University of Kerbala
College of Nursing

Effect of Sitting Balance Exercises on the Level of Mobility, Postural Control, and Level of Dependency among Patients with Stroke

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بسم الله الرحمن الرحيم

﴿لَوْ أَنزَلْنَا هَٰذَا ٱلْقُرْءَانَ عَلَىٰ جَبَلٍ
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ٱللَّهِ ۚ وَتِلْكَ ٱلْأَمْثَٰلُ نَضْرِبُهَا لِلنَّاسِ
لَعَلَّهُمْ يَتَفَكَّرُونَ﴾

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Dedication

I dedicate my effort and work to:

- *Who inspired me with knowledge and the ability to work ...* My God and my Lord.
- *To those who enlighten the world with their light, my masters: Fatima, her father, her Husband and her sons (peace is upon them).*
- *The sole that lives in my life and my heart with my pride forever.* ... My father.
- *The spring of my soul*...My mother gives me support and courage with all my love and respect.
- *My love, my dear and my life partner for all supportive and encouraging words* ...My husband.
- *The shining stars in my life*...My brother and sisters. My dear friends, with my love and respect.

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Abstract

Stroke commonly results in problems with balance, which increases the falling risk, limit physical mobility, and increased dependency. Patients with stroke can improve their balance by engaging in balance training exercises. This study aims to identify the effect of sitting balance exercises on mobility, postural control, and dependency levels in patients with stroke. A quasi-experimental study was conducted at Imam Al- Hussein Medical City, from 26 September 2022 to 15 July 2023. A non-probability purposive sampling consisted of sixty patients with stroke was divided into intervention and control groups. The study instruments include physical mobility scale, berg balance scale, and modified barthel index scale. The scales validity was investigated by a panel of seventeen experts and reliability by a pilot study. The study results were examined and measured using a descriptive analysis method as well as an inferential analysis method (independent sample T-test, paired sample T-test, and ANOVA); a p-value of 0.05 was determined statistically significant. The study found that 53.3% and 66.7% of patients in control and intervention groups at pre-test assessment had severe mobility impairment, while 83.3% and 80% had high fall risk. Additionally, 76.7% and 86.7% had severe dependency levels. A significant difference at P-value of 0.000 was observed between pre-test and post-test assessments in physical mobility, balance, and dependency levels. Sitting balance exercises post-stroke for 15-30 minutes, two sessions per day for14 days significantly help to improve mobility, postural control, reduce dependency, and promoting independence in daily activities. The researcher recommends the importance of conducting other studies to investigate the effect of sitting balance exercises on other physical limitation for patients with stroke such as muscle weakness, or to prevent muscle atrophy or joint stiffness.

Key-Words: Stroke, Postural Control, Siting Balance Exercises, Mobility, Fall Risk, Dependency, Activity of daily living (ADL).

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List of Abbreviations

Abbreviations	***Meaning***
ACE	Angiotensin Converting Enzyme
ADL	Activities of Daily Living
AEDs	Anti-Epileptic Medicines
AF	Atrial fibrillation
AH	Arachnoid Hemorrhages
AHA	American Heart Association
ASA	American Stroke Association
AIS	Acute Ischemic Stroke
ANOVA	Analysis Of Variance
ASA	American Heart Association
ASPECTS	Alberta Stroke Program Early Ct Score
ATP	Adenosine Triphosphate
BBS	Berg Balance Scale
BBS	Berg Balance Scale
BC	Before Christ
BMI	Body Mass Index
BP	Blood pressure
CAA	Cerebral Amyloid Angiopathy
CDC	Center for Disease Control and Prevention
CI	Cognitive Impairment
CP	Conventional Physiotherapy
Cs	The Core, Care, And Cure

CSE	Core Stability Exercises
CT	Computed Tomography
CVA	Cerebrovascular Accident
CVI	Content Validity Index
DALYs	Disability Adjusted Life Years
Df	Degree of Freedom
DM	Diabetes Mellitus
DSPAU	Difference Of Sitting Pressure Between the Affected and Unaffected Sides
EEG	Electrocardiogram
EVT	Endovascular Therapy
FAST	Facial droop, arm weakness, slurred speech, and time of onset
FDA	Food and Drug Association
FVI	Face Validity Index
GCS	Glasgow Coma Scale
H0	Null Hypothesis
H1	Alternative Hypothesis
HTN	Hypertension
ICH	Intracranial Hemorrhage
ICP	Intracranial Pressure
I-CVR	Item Level Content Validity Index
I-FVI	Item Level Face Validity Index
I-FVR	Item Level Face Validity Index
IV tpa	Intravenous tissue-type plasminogen activator
IVT	Intravenous thrombolysis
IVT	Intravenous Thrombolysis
LVO	Large Vessel Occlusion
mg/kg	Milligram\Kilogram
MI	Myocardial Infarction
mmHg	Millimeter(S) Of Mercury
MRC	Medical Research Council (MRC)
MRI	Magnetic Resonance Imaging
MS	Mean Of Score
MT	Mechanical thrombectomy
MT	Mechanical Thrombectomy
n	Number

NCT scans	Non-Contrast Computed Tomography Scans
NHS	National Health Service
NIHSS	National Institutes of Stroke Severity Scale
NS	Non- Significant
PE	Pulmonary Embolism
PE	Pulmonary Embolism
PMS	Physical Mobility Scale
P-value	Probability Value
QOL	Quality Of Life
ROS	Reactive Oxygen Species
S.PSS ver.26	Statistical Package of Social Sciences Version 26 Program
SAH	Subarachnoid Hemorrhages
S-C.VI\UA	Scale-Level Content Validity Index Based on The Universal Agreement
S-CVI\Ave	The Scales\Levels of Content Validation Index
SD	Standard Deviation
SD	Standard Deviation
SE	Systemic Embolism
S-FVI\Ave	The Scales\Levels of Face Validation Index Based on An Average Method
Sig.	Significant
TENS	Transcutaneous Electrical Nerve Stimulation
TIA	Transient ischemic attack
tPA	Tissue – Type Plasminogen Activator
IV tPA	Intravenous -Tissue Type Plasminogen Activator
UA	Universal Agreement
UE	Upper Extremity
US	United States
USBG	Unstable Surface Balance Training
VRT	Virtual Reality Training
VRT	Virtual Reality Training
VUSBG	Visual Feedback Unstable Surface Balance Training Group
WHO	World Health Organization
Wk.	Week

List of Symbols

Symbols	***Meaning***
f.	Frequency
x^2	Chi Square Test
=	Equal To
%	Percent
&	And
<	Less Than
>	More Than
≤	Equal or Less Than
≥	Equal or More Than

Chapter one

Introduction

Chapter one

Introduction

1.1 Introduction:

Stroke, also called cerebrovascular accident (CVA), is well identified as a rapid decline in brain perfusion or vasculature. Around 85% of patients with stroke having the ischemic type, while the remaining (15%) are hemorrhagic (Khaku & Tadi, 2022). Stroke affects physical, psychological, and cognitive capabilities, and it is a leading cause of mortality and disability globally (Komiya, et al., 2021). After ischemic heart disease, stroke was the second-most leading cause of death (11.8% of all deaths) and the third-leading cause of disability (6.1% of disability adjusted life years [DALYs] from all causes) in the world (Feigin, et al., 2017).

Stroke causes 113 million DALYs and 10.3 million new strokes annually, resulting in significant burden for society in general (Pandian, et al., 2018). Between the years of 2012 and 2030, the American Heart Association (AHA) and the American Stroke Association (ASA) predicted that the overall direct medical costs for stroke will triple and equal to up to 184.1 billion dollars (Rajsic, et al., 2018).

Patients who have had a stroke complains a wide range of impairments impacting their ability to move, sense, and think, due to these impairments on function level. Also, patient with stroke frequently find it difficult to fully participate in society (Rooij, et al., 2021).

Multiple system connected to postural control that is damaged or impaired can disrupt motor or balance functions and increase the risk of falling. Stroke is one of these conditions contributing to a high risk of falls and significant personal and social consequences (Fornari, 2018), and make difficult to carry out regular tasks (Morizio, et al., 2021).

Patients who survive a stroke experience a variety of sensorial impairments, motor dysfunction, perceptual, visual problems, and altered spatial cognition with regard to the upright body position, leading to balance issues (Morizio, et al., 2021). Stroke survivors' movement is significantly impacted by deficiencies in motor function. Mobility problems may result from a number of factors, such as difficulties sitting, standing, or walking, weakened balance, an increased risk of falling, or inefficient walking (Atalan, et al., 2021).

Musculoskeletal and neural network systems interact intimately to create the postural control system. Motor, sensory, and higher order cognitive processes are neural system components required for postural control. In a healthy person, the trunk muscles that maintain postural stabilization are activated before the movements for both the upper and lower extremities while with in activation of the trunk muscles is impaired in stroke patients causing limb muscles are activated earlier than the trunk muscles (Sumardi, 2020).

The demand for rehabilitation services is rising as the number of stroke survivors rises (Stinear, et al., 2020). After a stroke, rehabilitation is an intensive process with a multidisciplinary focus on enhancing social contact (Thijs, et al., 2021), and to help the patient in regaining or maintaining as independent as possible (Abdullahi, 2018). With delayed and diminished anticipatory postural adjustments, a stroke survivor demonstrates difficulties in motor techniques for postural control. Patients suffering from chronic stroke benefit from balance exercises in terms of postural control when moving about and ambulation. These techniques have been proven to enhance postural control and gait speed within individuals when used in conjunction with normal rehabilitation (Komiya, et al., 2021).

Postural control plays a crucial role in daily activities. This is especially true when the upper extremities or trunk is involved, or when the body is being supported by the extremities. Control of one's posture is the outcome of numerous neural pathways and is based on the continual afferent information on body position and orientation via visual, vestibular, or somatosensory input, as well as the following motor instructions to muscle groups (Sousa, et al., 2022). The study conducted by Halmi, et al., (2020) shows that post-stroke patients had much more postural instability than healthy controls. Despite the damaged side's complete recovery four years after the stroke, this disparity is still noticeable.

Post-stroke dependency in activity of daily living (ADL) is a typical consequence and 35% of stroke survivors experience ADL dependency in the first year after their stroke, which is a typical post-stroke complication. Age, co-morbidity, decreased cognition, and stroke severity at onset are a few of the characteristics that have been associated to increased disability following stroke. Dependency may occur in functional daily living activities (such as shopping and paying bills) and personal daily living activities such as consuming food and wearing clothes (Wurzinger, et al., 2021).

One of the earliest significant life milestones is learning how to sit up. Unfortunately, a lot of stroke survivors realize they can't stand or sit up without falling (Hoffman, 2017). Enhancing trunk functioning and sitting balance constitute essential parts of stroke therapy. An essential indicator of ADL recovery is sitting balance (Thijs, et al., 2021). Exercises for improving sitting balance can help stroke survivors who have balance problems following their stroke to regain their sitting balance (Hoffman, 2017).

1.1 . Importance of study:

Stroke is a serious life-threatening medical condition that happens when the blood supply to part of the brain is disrupted (National Health Service (NHS), 2022). It is occurring as a result of blocking by a clot or bursts in the blood vessel that carries oxygen and nutrients to the brain (American Heart Association, 2022).

According to the World Health Organization (WHO), in Iraq, during 2020, 20,793 stroke deaths—or 14.19% of all deaths. Iraq ranks 31 in the world with an age-adjusted death rate of 128.44 per 100,000 people. In more than half of stroke survivors aged 65 and older, stroke impairs movement, up to 50% among survivors being chronically disabled and over 80% in the sub-acute phase experience a balance disturbance, 40% of stroke survivors remain struggle to perform basic ADL six months after a stroke, 30% report participation restrictions, even at four years after a stroke (Valdés, et al., 2021).

Stroke associated with multiple symptoms of cerebral vascular problems, such as difficulty swallowing, paralysis, gait instability, cognitive impairment, motor weakness, and difficulties with balance (Kim& Lee, 2021). The postural control is a complex ability based on the reciprocal conduct of the sensory and motor systems and impairment or damage in any of postural control related system can cause balance or motor disturbance and increase the fall risks (Fornari, 2018).

