in other risky behaviors that increase their risk of stroke (Petrea *et al.*, 2009). On the other hand, certain diseases associated with pregnancy may pose a particular risk of stroke for women (Abdu & Seyoum, 2022).

iii. **Age**: About 80% of people who die from cardiovascular disorders are 65 years of age or older, according to calculations made by the American Heart Association. The risk of stroke increases with age, especially after the age of 65 (Bhat *et al.*, 2008). Stroke also strikes younger people; according to Bhat *et al.* (2008), 28% of stroke victims are under 65 years old.

iv. **Hereditary:** People who have a family history of stroke are more vulnerable. This increased risk is a result of shared lifestyle variables and genetic predispositions (Meschia *et al.*, 2014). Findings that are consistent point to family history as a major stroke risk factor. According to research, there can be a 50% increase in risk if there is a family history of stroke (Meschia *et al.*, 2014). It appears that this elevated risk is unaffected by other variables like smoking or high blood pressure. Furthermore, having a first-degree family with a history of stroke—a parent or sibling, for example—raises the risk of having a stroke significantly (Meschia *et al.*, 2014).

2.2.4 Relevant Anatomy

2.2.4.1 The Brain

The brain controls nearly all of the body's physiological and mental processes. It's complex mechanism propel humans above all other animals by controlling and integrating a myriad of physiological functions. The brain, which is shielded by the strong skull, is a sensitive organ that can be harmed by deep cuts, compression from tumors, or lack of oxygen because of a cerebral artery rupture or blockage (Moore *et al.*, 2017). This complex organ is vital to the development of human potential and experiences since it not only controls physiological processes but also permits the development of higher cognitive capacities.

2.2.4.2 Parts of the Brain

The brain is divided into three basic parts, which include the cerebrum, cerebellum and brainstem.

A. **Cerebellum:** The cerebellum also known as the little brain, is essential for balance and movement coordination. It maintains smooth and accurate movements by controlling the pace, rhythm, force, and accuracy of movements. Additionally, by adjusting motor output in response to sensory data, the cerebellum regulates posture, equilibrium, and muscle tone (Singh, 2021). The cerebellum has historically been linked to movement tasks, but new research indicates that it may also be involved in cognitive processing and other non-motor processes. Because of the way its neurons are organized, it can perform a wide range of tasks. For example, distinct brain modules are responsible for balance, movement, and cognitive behavior. In general, the cerebellum serves as a predictor, improving overall behavioral performance by fine-tuning motions based on results.
B. **Cerebrum:** The cerebrum, situated at the front of the brain, encompasses gray matter in the form of the cerebral cortex and white matter at its core. As the largest part of the brain, the cerebrum takes charge of initiating and coordinating movements, regulating temperature, and overseeing various cognitive functions (Maldonado & Alsayouri, 2023). These functions include speech, judgment, thinking, reasoning, problem-solving, emotions, learning, as well as sensory processes like vision, hearing, and touch. The cerebrum, which comprises most of the brain, is divided into the left and right cerebral hemispheres. The great longitudinal fissure, a prominent groove that splits the brain into these hemispheres, is sometimes referred to as the brain in its whole (Moore *et al*., 2017). These hemispheres are joined at the base by the corpus callosum, which facilitates

communication and message transfer between the two regions of the brain. Billion neurons and glial cells that are found on the surface of the cerebrum make up the cerebral cortex.

C. **Brainstem:** The brainstem is complex. It contains numerous cranial nerve nuclei and is traversed by multiple tracts between the brain and spinal cord (Sciacca *et al*., 2019). The medulla, pons, and midbrain make up the brainstem; the midbrain extends through the tentorial notch to the diencephalon (thalamus). Despite being formed from the rhombic lip, the cerebellum is regarded as a suprasegmental structure in the posterior fossa rather than a part of the brainstem. The cranial nerve nuclei are located in the tegmental region of the brainstem, while the corticospinal tract and other fiber tracts are located in the basilar region. The cerebral aqueduct, fourth ventricle, and lateral recesses make up the brain's ventricular spaces. The caudal portion of the fourth ventricle, or the medullary region, narrows and is connected with the cervical spinal cord's central canal (Haines & Mihailoff, 2018).

- **Midbrain:** The midbrain is a sophisticated structure with a variety of neuron clusters, neuronal connections, and features that support a range of functions, including hearing, movement, reactions, and environmental adaptability. The substantia nigra, an area affected by Parkinson's disease, is also housed there.
- **Pons:** The pons, which serves as the origin of four cranial nerves and links the midbrain to the medulla, facilitates a variety of functions, including chewing, blinking, and the production of tears.
- **Medulla**: The medulla, which is found at the base of the brainstem, is essential for survival because it controls breathing, blood flow, heart rhythm, and reflexive behaviours

like swallowing and sneezing. Messages are sent to and from the brain via the spinal cord, which emerges from the bottom of the medulla.

2.2.5 Arterial blood supply to the brain

The human brain is an essential organ that depends on an intricate system of arteries to provide it with a steady and sufficient blood flow, which is necessary for optimal brain function. The cerebral arterial circle, also referred to as the Circle of Willis, is formed by the union of the internal carotid arteries and the vertebral arteries, two major paired arteries that supply the brain with arterial blood. The energy requirements of the brain are strictly regulated and essential for preserving cognitive function. Since brain cells cannot store glucose or undertake glycolysis, they depend on the circulation for a constant supply of glucose to support ongoing cellular activity and proper functioning. The metabolic functions of the brain require 3.5 milliliters of oxygen per 100 grams of brain tissue every minute. Interestingly, compared to white matter, grey matter uses twice as much oxygen (Rink & Khanna, 2011).

2.2.5.1 Vertebral arteries

The vertebral arteries originate from the subclavian arteries and ascend through the transverse foramina of the cervical vertebrae before entering the cranial cavity through the foramen magnum. These arteries converge to form the basilar artery, which supplies blood to the brainstem and posterior areas of the brain. The posterior cerebral arteries (PCAs), which supply blood to the occipital lobes and parts of the temporal and inferior parietal lobes, are significant branches of the basilar artery.

2.2.5.2 The Internal Carotid Arteries

Anomalous internal carotid arteries (ICAs) present a concern during head and neck surgery. The ICA is an important vascular structure in this area. Many people, particularly the elderly, suffer from pathologies associated with the course of ICA in the parapharyngeal space. Furthermore, anomalies in ICA can resemble other disorders such as pituitary adenomas, highlighting the significance of prompt diagnosis and adequate treatment to avoid disastrous outcomes. Rare but severe, iatrogenic damage to the ICA during surgical operations necessitate specific treatment protocols for best results. Furthermore, the various anatomical presentations of the ICA are highlighted by uncommon variants such as congenital external carotid-internal carotid artery anastomosis. For the sake of patient safety and clinical practice, it is essential to comprehend the variability and possible consequences related to the ICA.

2.2.5.3 Circle of Willis

A comprehensive anatomical description of the arterial connections at the base of the brain, enveloped by cerebrospinal fluid, was developed by Thomas Willis which he named the Circle of Willis (CW) (Vrselja *et al.*, 2014). It has various anatomical features comprising of the optic chiasma, tuber cinereum, mammillary bodies, and the posterior perforated substance (Bhuiyan *et al.*, 2014). The blood flow to the brain separates into two pathways known as the anterior and posterior circulations. While the anterior circulation is supplied by the paired internal carotid arteries (ICA) and serves most of the cerebral hemispheres, including the frontal lobes, parietal lobes, lateral temporal lobes, and the anterior portion of the deep cerebral hemispheres, the posterior circulation receives blood from the bilateral vertebral arteries (VA) and supplies the brainstem, cerebellum, occipital lobes, medial temporal lobes, and the posterior part of the deep hemisphere, especially the thalamus. This enhances a connection between the anterior and posterior circulations, the Circle of Willis is an anatomical structure that establishes collateral blood flow to affected brain regions in instances of arterial insufficiency (Rosner *et al.,* 2023). Willis' work on the Circle of Willis highlighted its functional significance as a compensatory mechanism in instances of occlusion or narrowing of the internal carotid artery or vertebral artery (Rosner *et al.*, 2023; Vrselja *et al.*, 2014). This vascular arrangement serves an important role in maintaining cerebral blood flow and minimizing potential damage or ischemia caused by restricted blood supply to the brain

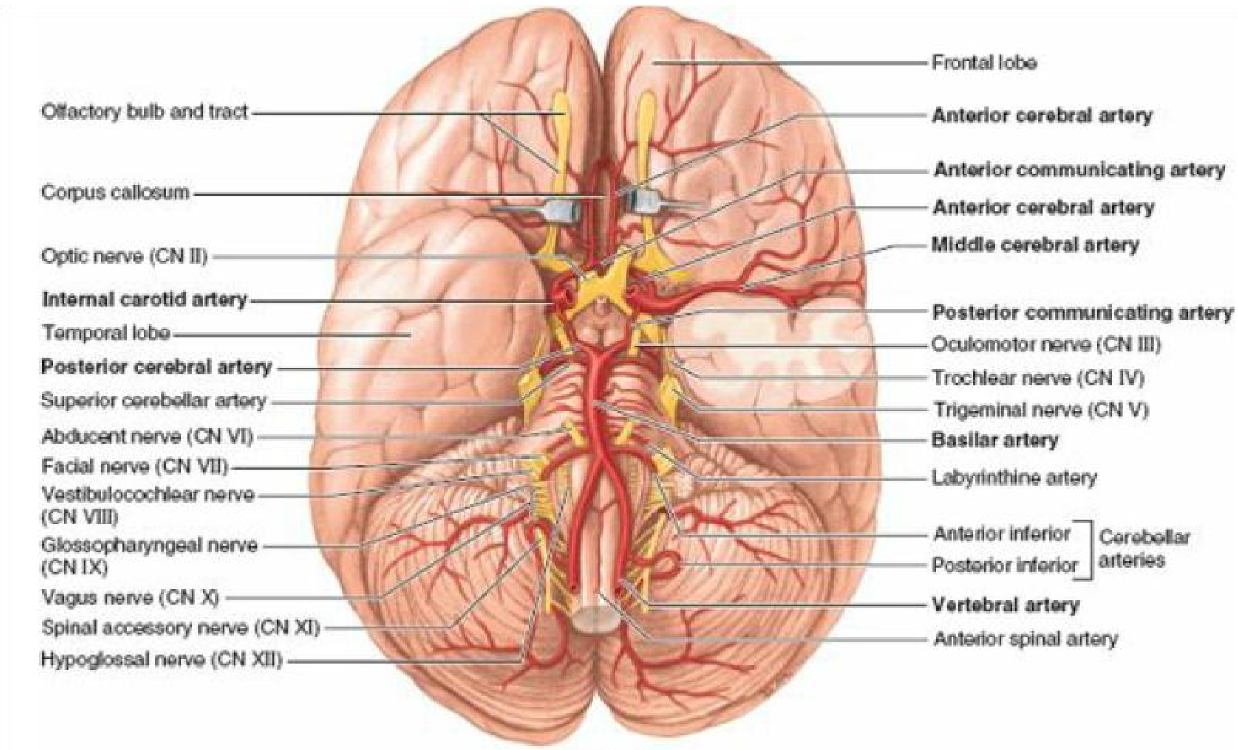


Figure 1: The circle of Willis

Image source Moore et al., 1992: The circle of Willis (circulus arteriosus)

2.2.6 Types of Stroke

Schemic and primary hemorrhagic strokes are two subgroups of strokes that can be further subdivided, 15% of strokes are hemorrhagic strokes (Parmar, 2018). According to the American Heart Association's 2020 report on Heart Disease and Stroke Statistics, ischaemic infarctions account for 87% of strokes. This prevalence rose significantly between 1990 and 2016 and was linked to better clinical interventions and lower mortality. Primary (first-time) hemorrhages comprise the majority of strokes, with secondary (second-time) hemorrhages constituting an estimated 10–25% (Kuriakose & Xiao, 2020). The fatality rate from hemorrhagic stroke is higher than that from ischemic stroke(Andersen *et al.*, 2009).

2.2.6.1 Ischemic Stroke

The primary lesion linked to ischaemic stroke is cerebral infarction. Insufficient blood flow to brain tissue causes a temporary loss of tissue function, followed by an infarction that kills neurones and supporting tissues (Feske, 2021). The bulk of stroke cases are ischemic strokes, which are brought on by the blockage of blood arteries that supply the brain with insufficient blood flow. Thrombosis, or the production of blood clots inside the cerebral arteries, and embolism, or the movement of blood clots from other areas of the body, are the two main mechanisms causing ischemic stroke. Ischemic stroke specifically refers to central nervous system infarction accompanied by overt symptoms (Sacco *et al.*, 2013).

2.2.6.2 Hemorrhagic Stroke

A hemorrhagic stroke happens when a blood artery bursts, causing internal bleeding in the brain. The primary pathology of hemorrhagic stroke is an area of bleeding that directly causes damage to the brain tissue. There are two primary forms of this type of stroke: subarachnoid hemorrhage

(SAH), which makes up about 5% of all strokes, involves bleeding into the subarachnoid space, and intracerebral hemorrhage (ICH), which involves bleeding into the brain matter and makes up about 10% of all stroke (Parmar, 2018). According to Chen *et al.* (2014), hemorrhagic stroke has a high fatality rate and is associated with considerable morbidity. The course of a hemorrhagic stroke frequently results in less favorable consequences. Because the hemorrhage typically spreads quickly, resulting in abrupt decreases in consciousness and neurological function, prompt diagnosis and treatment are essential (Unnithan *et al.*, 2023).

2.2.7 Signs and Symptoms of Stroke

The symptoms and indicators of stroke for both ischemic and hemorrhagic strokes are outlined by the American Heart Association/American Stroke Association (AHA/ASA). According to Johnston *et al.* (2018), the most typical symptoms of an ischemic stroke are sudden onset of face, arm, or leg weakness or numbness, trouble speaking or understanding speech, visual problems, dizziness, loss of balance and coordination, and excruciating headaches.

However, a hemorrhagic stroke is distinguished by an abrupt and intense headache, along with symptoms like nausea, vomiting, weakness or numbness in the arms, legs, or face, seizures, and loss of consciousness (Johnston *et al.*, 2018). Other symptoms that may suggest a stroke include dysphagia (difficulty swallowing), dysarthria (difficulty speaking), sensory deficits, cognitive impairment, hemi neglect (neglect of one side of the body), thalamic pain syndrome (persistent pain in the thalamus region), and pusher syndrome (a condition that causes a person to push away from the weaker side) (Martin & Kessler, 2015).

2.2.8 Diagnosis of Stroke

A number of diagnostic tests, along with a physical examination and medical history, can be used to diagnose stroke and establish its type, location, and severity (Yew & Cheng, 2015).

History taking:

One of the most effective methods for determining underlying pathophysiology guiding decision-making is still the patient history (Spader *et al.*, 2013). Information about the patient's medical history, current medications, family history of stroke, and risk factors like diabetes and hypertension should all be gathered. Accurate and useful decisions depend on obtaining information about medical history. Additionally, it is a crucial instrument for effective doctor-patient interactions (Acharya et al., 2018).