Maintaining proper posture is necessary for the benefit of the vulnerable side and to limit the effects of the altered postural tone in stroke survivors (Pellegrino et al., 2017). Any part of the postural control system that is neglected will raise the likelihood of falls and fall-related injuries and decrease the capacity to balance upright (Garner, et al., 2022). Among stroke patients, balance problems are occurred due to defect in the motor, sensory, and integrated aspects of controlling movement (Fukata, et al., 2019). Sitting balance impairment occur as a result of combination of muscular weakness, lack of flexibility, perceptual deficiencies, and a propensity to seek compensatory techniques to avoid balance risks (Pellegrino, et al., 2017). Multiple physical activities and exercise therapies are performed for the purpose of recovery by stroke patients (Kim& Lee, 2021). The most important component of recovery program is motor therapy (Thijs, et al., 2021), this can increase functional independence through improve balance and mobility (Pellegrino, et al., 2017). Functional impairment has a significant negative influence on quality of life for stroke survivors, 20 to 25% of all survivors are unable to walk without complete physical help, and 35% of survivors who first lost use of their limb does not recover it (Campos, et al., 2017).

The mobility of stroke survivors is significantly impacted by deficits in motor and sensory function. Mobility problems can be brought on by a number of factors, such as difficulties sitting, standing, or walking, weakened balance, an increased risk of falling, or sluggish walking (Atalan, et al., 2021). The capacity to execute limb movement will be restricted by reduced postural control as proximal stabilizer. Because postural control is now one of the factors that predicts the functional prognosis of a stroke, rapid and accurate assessment and treatment should start as soon as possible after the stroke (Sumardi, 2020).

Postural control is a necessary component of daily life and is crucial for steady and efficient movement, gait, and ADL (Kim, et al., 2019). Balance can be measured in a sitting and standing position and show that most patients with acute and sub-acute stroke cannot maintain the standing posture and they have a poor sitting balance (Lee, et al.,2021). Pervious study shows that post-stroke patients have significantly greater postural instability than healthy controls. Despite the affected side's complete recovery, this difference can still be seen up to 4 years following the stroke (Halmi, et al., 2020). While Komiya, et al. (2021) indicated that patients with stroke benefit from balance exercises to help patients in maintaining their postural control while mobility and walking. These techniques have been demonstrated to enhance postural control and walking abilities especially when used in conjunction with normal therapy.

Walking ability throughout the long term is thought to be early predicted by sitting balance and ADL1 (Inoue, et al., 2022), and cause change in the range of functional movement about 8% to 52% during nine to twelve weeks later (Sheehy, et al., 2020). According to study made by Wurzinger, et al. (2021) indicated that dependency in personal ADL during the first two days can explain dependency at three months and a year after a stroke. Early ADL evaluations following a stroke can be used to determine the patient's post-stroke rehabilitation needs. After stroke, sitting balance exercises can help manage balance problems to restore sitting balance and achieving independence (Hoffman, 2017).

1.2 . Problem statement:

Stroke is a dangerous medical condition that can lead to a variety of complications from brain injury, including motor weakness, sensory deficit and balance problems, therefore, stroke patients frequently experience issues with gait disturbance and reduced functional mobility (Kim& Lee, 2021). Following a stroke, the postural control system may be affected by an abnormal muscle activity pattern accompanied by weakness and muscle spasms soft tissue rigidity in the lower limbs, poor pelvic and trunk alignment (Dubey, etal., 2018). Any system connected to postural control that is damaged or impaired can interfere with balance or motor function (Fornari, 2018), and it may cause a high level of dependency and disability in individuals ADL (Khallaf, 2020).

Balance issues brought on by a stroke diminish the physical activity and raise the likelihood of falls (Komiya, et al., 2021). The morbidity related to stroke is high, and up to 50% of survivors develop a permanent disability. In the subacute stage, more than 80% of patients with stroke feel a balance disruption. Even four years after a stroke, thirty percent of patients with stroke maintain engagement limits and forty percent of survivor’s report trouble with basic ADLs (Valdés, et al., 2021).

According to previous studies, a variety of interventions have been developed, such as therapeutic exercise, stimulation using electricity, magnetic transcranial stimulation, and robotics-assisted exercise for walking (Kim& Lee, 2021). Many studies focusing on improve sitting balance, however, there is a need to explore new approaches to enhance sitting balance following stroke, especially in the subacute phase, when there is the most chance for neuroplasticity and healing (Sheehy, et al., 2020). Therefore, to address balance dysfunction, appropriate balance training is required. (Komiya, et al., 2021). A number of these research projects are constrained by inadequate sample numbers or a lack of a control group that is active that offers each treatment group the same amount of therapy time (Sheehy, et al., 2020).

There are only two study using program of sitting balance exercises first study by Sheehy, et al. (2020) performed using virtual reality training (VRT) in regulation of seated balance and upper limb function in individuals undergoing rehabilitation following a stroke, and another study that was conducted by Fukata, et al., (2019) that enrolled patients with poor sitting functioning during the initial days of stroke to describe the benefits of diagonally linked seated exercises consist of sitting balance performance on a slanted surface. It is clear that no actual study has been done in Iraq on sitting balance exercises, and also the variables of mobility, balance, and dependency have not been studied together in the same study previously. Therefore, the study will propose to apply sitting balance exercise in subacute stroke and investigate the effect of these exercise on postural control, mobility level and level of dependency among patient with stroke.

1.4. Research question:

Does sitting balance exercise affect on postural control, mobility level and level of dependency among patient with stroke.

1.5. Hypothesis:

a. **H0:** There is no significant effect of sitting balance exercise on postural control, mobility level and level of dependency among patient with stroke
b. **H1:** Siting balance exercise has a significant effect on postural control, mobility level and level of dependency among patient with stroke

1.6. Objectives of study:

1. To assess the level of mobility, postural control, and level of dependency among patients with stroke.

2. To determine the effect of sitting balance exercises on the level of mobility, postural control, and level of dependency among patients with stroke.
3. To find out the difference between the effect of sitting balance exercises on the level of mobility, postural control, and level of dependency with sociodemographic characteristics and clinical data of study participants.

1.7. Definition of the terms:

1.7.1. Sitting balance:

Theoretical definition: Sitting balance is considering an early predictor of long-term walking ability, ADL (Inoue, et al., 2022), and the capacity to manage posture is determined by a person's sitting balance (Shahi and Abbasi, 2022).

Operational definition: The capacity of patient post stroke for balance when executing tasks while seated.

1.7.2. Postural control:

Theoretical definition: is the capacity to sustain the equilibrium of the body and its constituent parts regardless of challenges that alter the body's balance (Garner, et al., 2022).

Operational definition: is the controlling of the stability and the orientation of the body's position among patient with acute stroke.

1.7.3. Mobility:

Theoretical definition: is the ability to move freely or be easily moved (Atalan, et al.,2021)

Operational definition: is the ability of patient post stroke to move around without need to support.

1.7.4. Dependency:

Theoretical definition: a situation in which patient with stroke need something or someone and are unable to continue normally without assistance (Cambridge Advanced Learner's Dictionary & Thesaurus, 2022).

Operational definition: is a state in which patient with acute stroke is unable to perform ADL without assistance.

Chapter two
Review of Literature

Chapter Two

Review of Literature

The overview of studies and concepts that enable to explain the subject matter of the current study is presented in this chapter.

2.1. Overview about stroke:

The term "stroke" was probably first used in medical context by William Cole in 1689 in a physical medical article about the late rates of "apoplexies," its most common term for acute non-traumatic brain injury. Hippocrates used it for more than 2000 years beginning in the year 400 before Christ (BC) (Alharbi, et al., 2019). The clinical definition of apoplexy, which comprised a number of illnesses, was a sudden collapse, loss of consciousness, and immobility. In the 17th century, Johannes Wepfer, a Swiss physician, first demonstrated that apoplexy was caused by an intracranial hemorrhage (as shown in figure 2-1); in 1664, Thomas Willis, an English anatomist, explored the circle of Willis as an anastomotic system of arteries that sits at the base of the brain. Then stroke became a cerebrovascular disease (Storey and Pols, 2010).

The World Health Organization (WHO) brought together a group in Monaco in 1970 for four days to talk about the issue of stroke, which was the third leading cause of death (behind ischemic heart disease and infectious/parasitic disease) in 40 of the overall 57 countries that were represented by the WHO, which involves the United States of America (USA), and was among the most common ten causes of mortality in fifty-four nations (Chang, et al., 2021).

Annual stroke death rates have exceeded 5.5 million during the past 20 years, affecting more than 12 million individuals worldwide. Statistics show that stroke is the second leading cause of death and leaves about 5 million individuals permanently disabled (Al-Obaidi, et al.,2023).

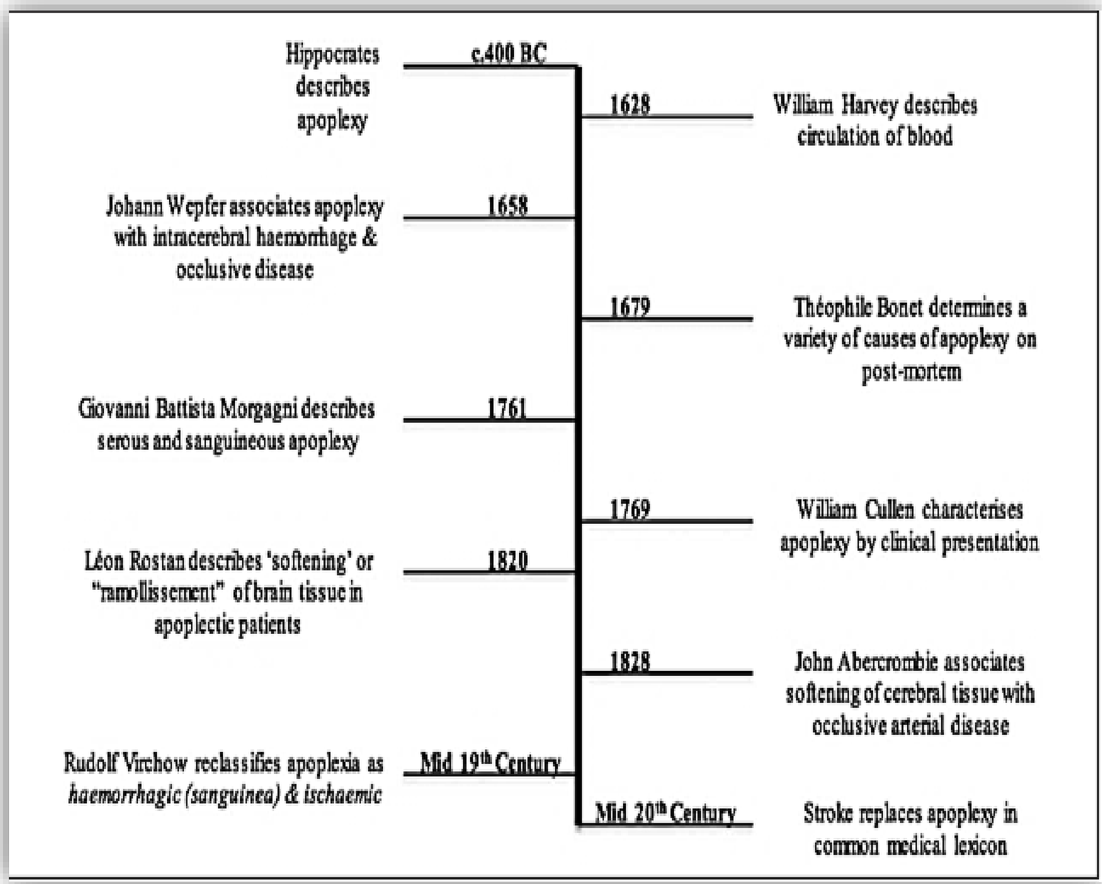

Figure 2-1: Historical timeline formulated from descriptive prose (Storey and Pols, 2010).

The most common disorders seen in clinical practice in Iraq, a Middle Eastern country, are coronary heart disease and stroke. According to Global Burden of Disease 2019 Stroke Collaborators, the incidence of stroke in Iraq varied from 196.2 to 218.3 per 100,000 persons in 2019. Additionally, a lot of Iraqis claim to have unhealthy lives, which include not getting enough exercise and eating high-calorie meals poorly (Al-Obaidi, et al.,2023).

The American Heart Association and American Stroke Association updated their accepted definition of stroke in 2013 to include silent infarctions, including those of the cerebral, spinal, and retina. Silent hemorrhages were also included. This adjustment was made in order to move away from a tissue-based definition of infarction and hemorrhage and toward a radiological demonstration of those two conditions (Coupland, et al., 2017). Stroke is the sixth leading cause for fatalities in USA, but it is still the major cause of serious long-term impairment (Chang, et al., 2021). The primary goal of nurses was to assist patients in adjusting to and coping with their disabilities (Nilsen, 2010).

The concept that "time is brain" the destruction of nerve tissue in the brain has been associated with a delay in management —has been proven by clinical studies. This principle highlights the significance of early stroke intervention, particularly in individuals with inadequate supplemented blood flow. In actuality, this problem necessitates that the desired intervention be feasible as well as simple to carry out in the field (Matei, et al., 2021).

2.2. Risk factor associated with stroke:

Multiple clinical and behavioral issues have been reported to increase the risk of having a stroke (Barthels and Das, 2020). If a person already has a medical condition like hypertension, coronary artery disease, or hyperlipidemia, their risk is significantly elevated. Patients with a history of transient ischemic attack (TIA) account for about 60% of stroke cases (Kuriakose and Xiao, 2020).

The risk factors for stroke can be divided into modifiable and non-modifiable. Age, previous cerebrovascular events, smoking, drinking, inactivity, dyslipidemia, diabetes mellitus (DM), cardiovascular illnesses, obesity, metabolic syndrome, nutrition, and genetic risk factors are the main risk factors for stroke (Koolaee, et al., 2018).

Age, sex, race and ethnicity, family history, previous stroke, and TIA are examples of non-modifiable risk factors that cannot be changed through lifestyle modifications or medical intervention (Alharbi et al., 2019). After age 55, the chance of incident stroke doubles every 10 years, and aging is the most significant non-modifiable risk factor. People under the age of 65 account for about three-quarters of all stroke cases (Yousufuddi and Young, 2019).

Alawneh, et al. (2022) reported that women have a lower prevalence of stroke than men. While another study by Barthels and Das (2020) demonstrate that females are more likely than males to die from a stroke. Typically, stroke result in six out of every ten mortalities among females. This elevated risk is due to a variety of factors. One of these is that women live longer on average than men do that make their chance of having a stroke is higher. Another factor is depression, anxiety, high blood pressure during pregnancy, and high blood pressure brought on by some types of birth control pills are more specific risk factors that affect only women.

Ischemic stroke has been linked to lack of activity, diabetes, hypertension (HTN), and lipidemia. In contrast, hemorrhagic stroke has been considerably associated only to HTN. Depression and dementia are additional stroke risk factors (Alawneh, et al., 2022). Blacks and Hispanics have higher stroke risk than non-Hispanic Whites. This study supports previous research that links race and ethnicity to an increased risk of stroke (Aldayel, et al., 2017).

The chance of inheriting a stroke is increased in subjects between the ages of 25 and 49 when there is a family history of an early stroke (Pourasgari and Mohamad khani, 2020). Many independent stroke-related threats such atrial fibrillation (AF), systemic embolism (SE), and all-cause mortality, and TIA enhances the risk of stroke in AF patients. Therefore, it is now more important than ever to assist individuals who suffer from AF whose have a previous experience of intracranial hemorrhage (ICH) and ischemic stroke or TIA (Yoshimoto, et al., 2022). According to evidence, the risk of stroke increases when more stroke risk factors are present (Zhang, et al., 2018).

Lifestyle adjustments or medical care are two ways to change modifiable risk factors. It is separated into medical conditions and lifestyle factors. Heart disease (myocardial infarction and atrial fibrillation), hypertension, asymptomatic carotid stenosis, diabetes mellitus, and hyperlipidemia are among the medical conditions. Obesity, excessive alcohol use, physical inactivity, and smoking are examples of lifestyles (Alharbi, et al., 2019).

Although there are some noticeable similarities between the risk factors for hemorrhagic and ischemic stroke, there are also major distinctions among the etiologic categories of ischemic stroke. Hypertension is a major predisposing elements for hemorrhagic attack, although it also causes atherosclerotic disease, which can result stroke with ischemic attack. Along with diminishing the risk associated with stroke, lifestyle and behavioral modifications including quitting smoking and modifying one's diet also lower the risk of other cardiovascular diseases. Other prevention measures include recognizing and treating diseases like diabetes and hypertension that raise the risk of stroke (Boehme, et al., 2017).

2.3. Pathophysiology of stroke:

When compared to other body organs, the brain is typically thought to be more susceptible to hypoxic injury. This is due to the presence of glutamate (a neurotransmitter) in high concentrations and the relatively high metabolic activity. Hypoxic damage can occur due to cerebral vascular blockage from an embolus or an existing thrombus (Alrabghi, et al., 2018). Two internal carotids located anteriorly and two vertebral arteries located posteriorly control the blood flow to the brain which called the circle of Willis (Kuriakose and Xiao, 2020). Pathophysiological mechanisms have different pathway between ischemic and hemorrhagic stroke as follow:

2.3.1. Pathophysiological mechanisms involved in ischemic stroke:

Ischemic stroke is caused by inadequate blood and oxygen delivery to the brain. Around 85% of stroke victims die from ischemic occlusions. Ischemic occlusion causes thrombotic and embolic situations in the brain. The narrowing of veins caused by atherosclerosis causing thrombosis affects blood infusing. Plaque buildup is going to lead the vessels in the brain to become more constricted and clots to form, which will result in thrombotic stroke.

The diminishing in circulation to the cerebral cortex area causes an embolism result in an embolic stroke; this embolism causes acute stress and early cell death (necrosis). Organelles swell and spill cellular contents into extracellular space, the plasma membrane is damaged, and the activity of neurons is lost after necrosis (Kuriakose and Xiao, 2020), Adenosine triphosphate (ATP) generation is disrupted, energy deficits result, ion homeostasis is affected, and there is an acid-base imbalance, all of which are characteristics of an ischemic stroke. Another characteristic is the interruption of cerebral blood flow (Qin, et al., 2022). Elevated intracellular calcium ratio are additional significant events that contribute to stroke pathology (Kuriakose and Xiao, 2020).

These dysfunctions collectively result in brain edema, neuroinflammation, and neural cell death, which together result in severe neurological deficits. Stroke pathogenesis and causes, including cellular excitotoxicity and mitochondrial dysfunctions, are now better understood (Qin, et al., 2022).

2.3.2. Pathophysiological mechanisms involved in hemorrhagic stroke:

Blood vessels burst as a result of internal damage and stress on the brain tissue. It is divided into ICH and subarachnoid hemorrhage (Kuriakose and Xiao, 2020). Pathophysiology of hemorrhagic stroke involve three mechanisms (as shown in figure 2-2):

a- Vascular changes caused by hypertension:

Intracerebral Hemorrhage (ICH) was typically initiated from burst arteries which deteriorated as a result of chronic hypertension. The media and smooth muscles in the responsible arteries have clearly degenerated. In contrast to cerebral amyloid angiopathy (CAA), which is comparatively prevalent in the lobar ICH, lipohyalinoses, and frequently associated with chronic hypertension, is more frequently detected in non-lobar ICH (An, et al., 2017).

b-Cerebral amyloid angiopathy (CAA): is an age-related condition which triggers ICH in elderly people and is marked by the buildup of the amyloid-peptide in the blood vessels, arterioles, and smaller and medium-size arteries in the brain's cerebral cortex, leptomeninges, and cerebellum. Young patients had likelihood to develop a familial syndrome, which is frequently brought on by changes in the gene that codes for amyloid precursor protein. Around 50% of people older than 70 years old have CAA, as the prevalence of the disease rises with age. Due to CAA, recurrent hemorrhages can happen (Unnithan, et al., 2023).

c-Molecular pathophysiology:

When a hematoma compresses brain parenchyma as part of the initial injury mechanism for ICH, parenchymal structure is physically disrupted. Expanding hematoma can cause increased intracranial pressure, which can have an impact on the passage of blood, structural distortion, the discharge of neurotransmitters, dysfunction of cells with mitochondria, and depolarization of the membrane. After endothelial damage and hemoglobin breakdown, the clotting cascade, specifically thrombin, is linked to a secondary cause of brain injury. Thrombin induces the infiltration of inflammatory cells into the brain, the growth of mesenchymal cells, the development of cerebral edema, and the production of scar tissue. When thrombin binds to protease-activated receptor1, the complement cascade and microglia in the central nervous system are activate (An, et al., 2017). Tissue-type plasminogen activator (tPA) was considered only medication approved by the food and drug association (FDA) for this purpose, is frequently administered to do this. However, due to its limitations, less than 10% of patients with stroke are eligible for tPA usage (Alrabghi, et al., 2018).

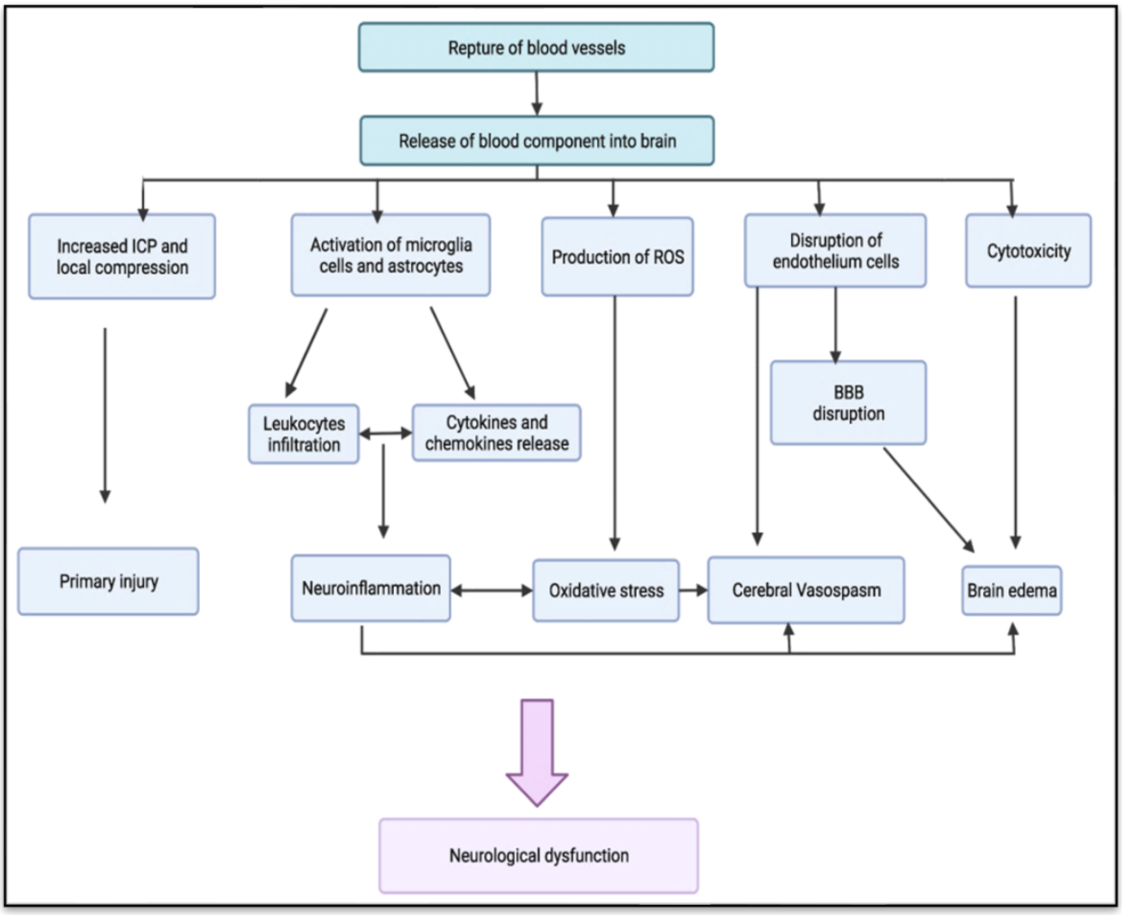

Figure 2-2: Pathophysiology of hemorrhagic stroke (Xu, et al.,2022)

2.4. Types of strokes: there are three different types of strokes (see figure2-3), that include ischemic, hemorrhagic, and transit ischemic attack.