Physical examination:

This procedure involves evaluating a patient's anatomical deviance objectively. It is an ongoing procedure that lasts for the duration of treatment sessions. There should be a systematic and organized approach to the examination. An in-depth examination requires the viewer's excellent observation skills as well as the examiner's knowledge of anatomy and the pathophysiology of anatomical variances. As soon as the examiner lays eyes on the patient, the physical examination begins. It is important to clarify what has to be done, why it needs to be done, and get permission before moving forward. The physical examination involves neurological examination which includes assessment of mental status, cranial nerves, motor system, coordination, sensory, gait etc.

Radiological Investigations:

Determining whether a stroke patient is suffering from an ischaemic or hemorrhagic stroke is the first step in evaluating them so that the proper treatment can begin. Radiography can be used for imaging. In the context of acute stroke, brain imaging offers an objective foundation for the clinical conclusions that guide the treatment of individual patients. A brain CT or MRI scan is required for all patients with suspected stroke or transient ischemic attack(Merino & Warach, 2010).

Laboratory test

Laboratory testing are essential for establishing the stroke diagnosis, ruling out other possible causes, and guiding therapy choices. A complete blood count (CBC) is one of the most commonly used assays among these. It helps identify diseases such as anemia, thrombocytopenia, and other blood disorders that may be associated with an increased risk of stroke.

2.2.9 Management of stroke

The management of stroke can be split into acute, subacute or chronic stage management which are based on medical, surgical and physiotherapy management.

Acute stage management

The acute management involves both medical and surgical management. For stroke patients, stabilization and completion of early examination and assessment (including imaging and laboratory testing) a short time of patient presentation are the main objectives of acute management.

Medical management:

Whether a stroke is hemorrhagic or ischaemic determines how it is treated medically. The following therapies are taken into consideration for the treatment of ischaemic stroke: While the patient is evaluated for eligibility for a possible intravenous recombinant tissue plasminogen activator (rt-PA) (alteplase), a CT scan is used to make sure there hasn't been any bleeding for the next 24 hours. If the patient is a candidate for thrombolytic therapy (recombinant tissue plasminogen activator), the patient and family are informed of the risks and advantages of the treatment before the tissue plasminogen activator is given. Aspirin is given and a number of indicators, including blood pressure, blood glucose, and oxygen saturation, are monitored and controlled if the patient is not eligible for rt-PA (WHO, 2012).

Appropriate coagulation factors and platelet concentrate should be administered for intracerebral haemorrhage in the ICH associated with coagulopathies and severe thrombocytopenia. Protamine sulphate should be started for patients with heparin-associated ICH. Recombinant activated factor, blood transfusions, and other necessary treatments may be started if ICH occurred in conjunction with fibrinolytic therapy (WHO, 2012).

Surgical management

i. **Decompressive Hemicraniectomy:** Decompressive hemicraniectomy (DHC) is the term used to describe the process of extracting a section of the skull to release pressure on the skull in a closed system by allowing swollen brain tissue to expand outward (Kohli & Koltz, 2021). Although the optimal trigger for decompressive craniectomy is unknown, it is reasonable to use a decrease in level of consciousness attributed to brain swelling as selection criteria (Powers *et al.*, 2019).

ii. **Ventriculostomy**: A well-known and successful treatment for acute obstructive hydrocephalus is ventriculostomy, which can also be used to relieve symptoms when used alone in individuals who have experienced an acute cerebellar infarction. In light of this, emergency ventriculostomy is a logical initial step in the surgical care paradigm for patients who experience symptoms of obstructive hydrocephalus as a result of spinal infarction(Powers *et al.*, 2019). Ventriculostomy is a common neurosurgical procedure in which a catheter is placed within the cerebral ventricle to allow for drainage of excess CSF(Kohli & Koltz, 2021).

iii. **Aneurysm clipping:** Aneurysm clipping is a technique used to control and ultimately stop bleeding in subarachnoid hemorrhages where a vascular aneurysm has formed. A clamp is placed at the base of the aneurysm to slow the blood flow through the burst conduit (WHO, 2012).

iv. **Carotid Endarterectomy**: In this surgical treatment, the plaque accumulation that narrows the carotid artery is removed. According to Doberstein *et al.* (2017), the procedure is carried out to rectify the artery's blood flow.

v. **Thrombectomy**: It is the surgical removal of clot from a cerebral blood vessel. It is recommended to be carried out in patients with stroke out within 6hours after the onset of stroke symptoms (Albers *et al.*, 2018).

Sub-Acute and chronic phase management

This phase of management involves physiotherapy rehabilitation, social and psychological support and preventing recurrence.

Physiotherapy management

There are several different approaches to physiotherapy treatment after stroke. These can broadly be divided into approaches that are based on neurophysiological, motor learning, or orthopaedic principles (Pollock *et al.*, 2008). Physiotherapy techniques commonly used includes the following;

i. **Task-oriented and functional training**: A person can practise tasks and functional activities they perform in real-life scenarios with this kind of training. This can involve things like walking, climbing stairs, and getting out of a chair.

ii. **Constraint induced movement therapy:** A neurorehabilitation method called constraint-induced movement therapy (CIMT) seeks to help patients with damage to the central nervous system regain their motor function. Behavioral research has shown that CIMT is useful in regaining motor function in a number of disorders, including as cerebral palsy, traumatic brain injury (TBI), stroke, and more (Gulrandhe *et al.*, 2023). Constraint-induced movement therapy (CIMT) promotes movement of upper extremities affected by paralytic stroke. The major components of CIMT include intense repetitive (task-oriented) training and behavioral sharping of the impaired limb with immobilization of the unimpaired arm (Yu *et al.*, 2017).

iii. **Mirror therapy**: Neuropathy, phantom limb pain, complicated regional pain syndrome, and low back pain have all been treated with mirror therapy. According to Wittkopf and Johnson (2017), the method entails placing a mirror so the patient can see a reflection of a body part. For the acute, subacute, and chronic stages of post-stroke impairments (motor, sensory, and perceptual deficits), mirror therapy is a viable approach. Patients respond better to mirror therapy when bilateral arm training is included (Gandhi et al., 2020). Additionally, it has been demonstrated that activity-based mirror therapy reduces gait abnormalities and encourages lower limb motor recovery in chronic poststroke hemiparetic individuals (Arya et al., 2019).

iv. **Strengthening exercise:** weakness and decreased motor function are common after a stroke. In order to assist restore muscular strength, increase mobility, and improve functional abilities, strengthening exercises are a crucial component of stroke therapy. The personal needs, capabilities, and recuperation stage of each person should be taken into account when designing these activities. For the purpose of targeting particular muscle groups impacted by stroke-related weakness, these exercises usually entail progressive and repetitive resistance training. Depending on the limitations of the individual, the workouts may concentrate on the upper and lower extremities (Smith *et al.*, 2012).

v. **Neuro-developmental approach (Bobath's approach):** the bobath approach is also known as Neuro-developmental Treatment(NDT) The International Bobath Instructors Training Association (IBITA) defines the current Bobath Concept as a problem-solving approach to the assessment and treatment of individuals with disturbances of function, movement, and postural control due to a lesion of the central nervous system(Raine, 2007). Bobath provided a neurophysiological explanation of movement failure in hemiplegia, emphasizing that the patient needs to be actively involved in their care while the therapist uses reflex inhibiting patterns and important control points to help them move(nakhosin *et al*., 2007).

vi. **Functional electrical stimulation (FES):** FES is a method that makes use of peripheral nerves and muscles that remain unaffected when the central nervous system is damaged.

Certain muscle groups can be made to contract and relax by applying electrical stimulation (Dobkin & Dorsch, 2013). FES is a neuromuscular electrical stimulation technique that is often used. There is a theory that the limb movements caused by FES-induced afferent-efferent stimulation, along with cutaneous and proprioceptive inputs during the acute stage, may help patients remember how to conduct movements correctly. This is because FES causes functional movement(Yan *et al.*, 2005).

vii. **Walking and balance training:** Gait training is an effective treatment for improving stroke patients' dynamic steady-state balance and balance test batteries(Lyu *et al.*, 2023).

2.3 Empirical literature review on determinants of return to work after stroke

AUTHOR/ YEAR/COUNTRY	TITLE	SAMPLE SIZE	AIM OF STUDY	STUDY TYPE	OUTCOME/MEASURE	FINDINGS
Han et al./2019/South Korea	Factors influencing return to work after stroke: the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) Study	193 persons with first ever stroke was recruited.	To determine the factors that influence return to work after stroke	Prospective cohort study	Functional assessments were conducted using a comprehensive set of tools, including the National Institutes of Health Stroke Scale (NIHSS), the modified Rankin Scale (mRS), the Fugl-Meyer Assessment (FMA), and the Functional Ambulatory Category (FAC). Cognitive and language functions were evaluated using the Korean Mini-Mental State Examination (K-MMSE) and the Korean version of	Age and PWI-SF (Personal Wellbeing Index–Short Form) scores of stroke survivors, along with caregiver characteristics such as age, sex, and living arrangements, are key factors influencing the likelihood of return to work (RTW) after stroke.

					the Frenchay Aphasia Screening Test (K-FAST). Additional assessments included the American Speech-Language-Hearing Association National Outcomes Measurement System (ASHA NOMS), the Korean-Modified Barthel Index (K-MBI) for activities of daily living, the Geriatric Depression Scale-Short Form (GDS-SF) for mood evaluation, and the EuroQol-5 Dimensions (EQ-5D) for assessing health-related quality of life.	
La Torre et al./2022/Spain	An overview of systematic reviews on factors that help and hinder stroke survivors' return to	The search initially yielded 180 records after removing duplicates; however, only 24 systematic reviews met the inclusion criteria and	To compile research on the elements that help and impede stroke survivors' ability to return to	Systematic review	*Medline (PubMed), Scopus and ISI Web.*	According to this study, personal abilities, socioeconomic status, healthcare-related factors, and stroke-related disabilities are

	work	were ultimately included in the overview.	work			the most important factors affecting return to work (RTW) among stroke survivors.
Orange et al./2024/Netherland	Determinants of Return to Work After a Stroke: A Systematic Review and Meta-analysis	1241 articles were screened, 39 met all inclusion criteria.	To synthesize the literature on the determinants of return to work after stroke	Systematic review	PubMed, MEDLINE, Cochrane, and Embase were systematically searched.	The type of stroke is one of the prognostic factors for returning to work following a stroke; people who had a hemorrhagic stroke were less likely to do so. Another factor is gender, since men are typically more likely to return to work after a stroke.
Palstam et al./2019/	**Work-related predictors for return to work after stroke**	204 persons with first-time stroke between year 2009-2010	To determine work-related predictors of return to work after stroke	*Prospective cohort study*	Disease-related characteristics were obtained from medical records, while work-related and socio-economic data were collected for up to six years post-stroke using data from Statistics Sweden.	Qualified occupation and employment in large organizations were identified as work-related predictors for a shorter time to return to work (RTW) after stroke. Additionally, being male was associated with a quicker and more frequent RTW.

Peters et al./2013/Nigeria	Determinants of return to work among Nigerian stroke survivors	101 participants	To explore the frequency and determinants of return to work among Nigerian Stroke survivors in the North.	Cross sectional design study	Socio-demographic, clinical and RTW data were obtained from participants while the modified Rankin Scale was used to assess functional ability.	Fifty-five percent of the participants had gone back to work. RTW was significantly influenced by the absence of disability and mild disability, whereas a year or less following a stroke was linked to a lower likelihood of going back to work.
Saeki et al. / 2020 / Japan	Factors affecting return to work after stroke: A retrospective study	287 stroke survivors	To identify predictors of RTW in stroke survivors	Retrospective cohort study	Data from medical records, including NIHSS, mRS, and employment surveys	Younger age, ischemic stroke, and lower NIHSS scores were associated with higher RTW rates; cognitive impairment was a significant barrier.
Trygged et al. / 2011 / Sweden	Return to work after stroke: The role of workplace and social factors	188 stroke survivors	To explore the impact of workplace and social factors on RTW	Prospective cohort study	Data from medical records, employment surveys, and Social Support Questionnaire	Social support, flexible work hours, and employer support significantly increased RTW likelihood; manual labor jobs posed barriers.

Wang et al. / 2014 / USA	Important factors influencing the return to work after stroke	200 stroke survivors	To identify key determinants of RTW post-stroke	Cross-sectional study	Assessed using FIM, MMSE, and employment status questionnaires	Higher cognitive function, lower disability levels, and white-collar occupations were associated with higher RTW rates.

2.4 Research gap

A review of current literature indicates a significant amount of research on the factors influencing return to work (RTW) after a stroke across different regions and populations. For instance, Peters et al. (2013) carried out a study in Northern Nigeria, recognizing functional ability and the length of time since the stroke as important predictors of RTW. Likewise, systematic reviews authored by Orange et al. (2024) and La Torre et al. (2022) have compiled global data, emphasizing elements like stroke type, gender, presence of aphasia, job category, and independence in daily living as vital to employment outcomes for those recovering from a stroke. Additional cohort studies from South Korea (Han et al., 2019) and Sweden (Palstam et al., 2019) further highlight the importance of cognitive function, quality of life, caregiver characteristics, and organizational environment in shaping RTW results.

In spite of this expanding body of research, there is a significant lack of geographic coverage in the literature focusing on the Southern region of Nigeria. Although Peters et al.'s research offers important insights into the factors affecting RTW in the North, no comparable studies have been undertaken in the South, which is currently facing a rising incidence of stroke. This regional deficiency is critical, given the cultural, socioeconomic, and healthcare delivery disparities existing between Nigeria's North and South, which may uniquely impact stroke rehabilitation outcomes and RTW rates. Consequently, there is an urgent need for localized data from Southern Nigeria to gain insight into the contextual factors that influence RTW for stroke survivors in this area. Filling this gap will not only enhance the national evidence base but also aid in the creation of tailored interventions and policies designed to improve stroke rehabilitation and workforce reintegration outcomes in the South.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Participants

Population for this study included male and female stroke survivors age 18years and above, who were attending physiotherapy out-patient care at University of Benin Teaching Hospital and Edo Specialist Hospital.

3.2 Selection Criteria

3.2.1 Inclusion Criteria

i. Stroke survivors who are 18 years and above.
ii. Stroke survivors that were receiving outpatient physiotherapy care for at least three months.
iii. Stroke survivors who understood English or pidgin English.
iv. Stroke survivors who are employed or have a job.

3.2.2 Exclusion Criteria

i. Stroke survivors unable to provide informed consent.
ii. Stroke survivors with a visual impairment.
iii. Stroke survivors who had unstable cardiovascular disease.