2.4.1. Ischemic stroke:

When a cerebral vessel occludes, blocking 80% or more of the vessel, an ischemic stroke happens (Alrabghi, et al., 2018). Both circumstances lead to local hypoxia, which damages brain tissue, while ischemic strokes are brought on by blockage of an artery in the brain. Although both types of strokes are dangerous and common, ischemic strokes account for 87% of all strokes in the US. Blood clots that get lodged in one of the brain's arteries frequently cause blockages in ischemic strokes (Barthels and Das, 2020).

Boehme, et al. (2017) propose that ischemic stroke can be further subdivided into what have been called etiologic subgroups, or groups, thought to indicate the causes of the stroke. There are three types of ischemic stroke: cardioembolic stroke, lacunar stroke, and large vessel stroke. The vertebrobasilar structure, middle cerebral arterial system, anterior cerebral arterial system, and the inside of the carotid artery are just a few of the main brain arteries that may become occluded by thrombosis or embolism in the event of a large artery stroke. Typically, lacunar strokes are caused by the involvement of smaller or perforating blood arteries supplying the deeper brain areas Chugh (2019).

2.4.2. Hemorrhagic stroke:

The two types of hemorrhagic strokes are ICH and subarachnoid hemorrhages (SAH). Myocardial infarctions, hypertension, and use of thrombolytics are predisposing factors that significantly raise the likelihood of experiencing a hemorrhagic stroke (Unnithan, et al.,2022). Arachnoid hemorrhages (AH) are the result of a hemorrhage from a cerebral blood vessel, aneurysm or vascular malformation into the subarachnoid space, the space surrounding the brain where blood vessels lie between the arachnoid and pia mater (Parmar, 2018).

Stroke caused by ICH is defined as “rapidly developing clinical signs of neurological dysfunction attributable to a focal collection of blood within the brain parenchyma or ventricular system that is not caused by trauma” (Parmar, 2018). Because most ICH aren't triggered by a high blood pressure using the term "hypertensive intracerebral hemorrhage" is not beneficial (Murphy and Werring, 2020).

From case to case, hemorrhagic strokes can appear in a number of different medical ways. The majority of individuals enter with serious headaches, nausea, and a dangerously elevated blood pressure. Minutes after initial clinical indications, severe neurological problems begin to develop. These early signs have been demonstrated to largely line up with bleeding strokes, but they can infrequently occur with any other kind of stroke (Ojaghihaghighi1, et al., 2017).

2.4.3. Transient ischemic attack (TIA):

Transient ischemic attack (TIA) define as a short episode of focal neurological impairment that lasts less than 24 hours and is not accompanied by a permanent cerebral infarction. Stroke is characterized as a localized neurological dysfunction that appears suddenly and lasts for longer terminating in mortality earlier than 24 hours. Because treatment for stroke is time-sensitive and these criteria are no longer appropriate in clinical settings because the 24-hour period of time is random from among 30-50% of the individuals with clinically-defined TIA exhibit confirmation of cerebral ischemia or infarction when using magnetic resonance imaging (MRI) (Murphy and Werring, 2020).

In emergency rooms and primary care clinics, mild strokes or TIAs that have been relatively involve common appearance (Perry, et al., 2022). Transient ischemia symptoms appear prior to 20–25% of ischemic strokes, these symptoms only last a few seconds or minutes. Symptoms typically lasting less than an hour and rarely may last up to 24 hours (Amarenco, 2020).

There are two definitions of TIA that are frequently used. One is time-based (symptoms disappearing through twenty-four hours period), whereas the other one depends on how the tissue seems, such as when an MRI demonstrates no infarction. To differentiate between TIA, patients with suspected cerebral ischemia may experience a small stroke or probable imitation such as migraine headaches, convulsions, dizziness, or fainting should have an immediate assessment. About 50% of initial TIA or minor stroke diagnosis is stroke mimic. After patients are diagnosed with mini strokes or TIA, it took a lot of tests and evaluations to figure out the problem since it has an impact on management (Perry, et al., 2022).

Provide a critical chance to promptly identify and address the underlying problem in order to avoid a life-threatening stroke. Without therapy, the risk of stroke can reach 20% after three months, and the majority of this risk happens in the first 10 days, especially the first two. According to observational data, an early clinical diagnosis and rapid preventive treatments are linked to a reduction in the 3-month risk of stroke of up to 80%. According to this study, there was a 5% chance of having a stroke within three months, but that chance increased significantly after a TIA (Perry, et al., 2022).

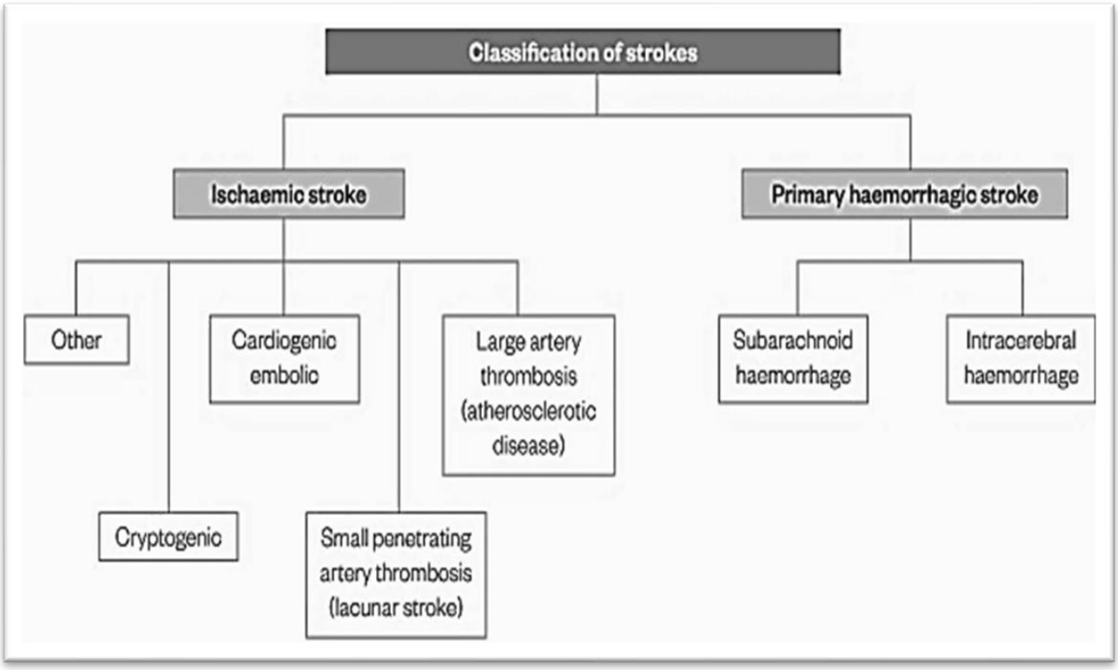

Figure 2-3: Classification of stroke (Parmar, 2018)

2.5. Clinical manifestation:

2.5.1. Clinical manifestation of ischemic stroke:

The site of the brain affected by the blocked arteries determines how a stroke will manifest clinically (Chugh, 2019). Three main factors contributing to ischemic stroke occurrence which involved: impaired circulation, an embolism, and blood clot—the most common cause—have all been proposed as factors contributing to ischemic stroke. These individuals' signs and symptoms might range in intensity and develop gradually over the course of many hours. A stroke caused by ischemia can cause a variety of symptoms, including paralysis, a movement disorder, weakness, vomiting, and visual gazing. The location of these symptoms, however, is dependent on the portion of the brain (Ojaghihaghighi1, et al., 2017). A preliminary screening within the respiratory tract, respiration, circulation, and cardiovascular integrity is going to be determined by measurements of vital signs and appropriateness to proceed to the scan, much like in any emergency condition. Approximately eighty percent of individuals who experience an initial stroke due to ischemia have elevated blood pressure (140 mmHg systolic), which naturally decreases via time of the next week and is linked to worse outcomes in both ischemic stroke and intracerebral hemorrhage (Hurford, et al.,2020).

FAST are abbreviation for (Facial dropped, arm vulnerability, speech difficulties, and time of arrival). The FAST technique was originally created by the American Heart Association and American Stroke Association and introduced in 1998 for the prehospital identification of stroke.

The BEFAST approach added: ‘B’ for balance changes and ‘E’ represent eye sight change in one or both eyes (Aroor, et al., 2017). Another method to diagnose stroke was the 6S method which abbreviated:

1. Suddenly (symptoms frequently appear out of nowhere).
2. Slurred speech (incoherent, drunken-sounding speech).
3. Side weakness (face, arm, leg, or all three of these might become weak).
4. Spinning (dizziness).
5. A extremely severe headache.
6. Seconds (mark the moment the symptoms begin and get straight to the hospital). All these symptoms listed above may be present and assist in the diagnosis of both ischemic and hemorrhagic stroke (Chugh, 2019).

2.5.2. Clinical manifestation of hemorrhagic stroke:

The majority of ICH occur throughout daily tasks; however, some individuals only notice them when they are under extreme physical or emotional stress. Typically, the neurologic symptoms deteriorate within a few minutes to an hour. Clinical signs depend on the size and location of the ICH, which commonly occurs in the putamen (An, et al., 2017). The common clinical manifestations of a hemorrhagic stroke are an acute headache, nausea, neck stiffness, blood pressure increases, and rapidly manifesting neurological symptoms. The location and size of the hemorrhage can be determined by symptoms. Coma occurs through engagement of the brainstem's reticular activating system (Unnithan, et al., 2022).

Patients with large hematomas are more likely to experience headaches, which are caused by the rise in the intracranial pressure, or the stress on meningeal sensory fibers, or blood in the cerebrospinal fluid. headache is rarely associated with deep, tiny blood clots. Vomiting is experienced by around 50% of patients suffering hemispheric ICH, although it arises more commonly in people with cerebellar hemorrhage. Seizures reported approximately 10 percent of ICH individuals and fifty percent of those experiencing lobar hemorrhage (An, et al., 2017).

2.6. Diagnosis of stroke:

The distinction between the kind of stroke is essential for patient care and recovery, and prompt evaluation and therapy may greatly minimize the likelihood of neurological impairment in patients suffering from stroke. Despite the fact that non-contrast computed tomography scans (NCT scans) are frequently used because they can detect hemorrhage in the early hours following stroke, not all hospitals and emergency rooms have access to them. Early detection is critical for stroke victims to prevent permanent defects. Despite the apparent reality that diagnostic imaging is necessary to differentiate between different forms of stroke, clinical results might still be useful in settings without imaging equipment (Ojaghihaghighi1, et al., 2017). Stroke Diagnosis include the following steps:

2.6.1. *Pre-imaging:*

Neuroimaging performed quickly is crucial for stroke victims. The only prior examination recommended by the American Stroke Association (ASA) is a vascular glucose level in the blood, which clinicians frequently collect (Hurford, et al.,2020).

2.6.2. *Imaging:*

Images exhibiting ischemic damage and related clinical warning signs are used to diagnose stroke. The most accurate way to detect brain infarcts using MRI through apply diffusion-weighted approaches for comparison of the necrotic brain size to the size of the circulatory deficit. Among hyperacute state, diffusion weighted imaging changes are visible. Other diagnostic techniques, such as computed tomography (CT), a diagnostic cerebral angiography, and a CT angiogram/perfusion can be used to identify cerebral infarct in the acute setting (Matei, et al., 2021). A head CT scan without contrasting is suitable to determine whether thrombolysis is appropriate because it is quick, sensitive, and economical in ruling out cerebral hemorrhage. However, as a result of the overall tissue concentration of water, the visible parenchymal atrophy modifies increases several hours after infarction first has taken place, the accuracy and precision of CT scanning are much lower for acute ischemia. Early implementing the 10-point Alberta stroke programme immediate CT Score (ASPECTS) can be measured during ischemic alterations to determine the degree of parenchymal damage. In minor stroke and TIA, intracranial large arterial obstruction is another indication of poor prognosis (Hurford, et al.,2020).

2.7. Complications associated with stroke:

After an acute stroke attack, there are several medical, neurological, and psychosocial problems. Medical and neurological consequences represent an important contributor in mortality and morbidity and have a negative impact on functional success. They are a continuing and anticipated aspect of inpatient rehabilitation following stroke. The length of hospital stay, functional recovery, stroke outcomes, and cost of care can all be hampered by these problems. Additionally, some patients need to transfer to the acute care setting, which delays the inpatient rehabilitation therapy and raises the overall cost of stroke management (Fekadu, et al., 2019). Stroke causes a variety of complications, such as musculoskeletal discomfort, pulmonary embolism, deep vein thrombosis, shoulder dislocation, pressure sores, spasticity, swallowing issues, urinary tract infections, and psychological issues. The most common complications experienced over a year following stroke were falls (73%), contractures (60%), discomfort (55%), shoulder pain (52%), emotional distress (50%), and pressure sores (22%). Additionally, about 65% of stroke survivors have hemiparesis and hemiplegia, which are frequent and well-known stroke deficits (Khazaal, et al., 2021).

According to the study of Chohan, et al. (2019) described the long-term effects and repercussions of a stroke (including the medical, musculoskeletal, and psychosocial issues). It consists of:

1. Post-stroke seizures, urinary incontinence, bowel incontinence, and cognitive impairment are late medical consequences.
2. Musculoskeletal issues: hypertonicity and spasticity; shoulder pain in hemiplegics; wrist and hand flexion
3. Psychosocial consequences include:

- Post-stroke depression
- Emotional lability (pseudobulbar affect)
- Mood/emotional changes

2.8. Therapeutic management of stroke:

Stroke management is a dynamic process, and time plays an important role in determining the effectiveness of acute stroke therapies and the patient's long-term prognosis. Delay in patient presentation to the hospital, many patients do not receive treatment in time, causing to pass the treatment's during effective time frame. The lack of awareness of the warning signs and risk factors linked with stroke is one of the primary causes of the lengthening of this period between the time frame across the starting point of symptoms to the hospital's presentation (Cámara, et al., 2020). According to Chalifoux (2021) since the early 1990s, when there was no option for acute treatment, other advancements in stroke treatment have occurred including:

•1996 – Intravenous tissue-type plasminogen activator (IV tpa) or alteplase was originally approved for use in patients presenting within three hours of their last known normal baseline and was later expanded to 4.5 hours.

• 2015 - The standard of care for individuals with a big vessel occlusion (The inside of the carotid artery or intermediate cerebral circulation) who presents inside six hours of exposure of their last known normal baseline was endovascular therapy.

• 2018 - Patients with emergent large vascular occlusions who present 6–24 hours after the beginning of symptoms should undergo established thrombectomy.

2.8.1. Therapeutic management of ischemic stroke:

There are many different opinions on the treatment of ischemic stroke that are as follow:

2.8.1. a. Early Detection:

Ischemic stroke can occur both in the community and in a hospital, thus bystanders and/or providers must recognize it. A chain of survival particular to strokes is triggered by early awareness. Stroke is a clinical diagnostic, and stroke patients can be recognized based on a number of characteristics of their clinical presentation. Emergency medical systems are crucial for the identification, evaluation, and transportation of stroke patients to treatment institutions (Herpich & Rincon, 2020).

The most important factor in the management of an acute ischemic stroke is time. Every minute, 190,0000 brain cells, 14 billion connections between nerves, and 12 kilometers (7.5 miles) of nerve fibers are lost in an ischemic stroke patient. Every hour in which the brain is not receiving blood causes it to age by 3.6 years (Chugh, 2019).

2.8.1.b. Intravenous thrombolysis (IVT):

Currently, the only FDA-approved therapy for the treatment of ischemic stroke is tPA, a thrombolytic medication that dissolves the clot. However, this medication must be administered to the stroke victim 4.5

hours after the onset of their symptoms (Barthels and Das, 2020). In the event of major vessel occlusion, IVT may be used alone or in combination with endo vascular therapy (EVT) and MT. Patients with large vessel occlusion (LVO) are advised to get MT between 4.5 and 6 hours after the onset of symptoms, either alone or in combination with IVT, within 4.5 hours (Mosconi and Paciaroni, 2022).

Although successful, intravenous treatment has certain inclusion and exclusion criteria that limit how many patients can use it. Additionally, intravenous tPA has limited effectiveness in individuals with major artery blockage and cannot be utilized after the 4.5-hour timeframe. (Chugh, 2019).

Patients over the age of 18 who have a disabling deficit that is frequently measured using the National Institutes of Stroke Severity Scale (NIHSS) and who are presumed to have had an ischemic stroke with no signs of an acute hemorrhage on a non-contrast head computed tomography are eligible for this treatment. This includes patients with fast improving symptoms who are significantly deficient, seizures at the outset with incapacitating symptoms unrelated to a postictal state, high NIHSS scores, and age greater than 80 (Lyden and Wold, 2022). Even if they are being considered for mechanical thrombectomy, the 2021 updates of the American Heart Association (AHA)/American Stroke Association (ASA) guidelines suggests administering intravenous thrombolysis to individuals who are susceptible to acute ischemic stroke. Pre-treatment with intravenous thrombolysis, especially in drip and ship models of care, may prolong the time before mechanical thrombectomy, which increases the chance for effective recanalization (Mistry, et al., 2017).

2.8.1.c. Mechanical thrombectomy (MT)**:**

According to Mathews and Jesus (2022) a blood clot or thrombus is removed using endovascular devices during a mechanical interventional treatment called a thrombectomy, which is guided by an image. Although it is also a procedure utilized for clot removal in acute myocardial infarction and pulmonary embolism (PE), thrombectomy is most frequently used in acute cerebral ischemic stroke. Different methods are used in mechanical thrombectomy. Stent retrieval, direct aspiration, or a combination of the two are the most often used catheter-based procedures. In cases of ischemic cerebral stroke, the main goal of mechanical thrombectomy is to save the ischemic penumbra. Recent years have seen a marked increase in the indications for mechanical thrombectomy.

Aspirin should be administered during the first 24 to 48 hours of an acute ischemic stroke (AIS) according to a 2018 AHA/ASA guideline. Aspirin administration is often delayed for 24 hours for patients receiving intravenous alteplase (Fekadu, et al., 2019). Aspirin has been demonstrated in several studies to lower the incidence of recurrent stroke by about 20% (Johnston, et al.,2018).

Patients with high blood pressure who are otherwise qualified to receive treatment with alteplase should have a blood pressure reading of less than 185/110 mm Hg. It is advised for certain individuals who may receive treatment within 3-4.5 hours of the beginning of ischemic stroke symptoms to administer intravenous alteplase (0.9 mg/kg, maximum dose 90 mg over 60 min, with the initial 10% of dose given as a bolus over 1 min) (Fekadu, et al., 2019).

2.8.2. Therapeutic management of hemorrhagic stroke:

There are many different opinions on the treatment of hemorrhagic stroke that are as follow:

2.8.2.a. Blood pressure (BP) management:

Patients with intracerebral hemorrhage frequently have raised blood pressure. Hypertension is associated with worse prognosis, increased hematoma extension, and neurological impairment. According to AHA recommendations, immediate systolic BP reduction to 140 mmHg is safe and can be beneficial for improving functional outcome in patients with intracerebral hemorrhage who present with systolic BP 150–220 mmHg and no contraindication to acute BP therapy (Wajngarten and Silva, 2019).

Beta-blockers (e.g. labetalol, esmolol), angiotensin converting enzyme (ACE) inhibitors (e.g. enalapril), calcium channel blockers (e.g. nicardipine), or hydralazine should be taken in order to steadily drop the blood pressure to 150/90 mmHg. The patient's blood pressure should be checked every 10 to 15 minutes (Unnithan, et al.,2021).

2.8.2.b. Management of raised intracranial pressure (ICP):

Another important aspect to take into account in individuals with intracerebral bleeding is intracranial pressure. It is advised to maintain cerebral perfusion pressure between 61 and 80 mmHg if the systolic blood pressure is greater than 180 mmHg and there is evidence or reason to suspect that intracranial pressure is elevated. A minor decrease in blood pressure (160/90 mmHg) is advised if there is no evidence or reason to suspect that there is an increased intracranial pressure. Acute reduction to 140 mmHg is probably safe if the systolic blood pressure is between 150 and 200 mmHg. Drugs that might result in a protracted or abrupt drop in blood pressure should be avoided (Wajngarten and Silva, 2019).

The first two medical treatments for higher levels of ICP involves using of osmotic agents (mannitol, hypertonic fluid) and raising the level of the head of the patient's bed around thirty degrees. Mannitol is given in twenty percent quantities of 1.0 to 1.5 g/kg (Unnithan, et al.,2021).

2.8.2.c. Hemostatic therapy:

Hemostatic therapy is used to control hematoma growth. It is advised to use fresh frozen plasma, vitamin K, recombinant active factor VII, and prothrombin complex concentrates. However, a phase III randomized study demonstrated no therapeutic benefit for people without coagulation disorders using hemostatic treatment (Xu, et al., 2022). Hemostatic therapy is offered to cease thrombus progress. This becomes crucial for those who use blood thinners to reverse the coagulopathy (Unnithan, et al.,2021).

2.8.2.d. Antiepileptic Therapy:

Anti-epileptic medications (AEDs) should be given in patients with ICH who present with clinical seizures or electrographic seizures, according to the recommendations on seizure prophylaxis. For patients with SAH, routine AED medication is advised, especially for those who have a higher risk of developing seizures (Xu, et al., 2022).

A seizure will take place within 3 to 17% of patients throughout the first two weeks. Approximately 30% of affected individuals are likely to have epileptic seizures when their electrocardiogram (EEG) is being monitored. Pathological seizures or electrographic seizures need to be treated with antiepileptic medications. Seizures brought on by lobar hematoma and hematoma growth are accompanied by worsening neurological conditions (Unnithan, et al.,2021).

2.8.2.e. Surgery:

Patients with ICH may benefit from surgical evacuation to reduce the mass impact and complication brought on by hematoma. Indicators for urgent surgical intervention in ICH patients include brainstem compression, neurological decline, and hydrocephalus caused by ventricular blockage (Xu, et al., 2022).

The various surgical procedures used to treat hemorrhagic stroke include stereotactic aspiration, endoscopic aspiration, catheter aspiration, decompressive craniectomy, and craniotomy. Early surgery may be beneficial for those with lobar hemorrhages that are diminished clinical deficits and a separation from the surface of the brain of less than 1 cm about Glasgow Coma Scale (GCS > 9) (Unnithan, et al.,2021).

2.8.2.f. Cerebroprotection

Erythrocyte aggregates and thrombin lethality occur because of inflammatory conditions, oxidative stress, and other factors make up hemorrhagic stroke's subsequent damage. Therefore, methods to reduce them are being tested. To lessen inflammatory damage, pioglitazone, misoprostol, and celecoxib are used. The administration of calcium channel blocker has a neuroprotective effect that helps patients to recover from SAH more quickly (Unnithan, et al.,2021).

2.8.3. Post stroke recovery management:

Optimizing post-stroke results requires a thorough rehabilitation program. Three key concepts of recovery are used in the rehabilitation process: neuroplasticity, restoration, and adaptation. Numerous techniques, both pharmacological and nonpharmacologic, are available to improve rehabilitation based on these concepts (Belagaje, 2017). Disorders caused by stroke frequently result in hemiplegia, which causes a paralyzing condition of half a person's body, and hemiparesis, which creates muscular weakness, can lead to permanent impairment and impair the capacity to carry out ADL. Following a stroke occurrence, restoration procedures must be the main focus of efforts to regain the patient's independence in doing daily tasks. Depending on a number of variables, such as the stroke patient's reliance status, the patient may receive treatment at a hospital, rehabilitation center, or even at home (Lestari, et al., 2021).