3.3 Materials

3.3.1 List of Instruments

i. Mini mental state examination to assess cognitive function.
ii. National Institutes of Health Stroke Scale for stroke severity
iii. Functional Independence Measure (FIM) to assess functional independence.
iv. Modified Rankin Scale (mRS) for disability level after stroke.
v. Rosenberg Self-Esteem Scale to assess self-esteem.
vi. Social Support Questionnaire (SSQ) to assess social support.
vii. General Self-Efficacy Scale to assess self-efficacy
viii. Work Ability Index (WAI)

3.3.2 Description of Instruments

i. Mini Mental State Examination: A popular screening tool for evaluating cognitive function and identifying dementia or cognitive impairment is the Mini-Mental State Examination (MMSE). With a total score ranging from 0 to 30, it assesses seven cognitive domains, including orientation, memory, language, and attention. Higher scores indicate better cognitive function. Excellent test-retest reliability (0.80–0.95) and high intraclass correlation coefficients (ICC = 0.94 overall; 0.89 in men and 0.95 in women), which show strong consistency across assessments, are two of the MMSE's strong psychometric qualities. Additionally, it exhibits respectable sensitivity and specificity in detecting mild to moderate dementia (Hörnsten et al., 2021).

ii. **Functional Independence Measure (FIM)**: The functional outcome of the participants will be evaluated using an instrument adapted from Dodds (1993), focusing specifically on the motor domain of the Functional Independence Measure (FIM). This instrument comprises 13 items rated on a 7-point scale, assessing the level of independence in activities of daily living (ADL). The FIM encompasses two domains: motor (13 items) and cognitive (5 items), with scores ranging from 1 (completely dependent) to 7 (total independence). For this study, only the motor domain of the FIM was utilized, as recent research suggests that the admission motor FIM rating is a robust predictor of discharge to acute care post inpatient stroke rehabilitation (Chung *et al.*, 2012). This choice indicates that the motor domain better reflects the functional outcome of stroke patients compared to the cognitive domain. Scores on the motor FIM range from 13 to 91, with a score of 55 or above signifying independence, while any score below 55 is indicative of dependence (Hoyer *et al.*, 2013). The FIM instrument exhibits good validity. Concurrent validity was supported by high intercorrelations with other functional assessment scales, such as the Barthel Index (Miki *et al.*, 2016). Construct validity was also demonstrated, as evidenced by differences in FIM scores between individuals with and without cerebral palsy in a study conducted by Erkin *et al.* (2005). Moreover, Gkouma *et al.* (2022) reported high inter-rater reliability for the FIM, ranging from 0.93 to 0.97. The internal consistency reliability was also found to be strong, with Cronbach's alpha values of 0.97 and 0.95 for the motor and cognitive scores, respectively.

iii. Rosenberg Self-Esteem Scale: A popular instrument for evaluating general self-worth and self-esteem is the Rosenberg Self-Esteem Scale (RSES), which was created by Morris Rosenberg in 1965. It consists of ten items that are rated on a four-point Likert scale. The total scores range from 10 to 40, with higher scores denoting greater self-esteem. Strong psychometric qualities, such as high internal consistency (Cronbach's alpha ≈ 0.81), excellent test-retest reliability (r = 0.85–0.88), and good predictive validity, have been demonstrated by the RSES. Additionally, it demonstrates strong internal consistency with a Guttman reproducibility coefficient of 0.92 (Schmitt & Allik, 2005; Sinclair et al., 2010).

iv. **Social Support Questionnaire - Shortened Form (SSQ):** The Social Support Questionnaire-Short Form (SSQ-SF) is a self-report tool developed by Sarason et al. (1983) to assess individuals' perceived availability and adequacy of social support across domains such as emotional, tangible, and informational support. Respondents rate their level of support, and scores are calculated for each category and overall support. Widely used in both research and clinical settings, the SSQ helps identify gaps in social support and guide interventions. It has demonstrated strong psychometric properties, including good test-retest reliability, internal consistency, and validity. The SSQ shows significant negative correlations with depression (r = -0.22 to -0.43), and positive correlations with optimism (r = 0.57) and satisfaction (r = 0.34), supporting its convergent and divergent validity (Sarason et al., 1987).

v. General Self-Efficacy Scale (GSE): The General Self-Efficacy Scale (GSE), created by Ralf Schwarzer and Matthias Jerusalem in 1979, is a validated and trustworthy tool used to gauge a person's perceived self-efficacy, or their confidence in their capacity to manage a variety of difficulties and deal with stressors in life. Participants rate the scale's ten items on a Likert scale that goes from disagree to agree. The items gauge a person's confidence in their capacity to overcome challenges and complete tasks successfully despite obstacles. Across a wide range of demographics and cultural contexts, the GSE has demonstrated strong validity and reliability. With Cronbach's alpha coefficients frequently surpassing 0.80, it exhibits strong internal consistency and high reliability when assessing perceived self-efficacy (Schwarzer and Jerusalem, 1979). The scale is applicable and helpful in a variety of populations around the world because it has been translated, validated, and used in a wide range of cultural contexts and languages (Dougherty et al., 2007).

vi. National Institutes of Health Stroke Scale for stroke severity (NIHSS): A common and standardised method for determining the degree of neurological impairments in stroke patients is the National Institutes of Health Stroke Scale (NIHSS). The total scores range from 0 to 42, indicating an increase in stroke severity from no symptoms to severe stroke. The items are scored on predetermined ranges. With Cronbach's alpha values ranging from 0.68 to 0.94 and strong correlations with other functional outcome measures like infarct volume, the Modified Rankin Scale (mRS), and the Barthel Index, the NIHSS has proven to be reliable and valid in both clinical and research settings (Dromerick et al., 2003; Hinkle, 2014).

v. **Modified Rankin Scale (mRS):** A popular clinical tool for assessing the level of dependence or disability in day-to-day activities in people who have had a stroke or other neurological condition is the Modified Rankin Scale (mRS). It offers a rapid and simple way to assess functional outcomes, ranging from 0 (no symptoms) to 6 (death). Although the mRS is a practical assessment tool, its inter-rater reliability has historically been variable due to the subjective nature of interpretation. However, the use of standardized structured interviews and proper training has significantly improved its reliability. For example, unstructured assessments of the mRS typically yield inter-rater reliability intraclass correlation coefficients (ICCs) ranging from 0.46 to 0.72, whereas structured or video-based assessments demonstrate much higher ICCs of approximately 0.90 or greater (Bruno et al., 2011).

vi. **Work Ability Index (WAI):** The Work Ability Index (WAI), developed by the Finnish Institute of Occupational Health (FIOH)**,** is a standardized self-assessment instrument designed to evaluate an individual's capacity to perform work tasks in relation to the demands of their job, their state of health, and their physical and mental resources. It provides an overall indication of a worker's ability to continue functioning effectively in their occupation. The WAI has shown good psychometric properties, with Cronbach's alpha values between 0.70 and 0.80, indicating acceptable internal consistency, and test–retest reliability coefficients of 0.83–0.88, demonstrating stability over time. It has also shown construct validity, correlating positively with measures of health status, work performance, and mental well-being (Tuomi et al., 1998).

3.4 Methods

3.4.1 Research Design

This is an exploratory cross sectional study design

3.4.2 Sampling Technique

Purposive sampling technique will be used in recruiting participants for this study.

3.4.3 Sample Size

Sample size was determined using G*Power version 3.1.9.7 for correlation: Bivariate normal model as illustrated below:

Input: Tail (s) =One

Correlation p H1 = 0.3

α error probability = 0.05

Power = 0.80

Output: Lower critical r = 0.2026735

Upper critical r = 0.2026735

Total sample size = 67

Actual power = 0.8032714

The total sample size of participants for this study will be 67 stroke survivors.

It was calculated using a power analysis and sample size software (PASS) http://www.psychologie.hhu.de.

3.4.4 Ethical Consideration

According to institutional guidelines, the University of Benin Teaching Hospital's (UBTH) Health Research Ethics Committee will grant ethical approval for this study. Eligible participants will receive comprehensive information about the study's goals, methods, possible risks and advantages, and their rights as participants after approval. Prior to data collection, all participants will be asked for their informed consent, guaranteeing their voluntary involvement and comprehension of the study.

3.4.5 Procedure for Data Collection

Every participant who satisfies the inclusion requirements will be enlisted in the research. Each participant will be asked for their informed consent before being enrolled. To guarantee participant comprehension, the researcher will give a thorough explanation of the study's goals, methods, and expectations after receiving consent.

A set of standardised questionnaires will be given to participants. The Mini-Mental State Examination (MMSE), Functional Independence Measure (FIM), National Institutes of Health Stroke Scale (NIHSS), Modified Rankin Scale (mRS), Rosenberg Self-Esteem Scale (RSES), Social Support Questionnaire (SSQ), General Self-Efficacy Scale (GSE), Work Ability Index (WAI), and a structured sociodemographic questionnaire to gather data on age, gender, return to work, marital status, and occupation.

Each questionnaire will be self-administered; however, assistance will be provided by the researcher upon request to ensure proper completion. All questionnaires will be collected immediately after completion to maintain data integrity and minimize data loss.

3.4.6 Data Analysis

IBM's statistical package of social sciences (SPSS version 27.0) software will be used to analyse the data. Using a histogram or other normality tests, the data distribution will be visually examined for normality. Descriptive statistics of frequency, percentages, and, if necessary, mean or median will be used to summarise the data. The differences in return to work between sociodemographic, clinical, and psychosocial variables will be ascertained using Chi Square. A binary logistic regression analysis with a significance level of $p < 0.05$ will be performed on variables that the univariate analysis finds to be statistically significant.

CHAPTER FOUR
RESULTS

4.1 Demographic Characteristics of participants

A total of 67 participants were included in the study. The sample was predominantly female (58.2%). The largest age group comprised those older than 40 years (64.1%). Secondary education was the most common highest level of schooling (41.8%), followed by tertiary education (37.3%). Married respondents formed the clear majority (70.1%). Ischemic stroke was the predominant stroke type (68.7%) and right sided laterality was slightly more frequent than left (52.2%). Most participants reported having returned to work after stroke (74.6%), as shown in table 1.

4.2 Cognitive functioning

Cognitive screening using the Mini Mental State Examination indicated that most participants showed no cognitive impairment (62.7%). Mild cognitive impairment was present in 31.3% and severe cognitive impairment was observed in 6.0%, as illustrated in fig. 1

Table 1: Demographic characteristics (n=67)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	28	41.8
Female	39	58.2
Age range (Years)		
18 – 25	6	9.0
26 – 32	5	7.5
33 – 40	13	19.4
>40 years	43	64.1
Educational level		
Primary	14	20.9
Secondary	28	41.8
Tertiary	25	37.3
Marital status		
Single	17	25.4
Married	47	70.1
Divorced	3	4.5
Religion		
Christian	83	94.0
Muslim	4	6.0
Traditional worshipper	0	0.0
Others	0	0.0
Return to work		
Yes	50	74.6
No	17	25.4
Type of stroke		
Ischemic	46	68.7
Hemorrhagic	21	31.3
Laterality		
Right	35	52.2
Left	32	47.8

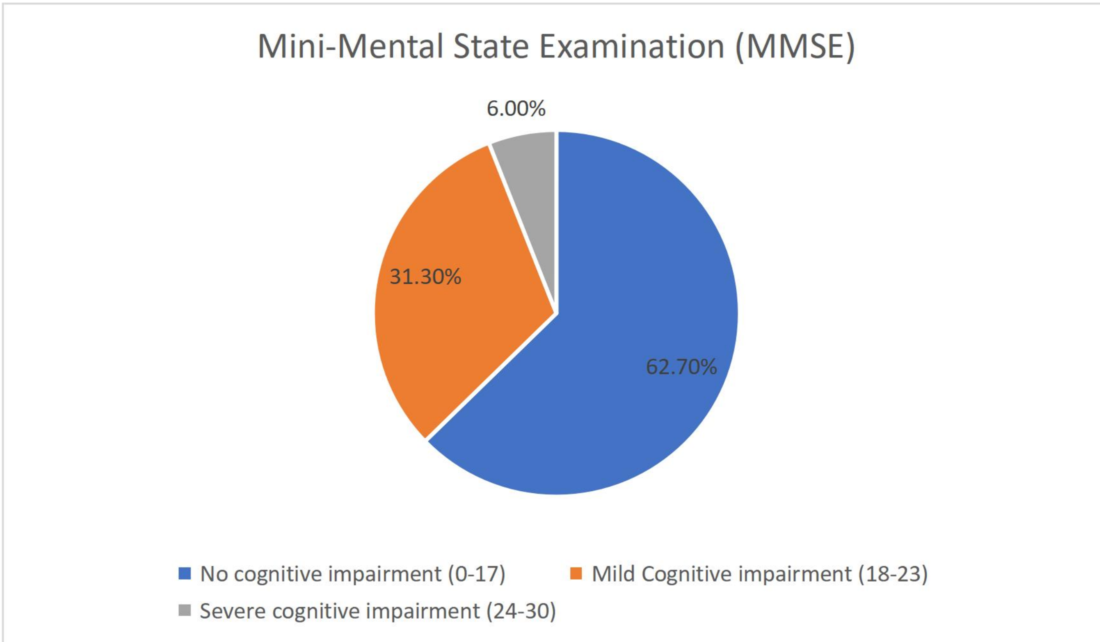


Figure 2: Pie chart showing the Mini-Mental State Examination (MMSE) (n=67)

4.3 Rosenberg Self-Esteem Scale

Table 2 presents item-level responses on the Rosenberg Self-Esteem Scale for the 67 participants. Overall, the grand mean score was 2.78, indicating a modestly weighted tendency toward neutral to slightly negative self-appraisal.

Results at the item level indicated that the statement's modal response Overall, 53.7% of respondents disagreed with the statement "I am satisfied with myself" (mean 2.82, SD 0.76). For There was an equal split between Agree and Disagree, each at 41.8%, with a mean of 2.50 (SD 0.77). At times, I feel like I am completely incompetent. The statement "I feel that I have a number of good qualities" received the highest mean score of 3.30 (SD 0.70), but the majority disagreed with it (52.2%). With a mean score of 2.76 (SD 0.68), the majority of respondents (53.7%) disagreed when asked if they could perform tasks as well as most other people. The most frequently disagreed statement (44.8%) was "I feel like I don't have much to be proud of," with a mean score of 2.46 (SD 0.77). Disagree (46.3%), mean 2.54 (SD 0.76), was the most common response for "I definitely feel useless at times." The majority of respondents (67.2%) disagreed with the statement "I feel that I am a person of worth, at least on an equal plane with others," with a mean score of 3.13. The source's standard deviation seems unusual and most likely reflects a typographical error. The majority of participants disagreed (44.8%) with the statement "I wish I could have more respect for myself," with a mean score of 2.61 (SD 0.74). Reactions to Overall, my perception of myself as a failure was mixed, with Strongly Disagree accounting for the largest percentage (34.3%), mean 2.69 (SD 1.17). Lastly, the modal response for "I have a positive attitude towards myself" was "Disagree" at 52.2%

(mean 2.96, SD 0.73). Figure 3 illustrates that, when categorised by total score, medium self-esteem accounted for 31.3%, while low and high self-esteem were equally prevalent at 34.3% each.