2.9. Benefit of sitting balance exercises for patient with stroke:

About 90% of recovery can be attained within three months of onset, and post-stroke neurological and functional recovery are influenced by the pathophysiology and location of the lesion. Also, the incidence of falls is increased as a result of poor capacity to control balance and the recruitment of muscles. Patients with post-stroke hemiplegia who have reduced coordination experience a loss of lower limb function, and diminished physical activity impairs independent ADL (Rhyu and Rhi, 2021). Sitting balance exercises consist of five exercises that necessitated extending across arm's length and bending the trunk, it includes:

1. Shift Weight from one Side to another:

Carefully the patient moves his/her weight to one side while maintaining a straight back; sustain that position for a little while, then return to the center. Continue on the opposite side. 20–30 sets of this exercise, or as many are feasible for the patient, can be performed in one round (Hoffman, 2017)

2. Reaching:

A ball should be held by a partner just beyond arm's reach from the patient. The ball is placed in various spots as they cautiously stretch towards it. In the event that you get clumsy and begin to tumble, the patient could want more assistance. 10-15 repetitions should be added to the exercise (Hoffman, 2017)

3. Seated Leg Lift:

Beginning by sitting up straight and bracing his/her hands. Lift a single leg up while maintaining his/her bent knee for roughly five seconds. Switch to the opposite leg, and repeat. In accordance with his/her strength, perform the exercise between five and ten more times (Hoffman, 2017)

4. Single-Leg Knee Extensions:

Extend one leg at the knee and throw it to the floor while sitting up straight and keeping his/her core active. Repeat with the other leg, and repeat. Perform two sets of 15 repetitions (Hoffman, 2017)

5. Reach With Clasped Hands:

Extend his/her hands straight forward until his/her entire body is engaged while ensuring that the patient was not in risk of falling while keeping his/her hands tightly gripped together. Hold for 5 seconds, after which the patient should sit back in your chair as usual. Ten times through the workout. Additionally, the patient can work on reaching to either side of his/her body (Hoffman, 2017)

2.9.1. The effect of sitting balance exercises on mobility level:

Muscle weakness after a stroke is a typical complication that can significantly reduce social and physical activities. The chance of discharge improves and walking ability recovery is particularly crucial because it is frequently necessary for ADL (Wang, et al.,2020).

After a stroke, it's typical to lose balance while walking, and 70% of stroke victims who live at home report falling within a year of their diagnosis. Reduced walking speed is a defining feature of post-stroke gait and is a result of frequent post-stroke issues such muscle weakening and lack of voluntary motions. Improving walking is an essential rehabilitation objective for stroke survivors in order to increase opportunities for social interaction and employment restoration (Arienti, et al., 2019). A crucial component of functional mobility after a stroke is sitting balance, which accounts for functional movement fluctuated from 8% to 52% between 9 weeks and 12 months thereafter. Reaching tasks involving the upper extremities require sufficient trunk stability (Sheehy et al., 2020). In order to regain walking abilities, balancing training and limb strengthening may be necessary since compensatory use of an unaffected limb in ADL is highly prevalent in stroke patients (Wang, et al.,2020).

Subacute stroke patients' sitting balance can be improved with rehabilitation (Sheehy, et al., 2020), especially sitting balance exercise which assist stroke survivors to restore their sitting balance (Hoffman, 2017). As previous study was conducted by Yeo, et al., (2023) to figure out if unstable surface balance training and visual feedback in conjunction with proprioceptive neuromuscular activation are helpful at regaining mobility and balance among individuals with chronic stroke, showed that a visual feedback complex exercise based on the proprioceptive neuromuscular activation principle may be an effective therapeutic technique to increase gait rapidity, the trunk equilibrium, and movement.

2.9.2. The effect of sitting balance exercises on postural control:

Walking and mobility after a stroke depend on postural control and balance. It's necessary to train specifically for weight bearing on the affected side. The best indication of independence in walking and everyday life activities for stroke patients is reportedly postural control. Therefore, one of the most important steps in the rehabilitation process is to help hemiplegic patients achieve a stable standing position and enhance their postural control (Ordahan, et al., 2015).

In terms of sitting balance, new research has shown that by incorporating visual feedback into well planned, tailored physiotherapy, stroke patients can functionally improve their postural control. However, for those experiencing strokes, using visual instruction in addition to carefully developed seated balancing activities may be helpful that take into account the onset time and balance features (Inoue, et al., 2022).

Postural balance can be improved using balance exercises. Exercise for balance can help lower the chance of getting older. Exercises for balance have the effect of making the muscles in the lower limbs stronger. Muscle contraction during sports or activities can improve strength by more than 100%. Regular exercise helps slow down the loss of muscle mass across age. According to research, exercising can make muscles stronger. Actin and myosin, which are the muscles' contractile proteins, can be replenished after two weeks of activity, according to research (Lestari, et al., 2021).

Determining the degree of poor postural control is critical in assessing the risk of falling and the efficacy of treatment (Dunsky, 2019). The majority of stroke patients, both acute and subacute, have poor sitting balance and are unable to maintain a standing position (Lee, et al., 2021). Balance exercises performed while sitting can assist in resolving balance problems following a stroke (Hoffman, 2017).

Training in sitting balance with the use of technology is possible and secure for those who have had a chronic stroke. In addition to standard treatment, a four-week, 12-session program may have positive impacts on functional balance (Thijs, et al., 2021).

2.9.3. The effect of sitting balance exercises on level of dependency:

Impairment of function of the central nervous system results in neurosensory coordination of movements that is constrained, which disrupts exercising and reduces autonomous activity (Lestari, et al., 2021). Brain injury due to stroke has a direct effect on ADL, paralysis and language impairment, visual impairment, gait impairment, and loss of balance and motor control. Thus, rehabilitation exercises for stroke patients focuses on training to restore ADL (Rhyu and Rhi, 2021). It has been noted that functional balancing performance is connected to sitting ability in the early and subacute phases of the stroke's onset and that sitting ability is an essential early predictor of long-term walking ability, ADL, and depression. Particularly, it has been demonstrated that lateral sitting balance mirrors future functional alterations in the early post-stroke phase (Inoue, et al., 2022).

The frequency of participating in a programme for recovery can influence how quickly a patient heals from their impairment. Patients who undergo reintegration following a stroke might lessen their risk of problems and return to their usual daily activities by doing so more often (Lestari, et al., 2021). Performance in ADLs and balance abilities are closely associated. Particularly fundamental ADLs like moving around and using bathrooms require sufficient balance. Falls are caused by insufficient balance, which can cause very serious secondary harm (Jeon, et al., 2019).

Activities for balance are part of an exercise programme that aims to enhance the body's abilities in order to emerge from difficulties performing daily tasks. Those with stroke exhibit almost twice as much postural sway when standing compared to healthy people due to balance impairment, and they also exhibit decreased stability and balance for postural preservation. Due to these causes, when stroke patients maintained an upright posture, ankle dysfunction and instability were induced by left-right imbalances, changed bone structure, and anteroposterior and anteroinferior asymmetry. These issues facilitated ADL difficulties (Rhyu and Rhi, 2021).

A typical stroke symptom that can affect movement and daily activities is a decrease in balance abilities. However, one of the essential components that might determine a stroke patient's functional level is the measurement of their balance. All stroke patients must define rehabilitation goals using mobility prediction since movement is essential for independent daily functioning. Restoring mobility is one of the physical goals of stroke therapy, thus it is crucial to educate patients and their families about the degree of mobility that may be recovered in order to enjoy a normal social life. Additionally, it is essential that the mobility level prognosis can motivate patients to actively participate in rehabilitation (Lee, et al., 2021). Lestari, et al., (2021) conducted quasi-experiment study has been demonstrated that the use of balancing exercises can increase the patient's degree of independence.

2.10. Theoretical framework:

Hall's Care, Core, and Cure Model is the theory that corresponds with the subject of the current thesis. The person, the body, and the disease are the three components Hall described for the patient. The care, core, and cure aspects were seen by her as overlapping circles that influenced one another. "Everyone in the health professions either ignores or considers any or all of these, but each profession, to be a profession, must have an exclusive area of expertness with which it practices, develops new procedures and theories, and receives newcomers to its practice." (Parker and smith, 2010).

In the 20th century, Lydia E. Hall was a significant figure in nursing philosophy and practice. She is famous for developing the Care, Cure, and Core philosophy, which outlines the several facets of a nurse's responsibility in delivering healthcare to patients who are chronically ill (Alligood, 2018).

Hall was raised in York, Pennsylvania after being born in New York City in 1906. She graduated with a nursing diploma and graduated in 1927 from York Hospital School of Nursing. She later went on to graduate from Columbia University in 1932 in nursing with a bachelor's degree with a focus on public health. After working in the medical field for several years, Hall got a master's degree in educating in the biological sciences in life in 1942 (Gonzalo, 2023).

She was given the distinguished achievement in nursing practice award by Columbia University in 1967. The Loeb Center for Nursing at Montefiore Hospital in New York City was designed and developed by Hall, who also applied her theory to nursing practice (Priyadarshini, 2021).

Nursing was defined by Lydia E. Hall as "participation in care, core, and cure components of patient care, where care is the primary responsibility of nurses, and core and cure are shared with other members of the health team." She inspired nurses at various levels of their careers and served as a mentor, and a supporter of people with chronic illnesses. She made an effort to implied the neighborhood in matters of health for the public (Gonzalo, 2023).

According to Hall, "Looking at and listening to oneself is often too difficult without the assistance of a major figure (nurturer) who has learnt how to hold up a mirror and sounding board to enable the behaver to see and listen to himself. If he accepts, he will investigate the issues reflected in his actions. As he listens to his investigation through the nurse's mirror, he may discover in order his challenges, the problem area, his problem, and eventually the threat causing his out-of-control behavior" (Priyadarshini ,2021).

2.10.1. Hall three aspects of nursing:

Lydia Hall developed her idea based on her understanding of psychiatry and her work as a nurse at the Loeb Center. It also is known as "the Three Cs of Lydia Hall" and consists of the core, care, and cure, three separate but related circles (Gonzalo, 2023). Three different yet connected patient care facets are given priority in this nursing approach.

Care:

The care aspect is concerned with the patient's body, is the first component of Hall's theory. This element includes intimate bodily care as well as the biology of the human body (Alligood, 2018) as shown in (Fig.2-4).

Hall separated between the areas that are within the scope of nursing specifically and those that are shared by other professions, describing nursing as having three characteristics based on her perspective of the patient. As the patient moves from a medical crisis to the rehabilitative stage of the illness, the circles overlap and alter in size. According to Hall, the practice of professional nursing is carried out by providing care that encourages interpersonal interaction, invites the patient to discover how to get to the core of his problems, and supports him through any potential treatments (Parker and smith, 2010).

The information in Hall's Care relates to nursing knowledge and procedures. When a person is unable of taking care of their own personal needs, nursing is required (Cosejo,2021).

Hall refers to this characteristic as "care" and emphasizes the importance of the natural and biological sciences to practice. The purpose of physical therapy is to put the patient at ease. The patient's person and body react to the physical care by way of this consoling (Parker and smith, 2010).

Core:

The focus of nursing is on the patient, whether they are a person, a family, or a community. The biological, social, behavioral, and humanities sciences are all included in the core area for nurses. The implementation of social sciences that emphasizes on the individual's knowledge and use of oneself in therapy. The nurse emphasizes the patient's social, emotional, spiritual, and intellectual requirements in connection to their family, institution, society, and the wider world, using relationships as a therapeutic tool (Cosejo,2021).

Cure:

The subsequent phase of the process of nursing, which collaborates with medicine, is referred to as the "cure." According to Hall (1958), this medical aspect of nursing has the potential to be interpreted as either the nurse assisting the doctor by performing medical duties or as the nurse giving the patient with consoling and loving care across their own medical, surgical, and therapeutic therapy (Parker and smith, 2010). An alternative perspective aspect of nursing is to see the nurse acting as a comforter and nurturer while the patient receives medical, surgical, and rehabilitative care (Abyu and Mapoma,2019).

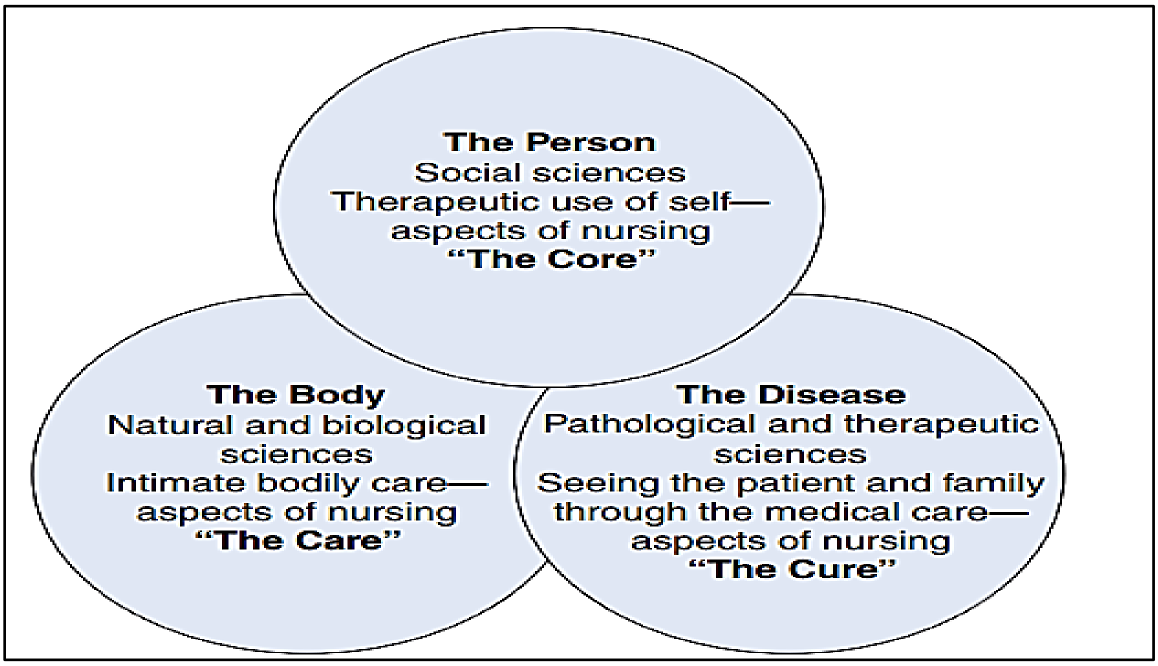

Figure 2-4. Hall three aspects of nursing (Nigatu & wondim,2019).

2.10.2. Hall's Care, Cure, Core theory's assumptions:

The expectations of Hall's Care, Cure, Core theory include: instead of being found in the medical staff, the patient is motivated and possesses the energy needed for recovery. Three aspects of nursing should be seen as interconnected. Finally, the shape of the circles representing the three elements' changes according to the patient's holistic manner of progress (Priyadarshini ,2021).

Prominent principles: the principles of Hall's Care, Cure, Core theory include:

-Individual:

The focus upon nursing care in Hall's work is the individual human who is 16 years of age or older and has passed the acute stage of a long-term disease. The person receiving care, not the healthcare provider, is the source of inspiration and energy for healing. Hall highlights the need of seeing each person as somebody special able to achieve growth and development who deserves a comprehensive approach (Gonzalo, 2023).

-Health:

Health may be viewed as a condition of consciousness accompanied by a conscious decision to engage in the behavior that are most appropriate for that specific individual. Hall emphasizes the significance of helping the person in examining the reason behind his or her behavior in order to recognize issues and find solutions through growing in maturity and self-identity (Gonzalo, 2023).

-Environments:

Hall is recognized with inventing the lobe center because she thought that an individual's experiences in a medical facility setting while receiving treatment for an acute illness contributed to its development (Abyu and Mapoma, 2019).

-Nursing:

Nursing is defined as taking part in the core, cure, and care components of patient care (Gonzalo, 2023).

2.10.3. The practical application of Hall's Care, Cure, Core theory of current research:

- Care: The researcher enabled those receiving treatment to handle post stroke problem that affect on mobility, postural control and dependency through use of interventional protocol by implementing sitting balance exercises for 14^{th} day period in order to help in the improvement mobility, postural control and reduce dependency as possible.
- Cure: The investigator identifies the post stroke difficulties impacting patients that impair mobility level, postural control and increase dependency in activity of daily living and establish solution for these problems.
- Core: The patients that diagnosed with stroke and have problems with mobility, postural control and activity performance.

2.11. Previous related studies:

First study:

Yeo, et al. (2023) performed randomized control study in Republic of Korea, to determine if balance training on unstable surfaces in addition to visual input is successful in regaining balance and gait capacity. The 45 chronic stroke patients in the current study were divided into unintentionally, participants were assigned to one of the following categories: the traditional group, the visual opinions unsteady platform balance instruction group, or unsteady surface balance exercise group. The results demonstrated that proprioceptive neurological and muscular facilitation-based unbalanced surface balance exercises considerably improved balance and gait performance.

Second study:

Inoue, et al. (2022) performed a pilot double-blinded randomized controlled study in Japan. Fifty-five hemiplegic patients with stroke were participated in this study to examine the effects of progressive seated training on the control of posture during the initial stages of having a stroke. 27 individuals with hemiparetic strokes were randomly assigned to the research (with a total of 13 participants) or control (n = 14). Regular physical treatment was supplemented with dynamic sitting exercises in the mediolateral and anteroposterior directions (30 times/day, 5 days/week), with visual input on a computer that was 500 minutes delayed for the experimental group or real-time for the control group. The findings indicate that individuals in the early post-stroke period may benefit from these exercises in both mediolateral and anteroposterior orientations to enhance postural control, dynamic sitting balance, and sit-to-stand capability.

Third study:

Mahmood, et al., (2022) conducted assessor blinded randomized control trial in Pakistan, to assess the efficacy of core stabilization exercises compared with conventional treatment on quality of life, ambulation, trunk mobility, and function of patients with stroke. Individuals with long-term stroke were enrolled. This intervention was finished in 8 weeks, and a follow-up was done in September 2018. Control group participants (n = 21) earned standard stroke therapy, five days weekly for eight weeks. Along with standard care, the experimental group (n = 20) had an additional 15 minutes of core stability training. This study came to the conclusion that core stabilization training is greater than traditional care in treating trunk deficits, functional ambulation, and the standard of living for survivors of strokes.

Fourth study:

Valdés, et al., (2021) performed a single-blind multicenter randomized controlled trial in Spain to evaluate the effectiveness of core stability exercises (CSE) and transcutaneous electrical nerve stimulation (TENS) to investigate the efficacy of CSEs in along with conventional physiotherapy (CP) in enhancing the control of posture, standing balance, drop percentage, probability of falls, ADL, and general quality of life (QOL), as well as to develop dynamic sitting stability and walking (stepping) at short/mid-term in the early stages of a stroke. A group acting as a control (n = 110) with CP (1 hour each session) concentrated on balance improvement. A test group (n = 110) completes CSE for 30 minutes in along with CP for 30 minutes (1 hour total/session). Therefore, the findings of this research were encouraged to perform these types of activities whenever as feasible for recovering from a stroke.

Fifth study:

Thijs, et al. (2021) conducted a pilot randomly controlled assessor-blinded design was developed for estimation of feasibility and security of using technology in order to teaching sitting balance in chronic stroke patients, as well as the improvement of clinical outcomes relative to standard treatment following a four-week course. About 29 out of the 30 participants that were enrolled in the trial successfully completed it (control group: 15; experimental group: 14). The study's findings suggest the feasibility and safety of technology-supported sitting balance training in chronic stroke patients.

Sixth study:

Sheehy, et al., (2020) performed a randomized controlled study in Canada to find out if additional sitting balancing exercises delivered by virtual reality training (VRT) enhanced the control of sitting balance in stroke rehabilitation hospitalized patients. The study enrolled seventy-six participants with subacute stroke, which hypothesized that 10–12 times of supplemental sitting balance exercises, delivered via VRT, would substantially enhance sitting balance alongside the achievement of everyday activities. The results of this research found that individuals taking part in an extensive inpatient stroke recovery programme in the initial days after stroke experienced equivalent improvements in seated equilibrium and upper extremities (UE) function between an experimental programme of sitting balance exercises delivered via VRT.

Seventh study:

Kim, et al., (2020) performed a retrospective research investigation was conducted in Korea to look at the correlations with sitting balance and factors that relate to stroke survivors' features or functionality. In hemiplegic survivors of stroke (n = 73), we look at difference of sitting pressure between the affected and unaffected sides (DSPAU) varies both prior to and following a 3-week training period. With regard to the features of the stroke, these pre- and subsequent assessments data were examined, and associations with both DSPAU and functioning scores were found. In comparison to the ambulatory group, the DSPAU was higher in the unable to walk category. Study results found that after recovery, an improvement in the function evaluation indicators was correlated with a decline within the DSPAU.

Eighth study:

Fukata, et al., (2019) performed an assessor-blinded, randomly managed study was conducted in the country of Japan to examine the impact of horizontally positioned sitting exercises on sitting balance in individuals suffering from stroke with poor sitting competence. Thirty-three people with stroke were divided into two distinct categories at random. The group acting as a control practiced on an area that was horizontal, whereas the test group utilized one that was slanted 10_ rearward and down towards the side that was most impacted. The two categories were instructed to shift their trunks diagonal in the direction of the side that was least impacted. For seven separate workouts spread across eight days, participants completed the exercise a total of forty times per session. The study found that, in comparison to sitting on a level surface, horizontally linked sitting training on a slanted surface can optimizes sitting balance.

2.12. Literature Synthesis:

Summary of the literature, which is proof from the earlier investigations shows that Annual stroke death rates have exceeded 5.5 million during the past 20 years, affecting more than 12 million individuals worldwide. After age 55, the chance of incident stroke doubles every 10 years, and aging is the most significant non-modifiable risk factor. Barthel and Das (2020) demonstrate that females are more likely than males to die from a stroke. Typically, stroke result in six out of every ten mortalities among females. Ischemic strokes account for 87% of all strokes. Following a stroke occurrence, restoration procedures must be the main focus of efforts to regain the patient's independence in doing daily tasks. About 90% of recovery can be attained within three months of onset .it is important to perform exercises in subacute phase, especially sitting balance exercise which assist stroke survivors to restore their sitting balance. In order to regain walking abilities, balancing training and limb strengthening may be necessary since compensatory use of an unaffected limb in ADL is highly prevalent in stroke patients.

Sitting balance exercises could be effective and productive in post stroke patients to improve the control of sitting balance in stroke rehabilitation by employing a sitting balance exercise given by VRT. The results of this studies found that individuals undergoing a comprehensive hospitalization stroke recovery programme in the initial days after stroke experienced equivalent improvements in sitting balance and upper limb function across a trial programme of sitting exercises for balance delivered using VRT as well as a control intervention of strengthening exercises for the upper extremities delivered by means of VRT and created for reducing trunk movement.

In contrast to previous studies, which mostly estimated for the recovery of sitting balance following a stroke, the incorporation of a sitting equilibrium treatment delivered via VRT and most of previous studies evaluated mobility, balance, and dependency levels in separated pattern and don’t focused in the acute phase, Our study is considered one of the first studies to study the effect of sitting balance exercises in an actual reality, especially during the acute phase, and evaluate the effect of sitting balance exercises on mobility, balance, and dependency levels during subacute duration of stroke.

Chapter three

Methods and Procedures

Chapter three

Methods and Procedures

This chapter will discuss every methodological procedure used in this study in order to accomplish the specific goals. These procedures involve the study design, the administrative agreements, the ethical issues, the study settings, the sampling selection method, the inclusion and exclusion criteria, the steps of the study, the study instruments, as well as methods for gathering and analyzing data.

3.1. Design of the study:

The current study employed a quasi-experimental design to determine the effect of applying sitting balance exercises on the level of mobility, postural control, and level of dependency among patients with stroke. This study was initiated from 26th September 2022 to 23th July 2023.

3.2. Administrative agreements:

Before gathering the data from the following institutions, a formal administrative approval was requested to perform this study that are as follow:

1. Arrangement of University of Kerbala / Collage of Nursing Council at 28/11/2022 with number of 2841(Appendix A).
2. Arrangement of "Ministry of Health / Kerbala Health Directorate/ Center of Training and Human Development" at 19/12/2022 with number 3162 (Appendix B).

3.3. Ethical consideration:

An ethical approval was obtained from the Research Ethical Committee at the University of Kerbala/College of Nursing (Appendix C). An informed consent (Appendix D) was attained from each participant to be enrolled in this study. Furthermore, each participant is given the freedom to withdraw at any moment.

3.4. Settings of the study:

The present study was conducted in Holy Kerbala/Iraq at neurological medical units of Imam Al-Hussein Medical City. Imam Al-Hussein Medical City is considered the largest health care facility in Kerbala. It has been established in 1972 and it provide health care services for patients from inside and outside of Kerbala government, which contain surgical, and medical department, contain 600 beds for inpatients. The medical unit contain more than 164 beds for males and female's wards of neurologic, cardiac and another, which receive admission with many health conditions especially of stroke.