Table 2: Rosenberg Self-Esteem Scale (n=67)

Variable	Strongly agree	Agree	Disagree	Strongly Disagree	Mean ± SD
On the whole, I am satisfied with myself.	3 (4.5)	17 (25.4)	36 (53.7)	11 (16.4)	2.82 ± 0.76
At times, I think I am no good at all.	5 (7.5)	28 (41.8)	28 (41.8)	6 (9.0)	2.50 ± 0.77
I feel that I have a number of good qualities.	2 (3.0)	3 (4.5)	35 (52.2)	27 (40.3)	3.3 ± 0.70
I am able to do things as well as most other people.	1 (1.5)	22 (32.8)	36 (53.7)	8 (11.9)	2.76 ± 0.68
I feel I do not have much to be proud of.	7 (10.4)	26 (38.8)	30 (44.8)	4 (6.0)	2.46 ± 0.77
I certainly feel useless at times.	5 (7.5)	26 (38.8)	31 (46.3)	5 (7.5)	2.54 ± 0.76
I feel that I'm a person of worth, at least on an equal plane with others.	1 (1.5)	5 (7.5)	45 (67.2)	16 (23.9)	3.13 ± 60
I wish I could have more respect for myself.	3 (4.5)	27 (40.3)	30 (44.8)	7 (10.4)	2.61 ± 0.74
All in all, I am inclined to feel that I am a failure.	15 (22.4)	14 (20.9)	15 (22.4)	23 (34.3)	2.69 ± 1.17
I take a positive attitude toward myself.	1 (1.5)	16 (23.9)	35 (52.2)	15 (22.4)	2.96 ± 0.73

Grand mean - 2.78

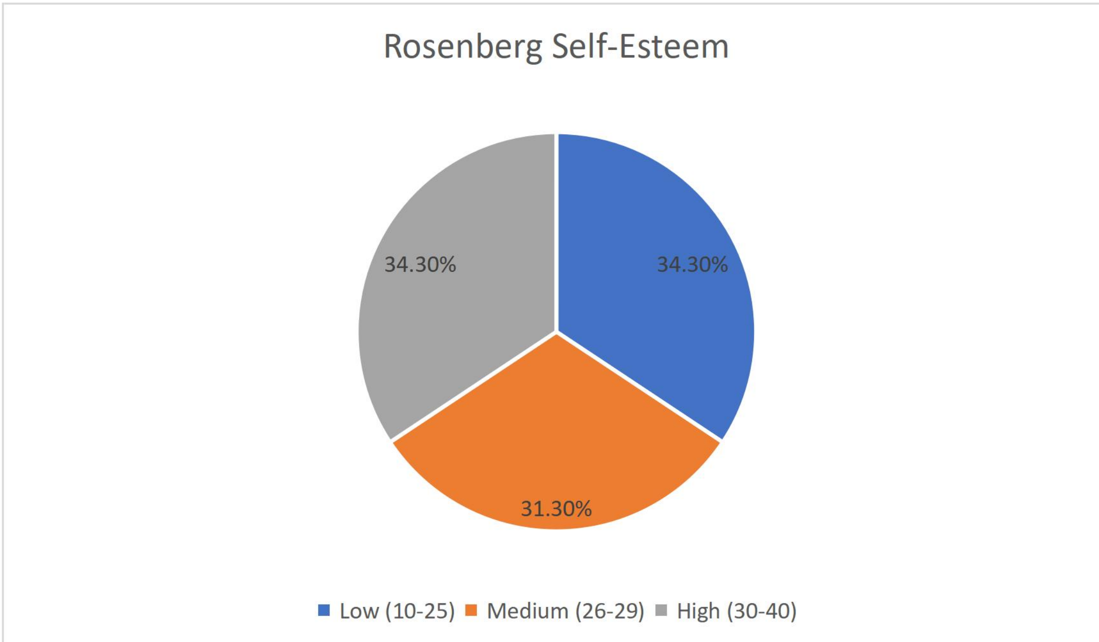


Figure 3: Pie chart showing the distribution of Rosenberg Self-Esteem (n=67)

4.4 Perceived social support

From table 3, most participants reported positive perceptions of social support. Nearly half of the sample were fairly satisfied with the support they received 47.8% and a further 28.4% were very satisfied, meaning 76.2% expressed at least a fairly satisfied level. Only small minorities reported dissatisfaction with social support, with 1.5% very dissatisfied, 1.5% fairly dissatisfied and 3.0% a little dissatisfied, while 17.9% were a little satisfied.

4.5 General Self-Efficacy Scale (GSE)

Table 4 reports the General Self Efficacy Scale findings for the 67 participants. Across every item the modal response was Moderately true, indicating a consistent pattern of moderate self-efficacy: 52.2% for being able to solve difficult problems if tried hard enough, 43.3% for finding ways to get what one wants when opposed, 34.3% for sticking to aims and accomplishing goals, 50.7% for dealing efficiently with unexpected events, 47.8% for handling unforeseen situations through resourcefulness, 50.7% for solving most problems with necessary effort, 49.3% for remaining calm because of coping abilities, 38.8% for finding several solutions when confronted with a problem, 56.7% for usually thinking of a solution when in trouble, and 44.8% for being able to handle whatever comes one’s way. The grand mean score was 2.87. When classified, most participants fell into the high efficacy category with 80.6% classified as high, 13.4% as moderate and 6.0% as low, as illustrated in fig.4.

Table 3: Social Support (n=67)

Satisfaction	Frequency (n)	Percentage (%)
1 = Very Dissatisfied	1	1.5
2 = Fairly Dissatisfied	1	1.5
3 = A Little Dissatisfied	2	3.0
4 = A Little Satisfied	12	17.9
5 = Fairly Satisfied	32	47.8
6 = Very Satisfied	19	28.4

Table 4: General Self-Efficacy Scale (GSE)

Variable	Not at all true	Hardly true	Moderately true	Exactly true	Mean ± SD
I can always manage to solve difficult problems if I try hard enough	3 (4.5)	13 (19.4)	35 (52.2)	16 (23.9)	2.96 ± 0.79
If someone opposes me, I can find the means and ways to get what I want	5 (7.5)	19 (24.8)	29 (43.3)	14 (20.9)	2.78 ± 0.87
It is easy for me to stick to my aims and accomplish my goals	10 (14.9)	19 (28.4)	23 (34.3)	15 (22.4)	2.54 ± 1.0
I am confident that I could deal efficiently with unexpected events	2 (3.0)	15 (22.4)	34 (50.7)	16 (23.9)	2.96 ± 0.77
Thanks to my resourcefulness, I know how to handle unforeseen situations	3 (4.5)	20 (29.9)	32 (47.8)	12 (17.9)	2.79 ± 0.79
Can solve most problems if I invest the necessary effort	3 (4.5)	9 (13.4)	34 (50.7)	21 (31.3)	3.09 ± 0.79
I can remain calm when facing difficulties because I can rely on my coping abilities	3 (4.5)	19 (28.4)	33 (49.3)	12 (17.9)	2.81 ± 0.78
When I am confronted with a problem, I can usually find several solutions	3 (3.4)	23 (34.3)	26 (38.8)	15 (22.4)	2.79 ± 0.85
If I am in trouble, I can usually think of a solution	1 (1.5)	12 (17.9)	38 (56.7)	16 (23.9)	3.03 ± 0.70
I can usually handle whatever comes my way	4 (6.0)	16 (23.9)	30 (44.8)	17 (25.4)	2.9 ± 0.86
Grand mean - 2.87					

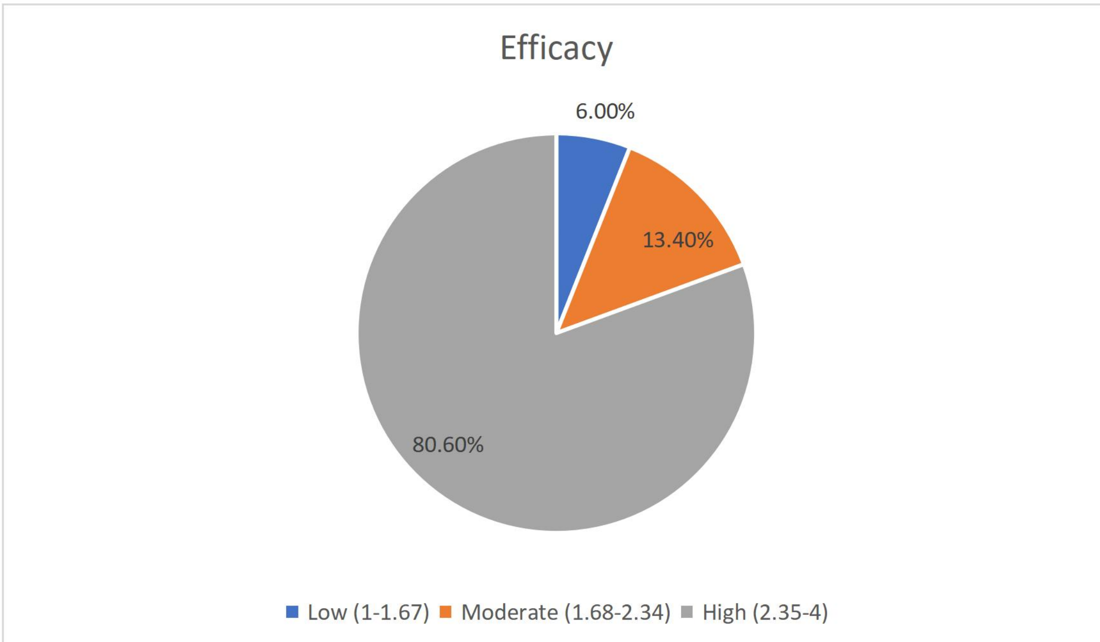


Figure 4: Pie chart showing the self-efficacy of participants (n=67)

4.6 Modified Ranking Scale

The majority of participants (46.3%) had moderate disabilities, meaning they needed some assistance but could walk without it. A further 35.8% had a moderately severe disability, meaning they couldn't walk or take care of their own physical needs without assistance, and 17.9% had a severe disability, meaning they were bedridden and needed continuous nursing care. Table 5 shows that none of the participants had any symptoms, a major disability, a minor disability, or were deceased.

Table 5: Modified Ranking Scale (n=67)

Variable	Frequency (n)	Percentage (%)
No symptoms at all	0	0.0
No significant disability despite symptoms; able to carry out all usual duties and activities	0	0.0
Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance	0	0.0
Moderate disability; requiring some help, but able to walk without assistance	31	46.3
Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance	24	35.8
Severe disability; bedridden, incontinent and requiring constant nursing care and attention	12	17.9
Dead	0	0.0

4.7 National Institutes of Health Stroke Scale findings

The majority of participants were alert and keenly responsive with 92.5% classified as level of consciousness 0. Most answered both level of consciousness questions correctly (64.2%) and performed both LOC commands correctly (56.7%). Normal gaze was predominant at 89.6% and no visual loss was recorded for 95.5% of participants. Facial movement was most commonly rated as minor paralysis with 47.8% in that category. For motor function the modal scores were as follows: right arm no drift 50.7%, left arm drift 58.2%, right leg no drift 50.7% and left leg no drift 61.2%. Limb ataxia was absent in 86.6% of participants. Sensory assessment most often indicated mild to moderate sensory loss at 62.7% rather than full normal sensation. The largest proportion had no aphasia at 65.7% while about half of participants had mild to moderate dysarthria approximately 49.3%. Neglect was largely absent in the sample at 88.1%, as shown in table 6. Stroke severity was distributed mainly between minor and moderate categories, each representing 47.8% of the sample, while severe stroke accounted for 4.5% of participants, as illustrated in fig. 5

Table 6: NIHSS (n=67)

Variable	Scale definition	Frequency (n)	Percentage (%)
Level of consciousness	0 = Alert; keenly responsive.	62	92.5
	1 = Not alert; but arousable by minor stimulation to obey, answer, or respond	4	6.0
	2 = Not alert; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped).	1	1.5
	3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and reflexes.	0	0.0
LOC questions	0 = Answers both questions correctly.	43	64.2
	1 = Answers one question correctly.	21	31.3
	2 = Answers neither question correctly	3	4.5
LOC commands	0 = Performs both tasks correctly.	38	56.7
	1 = Performs one task correctly.	26	38.8
	2 = Performs neither task correctly.	3	4.5
Best Gaze	0 = Normal.	60	89.6
	1 = Partial gaze palsy; gaze is abnormal in one or both eyes, but forced deviation and total gaze paresis is not present.	5	7.5
	2 = Forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver.	2	3.0
Visual	0 = No visual loss.	64	95.5
	1 = Partial hemianopia.	2	3.0
	2 = Complete hemianopia.	1	1.5
	3 = Bilateral hemianopia (blind including cortical blindness).	0	0.0
Facial palsy	0 = Normal symmetrical movements.	20	29.9
	1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling).	32	47.8
	2 = Partial paralysis (total or near-total paralysis of lower face).	15	22.4
	3 = Complete paralysis of one or both sides (absence of facial movement in the upper and lower face)	0	0.0
Motor arm (Right)	0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds.	34	50.7
	1 = Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support.	4	6.0
	2 = Some effort against gravity; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.	19	28.4
	3 = No effort against gravity; limb falls.	8	11.9
	4 = No movement.	2	3.0
Motor arm (Left)	1 = Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support.	39	58.2
	2 = Some effort against gravity; limb cannot get to or	8	11.9

	maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.		
	3 = No effort against gravity; limb falls.	16	23.9
	4 = No movement.	4	6.0
Motor leg (Right)	0 = No drift; leg holds 30-degree position for full 5 seconds.	34	50.7
	1 = Drift; leg falls by the end of the 5-second period but does not hit bed.	15	22.4
	2 = Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.	12	17.9
	3 = No effort against gravity; leg falls to bed immediately.	6	9.0
	4 = No movement.	0	0.0
Motor leg (Left)	0 = No drift; leg holds 30-degree position for full 5 seconds.	41	61.2
	1 = Drift; leg falls by the end of the 5-second period but does not hit bed.	17	25.4
	2 = Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.	9	13.4
	3 = No effort against gravity; leg falls to bed immediately.	0	0.0
	4 = No movement.	0	0.0
Limb ataxia	0 = Absent.	58	86.6
	1 = Present in one limb.	7	10.4
	2 = Present in two limbs.	2	3.0
Sensory	0 = Normal; no sensory loss.	21	31.3
	1 = Mild-to-moderate sensory loss	42	62.7
	2 = Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.	4	6.0
Best language	0 = No aphasia; normal.	44	65.7
	1 = Mild-to-moderate aphasia;	19	28.4
	2 = Severe aphasia	4	6.0
	3 = Mute, global aphasia; no usable speech or auditory comprehension.	0	0.0
Dysarthria	0 = Normal.	33	49.3
	1 = Mild-to-moderate dysarthria	29	43.3
	2 = Severe dysarthria;	5	7.5
Neglect	0 = No abnormality.	59	88.1
	1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.	7	10.4
	2 = Profound hemi-inattention or extinction to more than one modality; does not recognize own hand or orients to only one side of space.	1	1.5

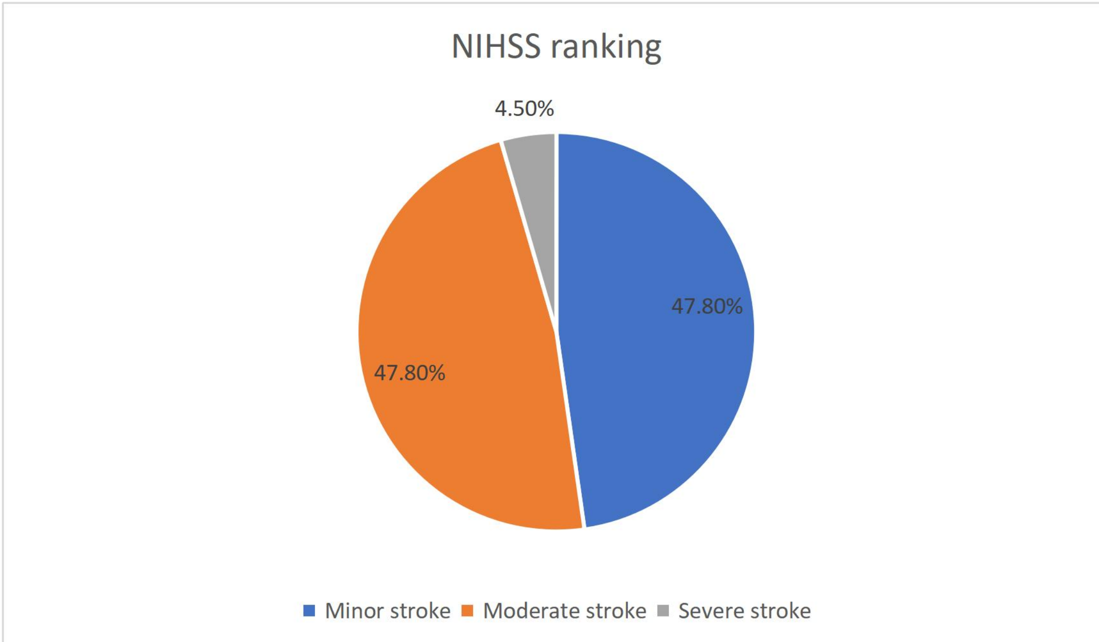


Figure 5: Pie chart showing the distribution of NIHSS ranking (n=67)

4.8 Association between sociodemographic and clinical factors and return to work

Overall, the majority of participants returned to work. Return to work did not differ by gender with most males and most females reporting return to work. Age distribution showed a significant association with return to work ($\chi^2 = 9.37$; $p = 0.02$). Although participants across age bands returned to work, the largest absolute numbers who returned were in the oldest age group. Marital status, type of stroke and stroke laterality were not significantly associated with return to work. Stroke severity showed a non-significant trend with those classified as minor or moderate stroke more often returning to work than those with severe stroke ($\chi^2 = 4.75$; $p = 0.08$). Cognitive function was significantly associated with return to work ($\chi^2 = 10.18$; $p = 0.01$). Participants with no cognitive impairment most frequently returned to work, while those with severe cognitive impairment were predominantly among those who had not returned, as shown in table 7.

Table 7: Association between Socio-demographic and clinical factors and return to work (n=67)

Social support level	Return to work Yes	No	X^2	P-value
Gender				
Male	21	7		
Female	29	10		
			0.004	**0.59**
Age Range				
18 – 25	6	0		
26 – 32	3	2		
33 – 40	13	0		
>40 years	28	15		
			9.37	**0.02***
Marital status				
Single	13	4		
Married	34	13		
Divorced	3	0		
			0.69	**0.89**
Type of stroke				
Ischemic	35	11		
Hemorrhagic	15	6		
			0.17	**0.77**
Laterality				
Right	28	8		
Left	22	9		
			3.30	**0.18**
Stroke severity				
Minor stroke	22	10		
Moderate stroke	27	5		
Severe stroke	1	2		
			4.75	**0.08**
Cognitive function				
No cognitive impairment	34	8		
Mild cognitive impairment	16	5		
Severe cognitive impairment	0	4		
			10.18	**0.01***

**-Significant*

4.9 Association between psychosocial factors and return to work

Self-esteem did not show a significant association with return to work ($\chi^2 = 1.68$; $p = 0.43$). In contrast, social support was strongly associated with return to work ($\chi^2 = 14.67$; $p < 0.001$). The largest proportion of those who returned reported being fairly satisfied with their social support, whereas participants reporting very high satisfaction were more evenly split between return and non-return. Self-efficacy was also strongly associated with return to work ($\chi^2 = 11.13$; $p < 0.001$). High self-efficacy predominated among those who returned, while low self-efficacy was concentrated among those who did not. Disability level demonstrated a marked and significant relationship with return to work ($\chi^2 = 25.94$; $p < 0.001$). Participants with slight or moderate disability were most likely to have returned to work, whereas those with moderately severe disability were predominantly among those who had not returned, as presented in table 8.

Table 8: Association between psychosocial factors and return to work

	Return to work		X^2	P-value
	Yes (50)	**No (17)**		
Self esteem				
Low	15	8		
Medium	17	4		
High	18	5		
			1.68	**0.43**
Social support				
Very Dissatisfied	0	1		
Fairly Dissatisfied	1	0		
A Little Dissatisfied	0	2		
A Little Satisfied	9	3		
Fairly Satisfied	31	1		
Very Satisfied	9	10		
			14.67	**0.00***
Self-efficacy				
Low	0	4		
Moderate	6	3		
High	44	10		
			11.13	**0.00***
Disability level				
No symptoms at all	0	0		
No significant disability despite symptoms.	0	0		
Slight disability	27	4		
Moderate disability	21	3		
Moderately severe disability	2	10		
Severe disability	0	0		
Dead	0	0		
			25.94	**0.00***

**-Significant*

4.10 Hypothesis Testing

4.10.1 Main hypotheses

Statement I: There will be no significant relationship between socio-demographic factors and returning to work after stroke.

Test statistics: Associations between return to work and sociodemographic variables were evaluated with chi square tests (Table 7). Age showed a significant association with return to work $\chi^2 = 9.37$, $p = 0.02$. Gender and marital status did not show significant associations, with $\chi^2 = 0.004$, $p = 0.59$ for gender and $\chi^2 = 0.69$, $p = 0.89$ for marital status. $\alpha = 0.05$.

Judgment: The p value for age (0.02) is less than α (0.05); therefore I reject the null hypothesis in part. There is evidence that at least one sociodemographic factor, age, is significantly associated with return to work. The overall null hypothesis that no sociodemographic factors relate to return to work is not supported.

Statement II: There will be no significant relationship between clinical variables and returning to work after stroke.

Test statistics: Associations between return to work and clinical variables were tested using chi square tests (Table 7).Stroke type showed $\chi^2 = 0.17$, $p = 0.77$ and stroke laterality $\chi^2 = 3.30$, $p = 0.18$. Stroke severity showed a non-significant trend $\chi^2 = 4.75$, $p = 0.08$. Cognitive function was significantly associated with return to work $\chi^2 = 10.18$, $p = 0.01$. $\alpha = 0.05$.

Judgment: Because the p value for cognitive function (0.01) is less than α (0.05) I reject the null hypothesis in part. Cognitive function is significantly associated with return to work. The overall null hypothesis that no clinical variables relate to return to work is not supported.

Statement III: There will be no significant relationship between psychosocial factors and returning to work after stroke.

Test statistics: Associations with psychosocial variables were tested via chi square (Table 8). Self-esteem was not significantly associated $\chi^2 = 1.68$, $p = 0.43$. Social support was strongly associated with return to work $\chi^2 = 14.67$, $p < 0.001$. Self-efficacy was also strongly associated $\chi^2 = 11.13$, $p < 0.001$. Disability level showed a marked association $\chi^2 = 25.94$, $p < 0.001$. $\alpha = 0.05$.

Judgment: The p values for social support, self-efficacy and disability level are all below α ($p < 0.001$); therefore I reject the null hypothesis. Psychosocial factors are significantly associated with return to work.

4.2.2 Sub-hypotheses

Statement I: There will be no significant relationship between age and return to work among stroke survivors.

Test statistics: Chi square test for age versus return to work $\chi^2 = 9.37$, $p = 0.02$, $\alpha = 0.05$.

Judgment: The p value (0.02) is less than α (0.05); therefore I reject the null hypothesis. Age is significantly associated with return to work.

Statement II: There will be no significant relationship between gender and return to work among stroke survivors.

Test statistics: Chi square test for gender versus return to work $\chi^2 = 0.004$, $p = 0.59$, $\alpha = 0.05$.

Judgment: The p value (0.59) is greater than α (0.05); therefore I fail to reject the null hypothesis. There is no evidence of a significant relationship between gender and return to work.

Statement III: There will be no significant relationship between marital status and return to work among stroke survivors.

Test statistics: Chi square test for marital status versus return to work $\chi^2 = 0.69$, $p = 0.89$, $\alpha=0.05$.

Judgment: The p value (0.89) is greater than α (0.05); therefore I fail to reject the null hypothesis. Marital status is not significantly associated with return to work.

Statement IV: There will be no significant relationship between type of stroke and return to work among stroke survivors.

Test statistics: Chi square test for stroke type versus return to work $\chi^2 = 0.17$, $p = 0.77$, $\alpha =0.05$.

Judgment: The p value (0.77) is greater than α (0.05); therefore I fail to reject the null hypothesis. There is no significant relationship between stroke type and return to work.

Statement V: There will be no significant relationship between stroke laterality and return to work among stroke survivors.

Test statistics: Chi square test for laterality versus return to work $\chi^2 = 3.30$, $p = 0.18$, $\alpha = 0.05$.

Judgment: The p value (0.18) is greater than α (0.05); therefore I fail to reject the null hypothesis. Stroke laterality is not significantly associated with return to work.

Statement VI: There will be no significant relationship between stroke severity and return to work among stroke survivors.

Test statistics: Chi square test for stroke severity versus return to work $\chi^2 = 4.75$, $p = 0.08$, $\alpha = 0.05$.

Judgment: The p value (0.08) is greater than α (0.05); therefore I fail to reject the null hypothesis. Stroke severity shows a non-significant trend but does not reach statistical significance in this sample.

Statement VII: There will be no significant relationship between cognitive function and return to work among stroke survivors.

Test statistics: Chi square test for cognitive function versus return to work $\chi^2 = 10.18$, $p = 0.01$, $\alpha = 0.05$.

Judgment: The p value (0.01) is less than α (0.05); therefore I reject the null hypothesis. Cognitive function is significantly associated with return to work.

Statement VIII: There will be no significant relationship between disability level and return to work among stroke survivors.

Test statistics: Chi square test for disability level versus return to work $\chi^2 = 25.94$, $p < 0.001$, $\alpha = 0.05$.

Judgment: The p value is less than α ($p < 0.001$); therefore I reject the null hypothesis. Disability level is strongly associated with return to work.

Statement IX: There will be no significant relationship between functional ability and return to work among stroke survivors.

Test statistics: Functional ability per se was not reported as a separate chi square in the supplied tables. Related constructs such as disability level and NIHSS components were tested; disability level was strongly associated with return to work $\chi^2 = 25.94$, $p < 0.001$. $\alpha = 0.05$.

Judgment: Because disability level, a close proxy for functional ability, is strongly associated with return to work I reject the null hypothesis in practice. If you wish I can run or report an explicit test using any functional ability variable you have available.

Statement X: There will be no significant relationship between self-esteem and return to work among stroke survivors.

Test statistics: Chi square test for self-esteem versus return to work $\chi^2 = 1.68$, $p = 0.43$, $\alpha = 0.05$.

Judgment: The p value (0.43) is greater than α (0.05); therefore I fail to reject the null hypothesis. Self-esteem is not significantly associated with return to work in this sample.

Statement XI: There will be no significant relationship between social support and return to work among stroke survivors.

Test statistics: Chi square test for social support versus return to work $\chi^2 = 14.67$, $p < 0.001$, $\alpha = 0.05$.

Judgment: The p value is less than α ($p < 0.001$); therefore I reject the null hypothesis. Social support is significantly associated with return to work.

Statement XII: There will be no significant relationship between self-efficacy and return to work among stroke survivors.

Test statistics: Chi square test for self-efficacy versus return to work $\chi^2 = 11.13$, $p < 0.001$, $\alpha = 0.05$.

Judgment: The p value is less than α ($p < 0.001$); therefore I reject the null hypothesis. Self-efficacy is significantly associated with return to work.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

This study examined the determinants of return to work (RTW) among stroke survivors in Edo State, Nigeria, focusing on socio-demographic, clinical, and psychosocial factors. The findings of this study revealed that majority of the participants (75%) returned to work after suffering stroke, a proportion notably higher than the 40–55% commonly reported in previous global studies (Han et al., 2019; La Torre et al., 2022) and the 55% reported among Nigerian stroke survivors by Peters et al. (2013). This higher rate may reflect contextual and socioeconomic factors in Edo State, where many individuals are self-employed or engaged in informal work that allows flexible reintegration compared to formal employment structures reported in earlier studies. The result aligns with Vestling et al. (2003), who found that motivation, social support, and functional recovery significantly enhance the likelihood of returning to work after stroke. However, it contrasts with findings from Orange et al. (2024) and Nascimento et al. (2021), which documented lower RTW rates, possibly due to stricter definitions of work resumption and shorter follow-up periods.

The findings further revealed that age, cognitive function, disability level, self-efficacy, and social support were significantly associated with RTW, while gender, marital status, stroke severity, stroke type, stroke laterality, and self-esteem showed no significant associations. Age was significantly related to RTW in this study, indicating that younger stroke survivors were more likely to resume work compared to older counterparts. This finding aligns with the results of Han et al. (2019) and Orange et al. (2024), who reported that younger age predicts a higher likelihood of RTW because younger individuals tend to experience faster recovery, fewer comorbidities, and better adaptability to post-stroke functional demands. Similarly, Peters et al. (2013) in Nigeria found that age was an important determinant of work resumption. However, this contrasts with the findings of Nascimento et al. (2021), who observed no significant association between age and RTW, possibly due to sample differences in occupational types or cultural variations influencing employment reintegration.

Additionally, the findings of this study revealed that gender and marital status were not significantly associated with RTW in the present study. This is consistent with Vestling et al. (2003) and Han et al. (2019), who noted that gender differences in RTW after stroke are diminishing, likely due to evolving social and occupational roles. Likewise, La Torre et al. (2022) found that marital status had minimal impact on RTW when social support and functional independence were accounted for. However, Orange et al. (2024) reported that men were more likely to return to work than women, which may reflect differences in occupational patterns and expectations across societies. The lack of gender influence in the current study could suggest more equal opportunities in employment or similar recovery expectations among male and female stroke survivors in Edo State.

Furthermore, among the clinical variables, stroke severity did not significantly predict RTW, which contrasts with the findings of Han et al. (2019) and Orange et al. (2024) who found that mild stroke severity was a key predictor of early work resumption. This discrepancy could be due to differences in sample composition or the cross-sectional design of the current study, which may have captured participants at varying stages of recovery. Conversely, disability level was strongly associated with RTW, consistent with Peters et al. (2013) and Nascimento et al. (2021), who both reported that individuals with less disability were more likely to return to work. This emphasizes that functional recovery and independence remain the most crucial clinical determinants of successful vocational reintegration after stroke. Furthermore, cognitive function showed a significant relationship with RTW, supporting findings from Han et al. (2019) and Orange et al. (2024), who identified cognitive capacity as a strong predictor of post-stroke employment outcomes. Stroke survivors with preserved cognitive abilities can perform work tasks more efficiently and adapt to environmental demands, whereas cognitive impairments often hinder workplace reintegration.

Stroke type and laterality were not significantly associated with RTW in this study. This finding agrees with La Torre et al. (2022), who reported that the type or side of stroke has limited direct influence on RTW once functional and cognitive consequences are accounted for. However, Orange et al. (2024) found that individuals with ischemic stroke were more likely to return to work than those with hemorrhagic stroke, suggesting that sample differences and stroke severity distribution might explain the contrasting results.

Regarding psychosocial determinants of RTW, self-efficacy was a significant determinant of RTW, indicating that stroke survivors who believed in their capacity to overcome challenges were more likely to re-engage in work. This finding corroborates the results of La Torre et al. (2022) and Peters et al. (2013), who highlighted the central role of self-efficacy in post-stroke adaptation and goal achievement. Similar to Han et al.

(2019), this study underscores that strong self-belief promotes persistence and motivation during rehabilitation and work re-entry. Social support also showed a significant association with RTW, which aligns with the findings of Han et al. (2019) and Vestling et al. (2003), who demonstrated that individuals with supportive family and workplace environments exhibit better adjustment and higher rates of work resumption. Support networks provide emotional encouragement, assist with daily tasks, and facilitate smoother transitions back into the workforce. This finding reinforces the importance of community and family involvement in rehabilitation planning. In contrast, self-esteem was not significantly related to RTW in this study. This contrasts with the report by La Torre et al. (2022), who found that self-esteem mediated the relationship between functional independence and RTW. The discrepancy might be due to contextual or cultural factors, as global self-esteem may not directly influence employment decisions in settings where economic necessity overrides psychological readiness. Moreover, as suggested by Han et al. (2019), self-esteem may be less predictive of concrete behavioral outcomes such as RTW compared to domain-specific constructs like self-efficacy.

5.2 Conclusion

This study examined the determinants of return to work (RTW) among stroke survivors in Edo State, Nigeria. The findings revealed that 75% of the participants returned to work after suffering a stroke, a proportion higher than those reported in previous studies. Age, cognitive function, disability level, self-efficacy, and social support were identified as significant predictors of RTW, while gender, marital status, stroke severity, stroke type, laterality, and self-esteem were not significantly associated. These results underscore that functional recovery, cognitive ability, and psychosocial resources play critical roles in post-stroke vocational reintegration.

5.3 Recommendations

i. **Rehabilitation practice:** Rehabilitation programs should incorporate self-efficacy–enhancing interventions, vocational counseling, and structured social support systems to facilitate successful RTW.

ii. **Policy and health System:** Policymakers should develop inclusive return-to-work policies and workplace reintegration programs that accommodate the physical and cognitive limitations of stroke survivors.

iii. **Clinical management:** Clinicians should prioritize functional independence and cognitive rehabilitation as part of routine stroke management, as these were strong predictors of RTW.

iv. **Community and family engagement:** Family members and community support networks should be actively involved in the rehabilitation process to provide emotional and practical assistance that supports work reintegration.

v. **Research and data development:** Future studies should employ larger, multi-center samples and use multivariate analytical models to identify the combined and interactive effects of clinical and psychosocial variables on RTW.

5.4 Implication for further research

i. Future research should adopt a longitudinal design to track stroke survivors over time and better understand how changes in functional and psychosocial status influence sustained return to work.

ii. Additionally, further studies should explore the quality, type, and sustainability of work after stroke considering both formal and informal employment contexts. Expanding the research to include multiple regions of Nigeria will also help to generalize findings and identify potential geographic or cultural differences affecting RTW outcomes.

REFERENCES

Acharya, Y., Badai, S., Vink, I., Ebisi, M., Arja, S., & Fadlallah Altahir Ahmed, T. (2018). A DESCRIPTIVE ANALYSIS OF PATIENT HISTORY BASED ON ITS RELEVANCE.

Adeloye D. (2014). An estimate of the incidence and prevalence of stroke in Africa: a systematic review and meta-analysis. PloS one, 9(6), e100724.

Adeloye, D., Ezejimofor, M., Auta, A., Mpazanje, R. G., Ezeigwe, N., Ngige, E. N., Harhay, M. O., Alemu, W., & Adewole, I. F. (2019). Estimating morbidity due to stroke in Nigeria: A systematic review and meta-analysis. Journal of the Neurological Sciences, 402, 136–144. https://doi.org/10.1016/j.jns.2019.05.020

Adeloye, D., Ezejimofor, M., Auta, A., Mpazanje, R.G., Ezeigwe, N., Ngige, E.N., Harhay, M.O., Alemu, W., & Adewole, I.F. (2019). Estimating morbidity due to stroke in Nigeria: a systematic review and meta-analysis. Journal of the Neurological Sciences, 402, pp. 136–144.

Akinyemi, R. O., Ovbiagele, B., Adeniji, O. A., Sarfo, F. S., Abd-Allah, F., Adoukonou, T., Ogah, O. S., Naidoo, P., Damasceno, A., Walker, R. W., Ogunniyi, A., Kalaria, R. N., & Owolabi, M. O. (2021). Stroke in Africa: profile, progress, prospects and priorities. Nature reviews. Neurology, 17(10), pp.634–656.

Albers, G. W., Marks, M. P., Kemp, S., Christensen, S., Tsai, J. P., Ortega-Gutierrez, S., McTaggart, R. A., Torbey, M. T., Kim-Tenser, M., Leslie-Mazwi, T., Sarraj, A., Kasner, S. E., Ansari, S. A., Yeatts, S. D., Hamilton, S., Mlynash, M., Heit, J. J., Zaharchuk, G., Kim, S., … DEFUSE 3 Investigators. (2018). Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging. The New England Journal of Medicine, 378(8), 708–718. https://doi.org/10.1056/NEJMoa1713973

Andersen, K. K., Olsen, T. S., Dehlendorff, C., & Kammersgaard, L. P. (2009). Hemorrhagic and Ischemic Strokes Compared. Stroke, 40(6), 2068–2072. https://doi.org/10.1161/STROKEAHA.108.540112

Arya, K. N., Pandian, S., & Kumar, V. (2019). Effect of activity-based mirror therapy on lower limb motor-recovery and gait in stroke: A randomised controlled trial. Neuropsychological Rehabilitation, 29(8), 1193–1210. https://doi.org/10.1080/09602011.2017.1377087

Bello, U. M., Chutiyami, M., Salihu, D., Abdu, S. I., Tafida, B. A., Jabbo, A. A., Gamawa, A., Umar, L., Lawan, A., Miller, T., & Winser, S. J. (2021). Quality of life of stroke survivors in Africa: A systematic review and meta-analysis. Quality of Life Research, 30(1), 1–19. https://doi.org/10.1007/s11136-020-02591-6

Birenbaum, D., Bancroft, L. W., & Felsberg, G. J. (2011). Imaging in Acute Stroke. Western Journal of Emergency Medicine, 12(1), 67–76.

Brannigan, C., Galvin, R., Walsh, M. E., Loughnane, C., Morrissey, E. J., Macey, C., ... & Horgan, N. F. (2017). Barriers and facilitators associated with return to work after stroke: a qualitative meta-synthesis. *Disability and rehabilitation*, *39*(3), 211-222.

Bruno, A., Shah, N., Lin, C., Close, B., Hess, D. C., Davis, K., ... & Switzer, J. A. (2011). Improving modified Rankin Scale assessment with a simplified questionnaire. *Stroke*, 41(5), 1048–1050.

Campbell, B. C. V., De Silva, D. A., Macleod, M. R., Coutts, S. B., Schwamm, L. H., Davis, S. M., & Donnan, G. A. (2019). Ischaemic stroke. Nature Reviews Disease Primers, 5(1), Article 1. https://doi.org/10.1038/s41572-019-0118-8

Chen, R., Ovbiagele, B., & Feng, W. (2016). Diabetes and Stroke: Epidemiology, Pathophysiology, Pharmaceuticals and Outcomes. The American Journal of the Medical Sciences, 351(4), 380–386. https://doi.org/10.1016/j.amjms.2016.01.011

Dobkin, B. H., & Dorsch, A. (2013). New Evidence for Therapies in Stroke Rehabilitation. Current Atherosclerosis Reports, 15(6), 331. https://doi.org/10.1007/s11883-013-0331-y

Dougherty, C. M., Johnston, S. K., & Thompson, E. A. (2007). Reliability and validity of the self-efficacy expectations and outcome expectations after implantable cardioverter defibrillator implantation scales. *Applied nursing research : ANR*, *20*(3), 116–124.

Dromerick, A. W., Edwards, D. F., & Diringer, M. N. (2003). Sensitivity to changes in disability after stroke: A comparison of four scales useful in clinical trials. *Journal of Rehabilitation Research and Development*, 40(1), 1–8.

Feigin, V. L., Brainin, M., Norrving, B., Martins, S. O., Pandian, J., Lindsay, P., F Grupper, M., & Rautalin, I. (2025). World Stroke Organization: Global Stroke Fact Sheet 2025. International journal of stroke : official journal of the International Stroke Society, 20(2), 132–144.

Feigin, V. L., Brainin, M., Norrving, B., Martins, S., Sacco, R. L., Hacke, W., … & Lindsay, P. (2022). World Stroke Organization (WSO): global stroke fact sheet 2022. International Journal of Stroke, 17(1), 18-29.

Feigin, V. L., Forouzanfar, M. H., Krishnamurthi, R., Mensah, G. A., Connor, M., Bennett, D. A., Moran, A. E., Sacco, R. L., Anderson, L., Truelsen, T., O’Donnell, M., Venketasubramanian, N., Barker-Collo, S., Lawes, C. M. M., Wang, W., Shinohara, Y., Witt, E., Ezzati, M., Naghavi, M., & Murray, C. (2014). Global and regional burden of stroke during 1990–2010: Findings from the Global Burden of Disease Study 2010. The Lancet, 383(9913), 245–255. https://doi.org/10.1016/S0140-6736(13)61953-4

Feigin, V. L., Stark, B. A., Johnson, C. O., Roth, G. A., Bisignano, C., Abady, G. G., Abbasifard, M., Abbasi-Kangevari, M., Abd-Allah, F., Abedi, V., Abualhasan, A., Abu-Rmeileh, N. M., Abushouk, A. I., Adebayo, O. M., Agarwal, G., Agasthi, P., Ahinkorah, B. O., Ahmad, S., Ahmadi, S., … Murray, C. J. L. (2021). Global, regional, and national burden of stroke and its risk factors, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. The Lancet Neurology, 20(10), 795–820. https://doi.org/10.1016/S1474-4422(21)00252-0

Ferrari, A. J., Santomauro, D. F., Aali, A., Abate, Y. H., Abbafati, C., Abbastabar, H., … & Bell, M. L. (2024). Global incidence, prevalence, years lived with disability (YLDs), disability-adjusted life-years (DALYs), and healthy life expectancy (HALE) for 371 diseases and injuries in 204 countries and territories and 811 subnational locations, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. The Lancet, 403(10440), 2133-2161.

Feske, S. K. (2021). Ischemic Stroke. The American Journal of Medicine, 134(12), 1457–1464. https://doi.org/10.1016/j.amjmed.2021.07.027

Gandhi, D. B., Sterba, A., Khatter, H., & Pandian, J. D. (2020). Mirror Therapy in Stroke Rehabilitation: Current Perspectives. Therapeutics and Clinical Risk Management, 16, 75–85. https://doi.org/10.2147/TCRM.S206883

GBD 2019 Stroke Collaborators (2021) Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Neurol 20: 795–820.

Goldstein, L. B., Bertels, C., & Davis, J. N. (1989). Interrater reliability of the NIH Stroke Scale. *Archives of Neurology*, 46(6), 660–662. https://doi.org/10.1001/archneur.1989.00520420080026

Grefkes, C., & Fink, G. R. (2020). Recovery from stroke: Current concepts and future perspectives. Neurological Research and Practice, 2(1), 17. https://doi.org/10.1186/s42466-020-00060-6

Gulrandhe, P., Acharya, S., Patel, M., Shukla, S., & Kumar, S. (2023). Pertinence of Constraint-Induced Movement Therapy in Neurological Rehabilitation: A Scoping Review. Cureus, 15(9), e45192. https://doi.org/10.7759/cureus.45192

Haines, D. E., & Mihailoff, G. A. (2018). Chapter 10—An Overview of the Brainstem. In D. E. Haines & G. A. Mihailoff (Eds.), Fundamental Neuroscience for Basic and Clinical Applications (Fifth Edition) (pp. 152–159). Elsevier. https://doi.org/10.1016/B978-0-323-39632-5.00010-4

Han, J., Lee, H. I., Shin, Y. I., Son, J. H., Kim, S. Y., Kim, D. Y., … & Kim, Y. H. (2019). Factors influencing return to work after stroke: the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) Study. BMJ open, 9(7), e028673.

Han, J., Lee, H. I., Shin, Y. I., Son, J. H., Kim, S. Y., Kim, D. Y., ... & Kim, Y. H. (2019). Factors influencing return to work after stroke: the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) Study. *BMJ open*, *9*(7), e028673.

Hartke, R. J., Trierweiler, R., & Bode, R. (2011). Critical factors related to return to work after stroke: a qualitative study. Topics in stroke rehabilitation, 18(4), 341-351.

Hewitt, J., Castilla Guerra, L., Fernández-Moreno, M. del C., & Sierra, C. (2012). Diabetes and Stroke Prevention: A Review. Stroke Research and Treatment, 2012, e673187. https://doi.org/10.1155/2012/673187

Hinkle, J. L. (2014). Reliability and validity of the National Institutes of Health Stroke Scale for neuroscience nurses. *Stroke*, *45*(3), e32-e34.

Hörnsten, C., Lövheim, H., Nordström, P., & Gustafson, Y. (2021). The Mini-Mental State Examination and its relation to dementia diagnosis in older adults. *BMC Geriatrics*, 21(1), 1–8. https://doi.org/10.1186/s12877-021-02199-7

Kohli, V., & Koltz, M. T. (2021). Indications for Surgical Intervention in the Treatment of Ischemic Stroke. In S. Dehkharghani (Ed.), Stroke. Exon Publications. http://www.ncbi.nlm.nih.gov/books/NBK572007/

Kondo, T., Nakano, Y., Adachi, S., & Murohara, T. (2019). Effects of Tobacco Smoking on Cardiovascular Disease. Circulation Journal, 83(10), 1980–1985. https://doi.org/10.1253/circj.CJ-19-0323

Kuriakose, D., & Xiao, Z. (2020). Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives. International Journal of Molecular Sciences, 21(20), Article 20. https://doi.org/10.3390/ijms21207609

La Torre, G., Lia, L., Francavilla, F., Chiappetta, M., & De Sio, S. (2022). Factors that facilitate and hinder the return to work after stroke: an overview of systematic reviews. La Medicina del lavoro, 113(3), e2022029.

La Torre, G., Lia, L., Francavilla, F., Chiappetta, M., & De Sio, S. (2022). Factors that facilitate and hinder the return to work after stroke: an overview of systematic reviews. *La Medicina del lavoro*, *113*(3), e2022029.

Larsson, S. C., Burgess, S., Mason, A. M., & Michaëlsson, K. (2020). Alcohol Consumption and Cardiovascular Disease. Circulation: Genomic and Precision Medicine. https://doi.org/10.1161/CIRCGEN.119.002814

Lyu, T., Yan, K., Lyu, J., Zhao, X., Wang, R., Zhang, C., Liu, M., Xiong, C., Liu, C., & Wei, Y. (2023). Comparative efficacy of gait training for balance outcomes in patients with stroke: A systematic review and network meta-analysis. Frontiers in Neurology, 14, 1093779. https://doi.org/10.3389/fneur.2023.1093779

Merino, J. G., & Warach, S. (2010). Imaging of acute stroke. Nature Reviews Neurology, 6(10), Article 10. https://doi.org/10.1038/nrneurol.2010.129

Mukherjee, D., & Patil, C. G. (2011). Epidemiology and the Global Burden of Stroke. World Neurosurgery, 76(6, Supplement), S85–S90. https://doi.org/10.1016/j.wneu.2011.07.023

Murphy, S. JX., & Werring, D. J. (2020). Stroke: Causes and clinical features. Medicine, 48(9), 561–566. https://doi.org/10.1016/j.mpmed.2020.06.002

nakhosin Ansari, N., & Naghdi, S. (2007). The effect of Bobath approach on the excitability of the spinal alpha motor neurones in stroke patients with muscle spasticity. Electromyography and Clinical Neurophysiology, 47, 29–36.

Nascimento, L. R., Scianni, A. A., Ada, L., Fantauzzi, M. O., Hirochi, T. L., & Teixeira-Salmela, L. F. (2021). Predictors of return to work after stroke: a prospective, observational cohort study with 6 months follow-up. Disability and rehabilitation, 43(4), 525-529.

Nascimento, L. R., Scianni, A. A., Ada, L., Fantauzzi, M. O., Hirochi, T. L., & Teixeira-Salmela, L. F. (2021). Predictors of return to work after stroke: a prospective, observational cohort study with 6 months follow-up. Disability and rehabilitation, 43(4), 525-529.

Ntaios, G., & Hart, R. G. (2017). Embolic Stroke. Circulation, 136(25), 2403–2405. https://doi.org/10.1161/CIRCULATIONAHA.117.030509

Opara, J., & Jaracz, K. (2010). Quality of life of post–stroke patients and their caregivers. Journal of Medicine and Life, 3(3), 216–220.

Orange, C., Lanhers, C., Coll, G., Coste, N., Dutheil, F., Hauret, I., … & Coudeyre, E. (2024). Determinants of return to work after a stroke: a systematic review and meta-analysis. Archives of physical medicine and rehabilitation, 105(2), 359-368.

Orange, C., Lanhers, C., Coll, G., Coste, N., Dutheil, F., Hauret, I., ... & Coudeyre, E. (2024). Determinants of return to work after a stroke: a systematic review and meta-analysis. *Archives of physical medicine and rehabilitation*, *105*(2), 359-368.

Owolabi, M., Olowoyo, P., Popoola, F., Lackland, D., Jenkins, C., Arulogun, O., Akinyemi, R., Akinyemi, O., Akpa, O., Olaniyan, O., Uvere, E., Kehinde, I., Selassie, A., Gebregziabher, M., Tagge, R., & Ovbiagele, B. (2018). The epidemiology of stroke in Africa: A systematic review of existing methods and new approaches. The Journal of Clinical Hypertension, 20(1), 47–55. https://doi.org/10.1111/jch.13152

Palstam, A., Westerlind, E., Persson, H. C., & Sunnerhagen, K. S. (2019). Work-related predictors for return to work after stroke. *Acta Neurologica Scandinavica*, *139*(4), 382-388.

Pandian, J. D., Gall, S. L., Kate, M. P., Silva, G. S., Akinyemi, R. O., Ovbiagele, B. I., Lavados, P. M., Gandhi, D. B. C., & Thrift, A. G. (2018). Prevention of stroke: A global perspective. The Lancet, 392(10154), 1269–1278. https://doi.org/10.1016/S0140-6736(18)31269-8

Parmar, P. P. author P. (2018, January 10). Stroke: Classification and diagnosis. The Pharmaceutical Journal. https://pharmaceutical-journal.com/article/ld/stroke-classification-and-diagnosis

Peters, G. O., Buni, S. G., Oyeyemi, A. Y., & Hamzat, T. K. (2013). Determinants of return to work among Nigerian stroke survivors. Disability and rehabilitation, 35(6), 455-459.

Peters, G. O., Buni, S. G., Oyeyemi, A. Y., & Hamzat, T. K. (2013). Determinants of return to work among Nigerian stroke survivors. *Disability and rehabilitation*, *35*(6), 455-459.

Pollock, A., Baer, G. D., Langhorne, P., & Pomeroy, V. M. (2008). Physiotherapy Treatment Approaches for Stroke. Stroke, 39(2), 519–520. https://doi.org/10.1161/STROKEAHA.107.492710

Powers, W. J., Rabinstein, A. A., Ackerson, T., Adeoye, O. M., Bambakidis, N. C., Becker, K., Biller, J., Brown, M., Demaerschalk, B. M., Hoh, B., Jauch, E. C., Kidwell, C. S., Leslie-Mazwi, T. M., Ovbiagele, B., Scott, P. A., Sheth, K. N., Southerland, A. M., Summers, D. V., & Tirschwell, D. L. (2019). Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke, 50(12), e344–e418. https://doi.org/10.1161/STR.0000000000000211

Rachpukdee, S., Howteerakul, N., Suwannapong, N., & Tang-aroonsin, S. (2013). Quality of Life of Stroke Survivors: A 3-Month Follow-up Study. Journal of Stroke and Cerebrovascular Diseases, 22(7), e70–e78. https://doi.org/10.1016/j.jstrokecerebrovasdis.2012.05.005

Raine, S. (2007). The current theoretical assumptions of the Bobath concept as determined by the members of BBTA. Physiotherapy Theory and Practice, 23(3), 137–152. https://doi.org/10.1080/09593980701209154

Rosenberg, M. (1965). Rosenberg self-esteem scale (RSE). Acceptance and Commitment Therapy. Measures Package, 61.

Rudberg, A.-S., Berge, E., Laska, A.-C., Jutterström, S., Näsman, P., Sunnerhagen, K. S., & Lundström, E. (2021). Stroke survivors’ priorities for research related to life after stroke. Topics in Stroke Rehabilitation, 28(2), 153–158. https://doi.org/10.1080/10749357.2020.1789829

Sacco, R. L., Kasner, S. E., Broderick, J. P., Caplan, L. R., Connors, J. J. (Buddy), Culebras, A., Elkind, M. S. V., George, M. G., Hamdan, A. D., Higashida, R. T., Hoh, B. L., Janis, L. S., Kase, C. S., Kleindorfer, D. O., Lee, J.-M., Moseley, M. E., Peterson, E. D., Turan, T. N., Valderrama, A. L., & Vinters, H. V. (2013). An Updated Definition of Stroke for the 21st Century. Stroke, 44(7), 2064–2089. https://doi.org/10.1161/STR.0b013e318296aeca

Sakinah, S., & Nugroho, S. D. (2022). Relationship Between Smoking and Ischemic Stroke: Meta Analysis. Journal of Epidemiology and Public Health, 7(1), Article 1. https://doi.org/10.26911/jepublichealth.2022.07.01.10

Sarason, I. G., Levine, H. M., Basham, R. B., & Sarason, B. R. (1983). Assessing social support: the social support questionnaire. *Journal of personality and social psychology*, *44*(1), 127.

Sarason, I. G., Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). A Brief Measure of Social Support: Practical and Theoretical Implications. *Journal of Social and Personal Relationships*, *4*(4), 497–510.

Schmitt, D. P., & Allik, J. (2005). Simultaneous administration of the Rosenberg Self-Esteem Scale in 53 nations: exploring the universal and culture-specific features of global self-esteem. Journal of personality and social psychology, 89(4), 623.

Sciacca, S., Lynch, J., Davagnanam, I., & Barker, R. (2019). Midbrain, Pons, and Medulla: Anatomy and Syndromes. RadioGraphics, 39(4), 1110–1125. https://doi.org/10.1148/rg.2019180126

Singh, R. (2021). Cerebellum: Its Anatomy, Functions and Diseases. In N. Ersoy Tunalı (Ed.), Neurodegenerative Diseases—Molecular Mechanisms and Current Therapeutic Approaches. IntechOpen. https://doi.org/10.5772/intechopen.93064

Skolarus, L. E., Burke, J. F., Brown, D. L., & Freedman, V. A. (2014). Understanding Stroke Survivorship: Expanding the Concept of Poststroke Disability. Stroke, 45(1), 224–230. https://doi.org/10.1161/STROKEAHA.113.002874

Spader, H. S., Grossberg, J. A., Haas, R. A., & Soares, G. M. (2013). Fundamentals of the Neurologic Examination for Patients Undergoing Central Nervous System Interventional Procedures. Seminars in Interventional Radiology, 30(3), 240–244. https://doi.org/10.1055/s-0033-1353476

Uloko, A. E., Musa, B. M., Ramalan, M. A., Gezawa, I. D., Puepet, F. H., Uloko, A. T., … & Sada, K. B. (2018). Prevalence and risk factors for diabetes mellitus in Nigeria: a systematic review and meta-analysis. Diabetes Therapy, 9, 1307-1316.

Velez, L., Toffel, S., Trejo-Lopez, J., Kresak, J. L., & Beal, S. G. (2020). Educational Case: Etiologies, Mechanisms, and Treatment of Stroke. Academic Pathology, 7, 2374289520901817. https://doi.org/10.1177/2374289520901817

Vestling, M., Tufvesson, B., & Iwarsson, S. (2003). Indicators for return to work after stroke and the importance of work for subjective well-being and life satisfaction. Journal of rehabilitation medicine, 35(3), 127-131.

Wafa, H. A., Wolfe, C. D. A., Emmett, E., Roth, G. A., Johnson, C. O., & Wang, Y. (2020). Burden of Stroke in Europe: Thirty-Year Projections of Incidence, Prevalence, Deaths, and Disability-Adjusted Life Years. Stroke, 51(8), pp.2418–2427

Wajngarten, M., & Silva, G. S. (2019). Hypertension and Stroke: Update on Treatment. European Cardiology Review, 14(2), 111–115. https://doi.org/10.15420/ecr.2019.11.1

Wang, Y. C., Kapellusch, J., & Garg, A. (2014). Important factors influencing the return to work after stroke. *Work*, *47*(4), 553-559.

Watson, H. (2015). A biopyschosocial approach to the return to work. *Occupational Health & Wellbeing*, *67*(8), 26.

Weir, C. B., & Jan, A. (2024). BMI Classification Percentile And Cut Off Points. In StatPearls. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK541070/

Wittkopf, P. G., & Johnson, M. I. (2017). Mirror therapy: A potential intervention for pain management. Revista Da Associação Médica Brasileira, 63, 1000–1005. https://doi.org/10.1590/1806-9282.63.11.1000

Yan, T., Hui-Chan, C. W. Y., & Li, L. S. W. (2005). Functional Electrical Stimulation Improves Motor Recovery of the Lower Extremity and Walking Ability of Subjects With First Acute Stroke. Stroke, 36(1), 80–85. https://doi.org/10.1161/01.STR.0000149623.24906.63

Yew, K. S., & Cheng, E. M. (2015). Diagnosis of Acute Stroke. American Family Physician, 91(8), 528–536.

Young, A. E., Roessler, R. T., Wasiak, R., McPherson, K. M., Van Poppel, M. N., & Anema, J. (2005). A developmental conceptualization of return to work. Journal of occupational rehabilitation, 15, 557-568.

Yu, C., Wang, W., Zhang, Y., Wang, Y., Hou, W., Liu, S., Gao, C., Wang, C., Mo, L., & Wu, J. (2017). The Effects of Modified Constraint-Induced Movement Therapy in Acute Subcortical Cerebral Infarction. Frontiers in Human Neuroscience, 11. https://www.frontiersin.org/articles/10.3389/fnhum.2017.00265

APPENDIX 1

SECTION 1

HEALTH RESEARCH ETHICS COMMITTEE (HREC)

UNIVERSITY OF BENIN TEACHING HOSPITAL

P.M.B. 1111 BENIN CITY NIGERIA Telephone: 052-600418 Website: ubth.org

CHIEF MEDICAL DIRECTOR
Prof. Darlington E. Obaseki
E-mail: darlobaseki@gmail.com

DIRECTOR OF ADMINISTRATION
Jim Uwadie, Esq

CHAIRMAN
Prof. (Mrs.) Antoinette N. Ofili

HREC OFFICE:
Committee email: ubthresearchethics@gmail.com
Registration Number:
NHREC-UBTH-HREC/24/12/2022B

PROTOCOL NUMBER: ADM/E 22/A/VOL.VII/2025/115

PROPOSAL TITLE: "DETERMINANT OF RETURN TO WORK AFTER STROKE IN BENIN CITY, EDO STATE"

PRINCIPAL INVESTIGATOR(S): IMEOKPARIA JOSHUA OSE-IKHUENMOSE

DEPARTMENT/INSTITUTION: DEPARTMENT OF PHYSIOTHERAPY, SCHOOL OF BASIC MEDICAL SCIENCES UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

DATE CONSIDERED: JULY 14TH, 2025

DECISION OF THE COMMITTEE: APPROVED

THIS APPROVAL DATES 14/7/2025 TO 13/7/2026. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

REMARK:

CHAIRMAN: PROF. (MRS) A.N. OFILI **SIGNATURE & DATE** 14/7/2025

SUPERVISOR (S): DR. ND. EKECHUKWU

DECLARATION BY INVESTIGATOR(S):

PROTOCOL NUMBER (please quote in all enquiries)

Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

Signature & Date.................................

ubthresearchethics@gmail.com Registration Number: NHREC/24/01/202

APPENDIX 2
SECTION 2
INFORMED CONSENT FORM

Title of the Study: Determinants of Return to Work After Stroke in Benin city, Edo state.

Investigator: Imeokparia Joshua Ose-ikhuenmose

Supervisor: Dr. Nd. Ekechukwu

Financial Sponsorship: This research project is self-sponsored

Purpose of the research: The purpose of the research is to determine the determinants (socio-demographics, clinical and psychosocial variables) of return to work after stroke in Benin city Edo state.

Procedures and protocol involved in the study

You are politely approached to respond to an interviewer-administered questionnaire interview.

This questionnaire would be only used for research purpose and will determine the determinants (socio-demographics, clinical and psychosocial variables) of return to work after stroke in Benin city Edo state.

Compensation

There will be no financial compensation for participating in this study.

Voluntary participation

Please note that your participation in this research is entirely voluntary. No form of discrimination will be meted to you, should you decide not to participate in this study; You are entirely free to change your mind and stop participating even if you agreed earlier.

Side Effects

There is no anticipated adverse effect associated with participating in this study.

Benefits

The purpose of the research is to determine the determinants (socio-demographics, clinical and psychosocial variables) of return to work after stroke in Benin city Edo state.

Confidentiality

All information and data obtained in the course of this study will be treated confidentially. The names of the participants will not be written on the questionnaire and all information collected will be encoded in a file in my personal computer and passworded. Thereafter the questionnaire will be shelved and locked in my personal document cabinet.

CONTACT INFORMATION

IMEOKPARIA JOSHUA OSE-IKHUENMOSE

PROJECT STUDENT

Email: Joshuaimeokparia@gmail.com

Ethics and Research Committee

University of Benin Teaching Hospital

Benin City.

Phone Number: 08153602413

CERTIFICATE OF CONSENT

I have read the above information (or it has been read to me). I had the opportunity to ask questions about it and the questions were answered to my satisfaction.

I consent voluntarily to take part as a participant in this study

I do not consent to participate in this study.

Signature of participant: ______________________

Date: ____________________

APPENDIX 3
SECTION 3

SOCIODEMOGRAPHIC DATA

Please fill in the details

Gender: ☐ **Female** ☐ **Male**

Age: ☐ **18 – 25** ☐ **26 -32** ☐ **33 -40** ☐ **> 40 years**

Education Level: ☐ **Primary** ☐ **Secondary** ☐ **Tertiary**

Marital status: ☐ **Single** ☐ **Married** ☐ **Divorced**

Religion: ☐ **Christian** ☐ **Muslim** ☐ **Traditional** ☐ **Others**

Socio-economic Status: ☐ **Low** ☐ **Medium** ☐ **High**

Occupation: ☐

RETURN TO WORK: ☐ **YES** ☐ **NO**

CLINCAL DATA

Type of Stroke: ☐

Laterality: ☐

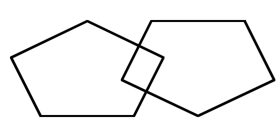
APPENDIX 4

SECTION 4

Mini-Mental State Examination (MMSE)

Patient's Name:____ Date: ______

Instructions: Score one point for each correct response within each question or activity.

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, …) Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 

30		TOTAL

Interpretation of the MMSE:

Method	Score	Interpretation
Single Cutoff	<24	Abnormal
Range	<21 >25	Increased odds of dementia Decreased odds
Education	21 <23 <24	Abnormal for 8^{th} grade education Abnormal for high school education Abnormal for college education
Severity	24-30 18-23 0-17	No cognitive impairment Mild cognitive impairment Severe cognitive impairment

APPENDIX 5

SECTION 5

Rosenberg Self-Esteem Scale (Rosenberg, 1965)

Instructions: Below is a list of statements dealing with your general feelings about yourself. If you **strongly agree**, tick in that column. If you **agree** with the statement, tick in the agree column. If you **disagree**, tick disagree. If you **strongly disagree**, tick strongly disagree.

		Strongly agree	Agree	Disagree	Strongly Disagree
1.	On the whole, I am satisfied with myself.				
2.*	At times, I think I am no good at all.				
3.	I feel that I have a number of good qualities.				
4.	I am able to do things as well as most other people.				
5.*	I feel I do not have much to be proud of.				
6.*	I certainly feel useless at times.				
7.	I feel that I'm a person of worth, at least on an equal plane with others.				
8.*	I wish I could have more respect for myself.				
9.*	All in all, I am inclined to feel that I am a failure.				
10.	I take a positive attitude toward myself.				

Scoring: SA=3, A=2, D=1, SD=0. Items with an asterisk are reverse scored, that is, SA=0, A=1, D=2, SD=3. Sum the scores for the 10 items. The higher the score, the higher the self esteem

APPENDIX 6

SECTION 6

SOCIAL SUPPORT QUESTIONNAIRE- SHORT FORM

1. Whom can you really count on to be dependable when you need help?
1a.How satisfied are you with that level of support?
2. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?
2a.How satisfied are you with that level of support?
3. Who accepts you totally, including both your worst and best points?
3a.How satisfied are you with that level of support?
4. Whom can you really count on to care about you, regardless of what is happening to you?
4a. How satisfied are you with that level of support?
5. Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?
5a. How satisfied are you with that level of support?
6. Whom can you count on to console you when you are very upset?
6a.How satisfied are you with that level of support?
1 = Very Dissatisfied, 2 = Fairly Dissatisfied, 3 = A Little Dissatisfied, 4 = A Little Satisfied, 5 = Fairly Satisfied, 6 = Very Satisfied

APPENDIX 7
SECTION 7

General Self-Efficacy Scale (GSE)

Scoring:

	Not at all True	Hardly true	Moderately true	Exactly true
All questions	1	2	3	4

The total score is calculated by finding the sum of the all items. For the GSE, the total score ranges between 10 and 40, with a higher score indicating more self-efficacy

General Self-Efficacy Scale (GSE)

	Not at all true	Hardly true	Moderately true	Exactly True
1. I can always manage to solve difficult problems if I try hard Enough	◻	◻	◻	◻
2. If someone opposes me, I can find the means and ways to get what I want.	◻	◻	◻	◻
3. It is easy for me to stick to my aims and accomplish my goals.	◻	◻	◻	◻
4. I am confident that I could deal efficiently with unexpected events.	◻	◻	◻	◻
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	◻	◻	◻	◻
6. I can solve most problems if I invest the necessary effort.	◻	◻	◻	◻
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	◻	◻	◻	◻

8. When I am confronted with a problem, I can usually find several solutions.	□	□	□	□
9. If I am in trouble, I can usually think of a solution	□	□	□	□
10. I can usually handle whatever comes my way.	□	□	□	□

APPENDIX 8
SECTION 8

MODIFIED RANKIN SCALE (MRS)

Rater Name: ___________________________________

Date: _________________________________

Score Description

0 No symptoms at all

1 No significant disability despite symptoms; able to carry out all usual duties and activities

2 Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance

3 Moderate disability; requiring some help, but able to walk without assistance

4 Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance

5 Severe disability; bedridden, incontinent and requiring constant nursing care and attention

6 Dead

TOTAL (0–6): __________

APPENDIX 9

SECTION 9

National Institute of Health Stroke Scale (NIHSS)

National Institutes of Health Stroke Scale (NIHSS)			Score
1a Level of consciousness (LOC)	0	Alert - keenly responsive	
	1	Drowsy – rousable by minor stimulation to obey	
	2	Stuporous- requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped)	
	3	Comatose – responds only with reflex motor or autonomic effects or totally unresponsive, flaccid	
1b LOC Questions	0	Answers both correctly	
	1	Answers one correctly ***Patient is asked to state the month & his/her age***	
	2	Both incorrect	
1c LOC Commands	0	Obeys both correctly ***Patient is asked to open & close eyes, grip & release normal hand***	
	1	Obeys one correctly	
	2	Both Incorrect	
2 Best Gaze	0	Normal ***Test horizontal eye movements (voluntary or following stimulus)***	
	1	Partial gaze palsy – gaze is abnormal in one or both eyes, no forced deviation/total gaze paresis	
	2	Forced deviation – or total gaze paresis not overcome by oculocephalic maneuver	
3 Visual Fields	0	No visual loss ***Test quadrants using finger counting or visual threat.***	
	1	Partial hemianopia	
	2	Complete hemianopia	
	3	Bilateral hemianopia including cortical blindness	
4 Facial Palsy	0	Normal ***Ask patient to show teeth, raise eyebrows, close eye***	
	1	Minor flattened nasolabial fold, asymmetry on smiling	
	2	Partial total or near total paralysis of lower face	
	3	Complete absent facial movement in upper and lower face and lower face on one or both sides	
5 Best Motor RIGHT ARM	0	No drift ***Hold each arm at 90° (sitting) or 45° (supine) for 10 seconds.***	
	1	Drift drifts down but does not hit bed	
	2	Some effort against gravity	
	3	No effort against gravity	
	4	No movement	
6 Best Motor LEFT ARM	0	No drift holds limb at 90 degrees for full 10 seconds	
	1	Drift drifts down but does not hit bed	
	2	Some effort against gravity	
	3	No effort against gravity	
	4	No movement	
7 Best Motor RIGHT LEG	0	No drift ***Hold each leg at 30° (supine) for 5 seconds***	
	1	Drift drifts down but does not hit bed	
	2	Some effort against gravity	
	3	No effort against gravity	
	4	No movement	
8 Best Motor LEFT LEG	0	No drift holds limb at 45 degrees for full 5 seconds	
	1	Drift drifts down but does not hit bed	
	2	Some effort against gravity	
	3	No effort against gravity	
	4	No movement	
9 Limb Ataxia	0	Absent (or in a coma) ***Ataxia is not usually present when weakness is present ,Test finger-nose-finger and heel-shin coordination.***	

	1 2	Present in 1 limb Present in 2 or more limbs	
10 **Sensory**	0 1 2	Normal ***Test pin-prick sensation on arm, legs, trunks, face*** Partial loss patient feels pinprick is less sharp or is dull on affected side Dense loss (or in a coma) patient is unaware of being touched on face, arm or leg	
11 **Best Language**	0 1 2 3	No dysphasia ***Assess speech using naming, repetition, and comprehension tasks e.g., reading a sentence*** Mild moderate dysphasia obvious loss of fluency or comprehension, without significant limitation on ideas expressed or form of expression. Makes conversation about provided material difficult or impossible e.g. examiner can identify picture or naming card from patients response Severe dysphasia all communication is through fragmentary expression: great need for inference, questioning and or guessing by the listener who carries burden of communication. Examiner cannot identity materials provided from patient response Mute no useable speech or auditory comprehension, or in a coma	
12 **Dysarthria**	0 1 2	Normal articulation ***Assess speech clarity by reading or repeating words.*** Mile moderate dysarthria patient slurs some words can be understood with some difficulty Unintelligible or worse speech is so slurred as to be unintelligible (absence of or out of proportion to dysphasia) or is mute/ or in a coma	
13 **Neglect**	0 1 2	No neglect (or in a coma) ***Test for neglect using double stimulation(visual/tactile).*** Partial neglect – visual tactile, auditory, spatial or personal inattention or extinction to bilateral simultaneous simulation in one of the sensory modalities Complete neglect-profound hemi-inattention or hemi-inattention to more than one modality. Does not recognise own hand or orients to only one side of space	
TOTAL SCORE			

APPENDIX 10
SECTION 10

Work Ability Index (WAI)

Section A: Pre-Stroke Work Baseline

Answer these questions based on your work situation **before your stroke**.

1. **Pre-Stroke Employment Status**
   Were you employed before your stroke?

   ☐ Yes (Full-time)

   ☐ Yes (Part-time)

   ☐ No (If no, skip to Section B)

2. **Pre-Stroke Work Duration**
   How many hours did you work per week before your stroke?

   _____ hours/week

3. **Pre-Stroke Work Frequency**
   What was the frequency of your work schedule before your stroke?

   ☐ Daily (e.g., 5–7 days/week)

   ☐ Specific days (e.g., 3 days/week)

   ☐ Irregular shifts

   ☐ Other: ____________________________

4. **Pre-Stroke Work Tasks**
   What specific tasks did you perform in your job before your stroke? (e.g., typing reports, lifting boxes, managing teams)

   ☐____________________________

5. **Pre-Stroke Task Performance Methods**
   How did you perform these tasks before your stroke? (Check all that apply)

   ☐ Independently

   ☐ With tools/equipment (specify: ___________________________)

   ☐ With assistance from others

   ☐ Under time pressure or stress

   ☐ Other: ___________________________

6. **Pre-Stroke Work Ability**
   On a scale of 0–10, how would you rate your work ability before your stroke? (0 = completely unable to work, 10 = best possible work ability)

   ☐_____ (0–10)

Section B: Work Ability Index (Post-Stroke)

Answer these questions based on your **current situation** (post-stroke). If you are not currently employed, answer based on your perceived ability to work.

7. **Current Work Ability Compared to Lifetime Best**
   Assume your work ability at its best (likely pre-stroke) has a value of 10 points. How many points would you give your current work ability?

   ☐ _____ (0 = completely unable to work, 10 = work ability at its best)

8. **Work Ability in Relation to Job Demands**
   How do you rate your current work ability with respect to the demands of your job?
   a. **Physical demands** (e.g., lifting, standing, walking):

   ☐ Very good (5)

   ☐ Rather good (4)

   ☐ Moderate (3)

   ☐ Rather poor (2)

☐ Very poor (1)
b. **Mental demands** (e.g., concentration, decision-making):

☐ Very good (5)

☐ Rather good (4)

☐ Moderate (3)

☐ Rather poor (2)

☐ Very poor (1)

9. **Number of Current Diseases Diagnosed by a Physician**
Which of the following health conditions have been diagnosed by a doctor and affect your work? (Check all that apply, then select the number of conditions.)

☐ Stroke-related impairments (e.g., weakness, paralysis, aphasia)

☐ Musculoskeletal (e.g., arthritis)

☐ Cardiovascular (e.g., hypertension)

☐ Mental health (e.g., depression, anxiety)

☐ Other: ____________________________
Number of conditions:

☐ 5 or more (1)

☐ 3–4 (2)

☐ 2 (3)

☐ 1 (5)

☐ 0 (7)

10. **Estimated Work Impairment Due to Diseases**
Do your health conditions (e.g., stroke-related impairments) hinder your current work?

☐ No hindrance (6)

☐ Very mild hindrance (5)

☐ Mild hindrance (4)

☐ Moderate hindrance (3)

☐ Great hindrance (2)

☐ Completely unable to work (1)

11. **Sick Leave During the Past 12 Months**
    How many days have you been absent from work due to health problems in the past 12 months?

    ☐ 0 days (5)

    ☐ 1–9 days (4)

    ☐ 10–24 days (3)

    ☐ 25–99 days (2)

    ☐ 100–365 days (1)

12. **Own Prognosis of Work Ability in 2 Years**
    Do you believe you will be able to do your current job (or a similar job) two years from now?

    ☐ Definitely (7)

    ☐ Probably (4)

    ☐ Unsure (2)

    ☐ Probably not (1)

    ☐ Definitely not (1)

13. **Mental Resources**
    How often do you experience the following? (Circle one for each)
    a. Enjoying daily activities:

    ☐ Often (4) ☐ Sometimes (3) ☐ Rarely (2) ☐ Never (1)
    b. Feeling active and alert:

☐ Often (4) ☐ Sometimes (3) ☐ Rarely (2) ☐ Never (1)
c. Feeling hopeful about the future:

☐ Often (4) ☐ Sometimes (3) ☐ Rarely (2) ☐ Never (1)

Section C: Post-Stroke Work Status

Answer these questions based on your **current work situation** (post-stroke).

14. **Current Employment Status**
    Are you currently employed?

    ☐ Yes (Full-time)

    ☐ Yes (Part-time)

    ☐ No

15. **Post-Stroke Work Duration**
    If employed, how many hours do you work per week now?

    _____ hours/week (If not employed, enter 0)

16. **Post-Stroke Work Frequency**
    If employed, what is the frequency of your work schedule now?

    ☐ Daily (e.g., 5–7 days/week)

    ☐ Specific days (e.g., 3 days/week)

    ☐ Irregular shifts

    ☐ Other: ____________________________

    ☐ Not employed

17. **Post-Stroke Work Tasks**
    Are you performing the same tasks as before your stroke?

    ☐ Yes, same tasks

    ☐ Yes, but modified (e.g., lighter duties, assistive tools)

☐ No, different tasks

☐ Not employed
If modified or different, describe: ___________________________

18. **Post-Stroke Task Performance Methods**
If employed, how do you perform your tasks now compared to pre-stroke? (Check all that apply)

☐ Independently

☐ With tools/equipment (specify: ___________________________)

☐ With assistance from others

☐ Under time pressure or stress

☐ Other: ___________________________

☐ Not employed

Scoring (WAI Portion, Items 7–13): Sum the scores (7–49):

- 7–27: Poor (significant RTW barriers)
- 28–36: Moderate (may need accommodations)
- 37–43: Good (minor adjustments needed)
- 44–49: Excellent (full work ability)