3.5. The study sample:

The selected sample size was sixty patients with acute stroke, the participants were assigned using nonprobability purposive sampling technique into two groups: intervention and a control group. As presented in Figure (3-1), the intervention and control groups together composed of 30 patients. All study group participants had been exposed to an interventional protocol while the control group was not. The selectin criteria were designed as follows:

3.5.1. Inclusion Criteria:

1. All patients with acute stroke that are admitted to the neurological wards at Imam Al-Hussein Medical City.
2. Could sit independently for at least 1 minute without support.
3. Those don't have the ability to stand separately for more than one minute.
4. Patients who had been given an agreement to participate in the study.
5. More than18 years old.

3.5.2. Exclusion Criteria:

The researcher excluded the patients if they failed to meet any of the requirements for enrollment or when they had one of the following:

1. Patients who had limitations in cognition.
2. Patients with tetraplegia or hemiplegia.
3. Those who had vestibular deficits or vertigo.

4. Patients who had seizure activity in the prior 6 months.
5. Patients who had limbs amputation.
6. Patients who had visual or auditory impairment.
7. Patient with severe weakness.

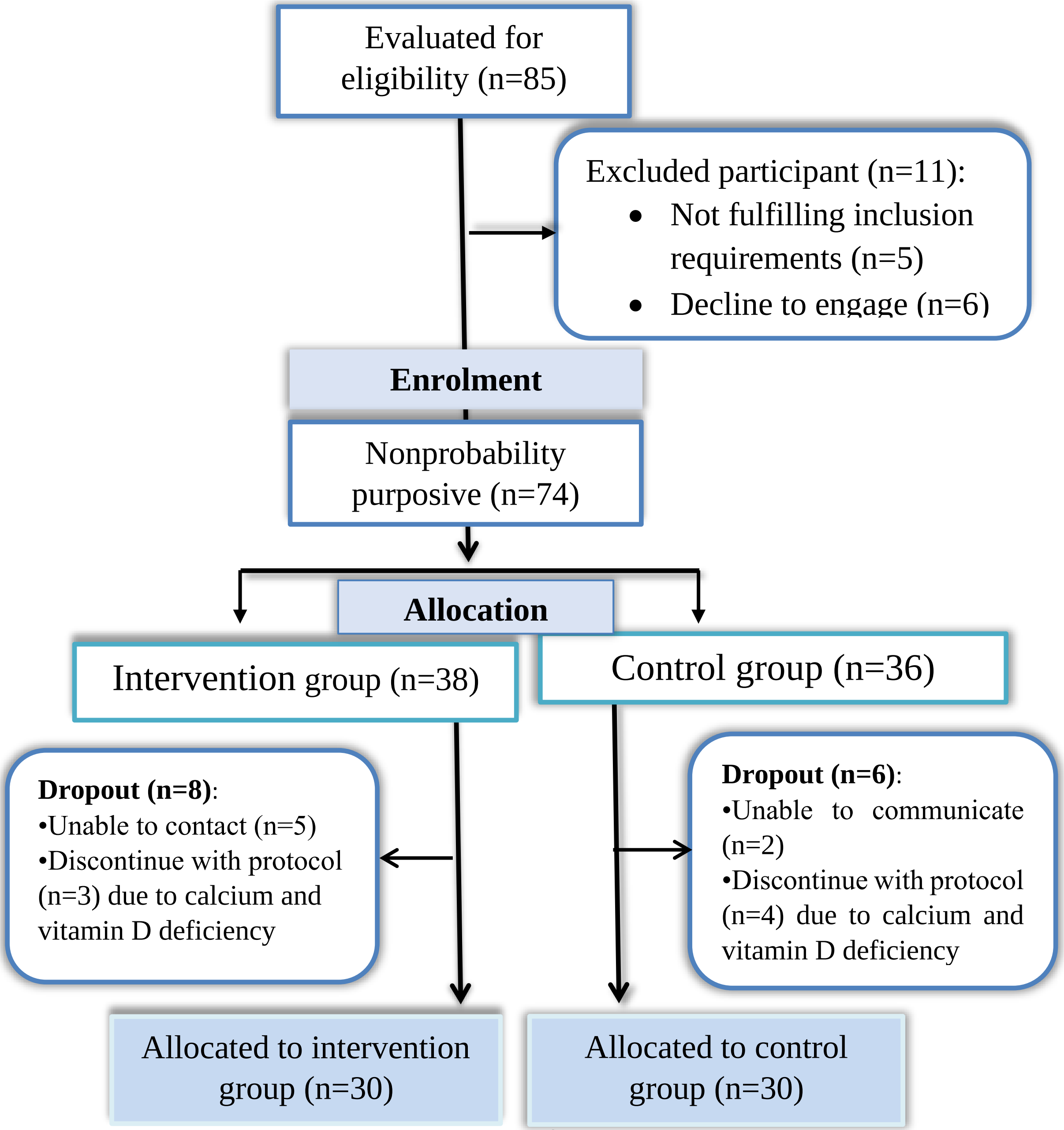

Figure (3-1): A diagram for the evaluated criteria

3.6. Steps of the Study:

There are many steps performed in the study as following:

3.6.1. Interventional protocol:

Following an analysis of the relevant academic literature and earlier investigations, this interventional strategy was created. This interventional procedure is intended to offer instructions on how to improve mobility, postural control, and dependency level for patients with stroke. Therefore, this interventional protocol includes basic procedure (sitting balance exercises), all patients were explained the procedure and written informed consent (Appendix D).

Participants were separated into two groups: [intervention group (Group1; n =30)] and [control group (Group2; n=30)]. The intervention group instructed to preform sitting balance exercises (15-30 minutes) two sessions per day for14th days. All participants continued to receive their conventional stroke program. The intervention group performed five exercises (designed for stroke recovery) (Appendix EI, EII, EIII, EIV) that required trunk lean and reaching beyond arms' length, it includes:

1. Shift Weight Side to Side:

The patients informed to gently move his weight to one side, hold it there for a moment, then gently return to the center while maintaining a straight back. On the opposite side, repeat. This exercise performed 20 to 30 times per session, or as often as is safe for the patients (Hoffman, 2017) as shown in figure (3-2). This exercise improves balance by loosening and lubricating the spine, which facilitates reaching down to pick objects up off the ground (Hanna & Norman, 2011)

Figure (3-2): Shift Weight Side to Side exercise (Hanna & Norman, 2011)

2. Reaching:

The researcher handles a ball at a distance of about an arm's length from the patient, then cautiously pick up the ball and arrange it in various places. If the patient started to get shaky and fall, he could require a second assistance to catch him. Performed about 10 to 15 repetitions of the exercise (Hoffman, 2017) as shown in figure (3-3).

Figure (3-3): Reaching exercise (Balance Exercises for Stroke Patients, 2010)

3. Seated leg lift:

Inform the patient to straighten up, holding his palms out to support himself. Hold one leg up while maintaining the knee bent for roughly five seconds. Do the same with the opposite leg. Depending on strength, carry out the exercise 5–10 times more (Hoffman, 2017) as shown in figure (3-4).

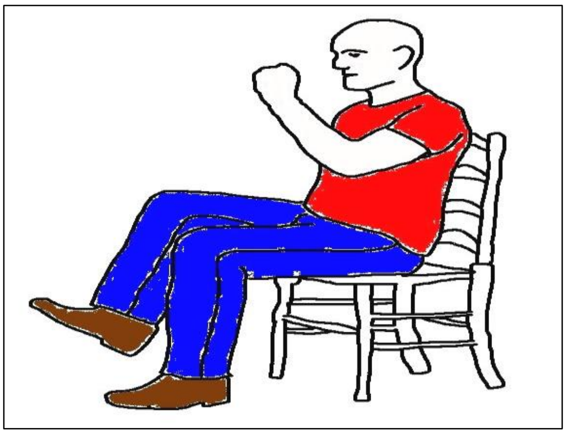

Figure (3-4): Seated leg lift exercise (Hanna & Norman, 2011)

4. Single-leg knee extensions:

The patient extended one leg at the knee and lower it to the floor while sitting upright and maintaining an engaged core. Apply the same technique to the other leg. Execute two sets of 15 repetitions (Hoffman, 2017) as shown in figure (3-5).

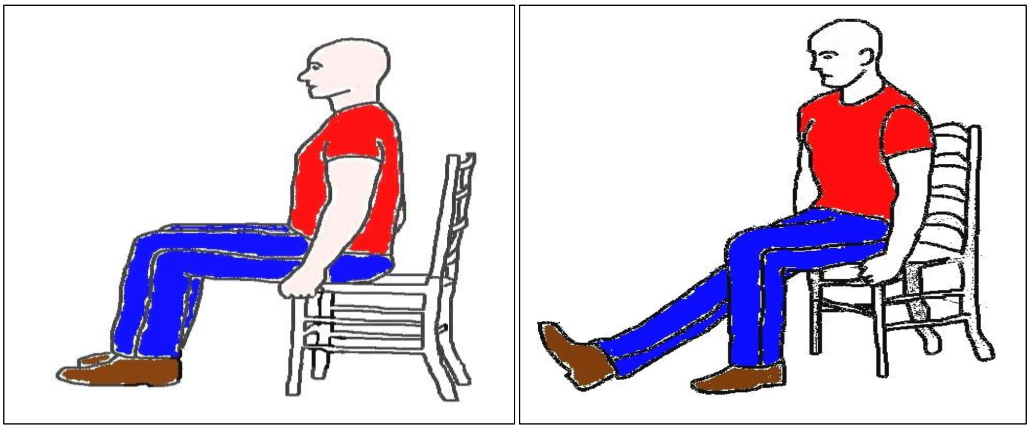

Figure (3-5): Single-leg knee extensions exercise (Hanna & Norman, 2011)

4. Reach with clasped hands:

The reseacher inform the patient to keeping his hands forward with his palms clenched together until his entire body is engaged but he is not in risk of falling apart. Hold for five seconds, then slowly return to a regular sitting position in his chair. 10 times should be added to the workout. He can also work on reaching to either side of his entire body (Hoffman, 2017) as shown in figure (3-6).

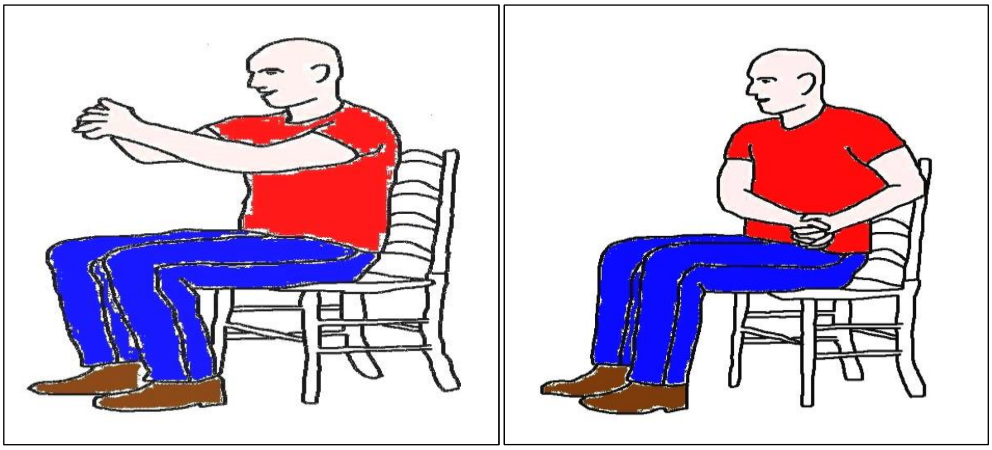

Figure (3-6): Reach with clasped hands exercise (Hanna & Norman, 2011)

3.6.2. The study instruments:

The researcher selected a suitable instrument with four separate components to accomplish the study's purposes:

3.6.2.1.First section (Socio-demographic characteristics and clinical data):

This section contains the socio-demographic and clinical data about the patients, including ages, sex, marital status, educational level, occupation, chronic diseases, type of stroke, location of stroke, period after stroke, recurrence of stroke, height and weight [Body Mass Index (BMI)] (Appendix FI).

3.6.2.2. Second part [Physical Mobility Scale (PMS)]:

This part was selected for measuring mobility, it was designed by the Australian Physiotherapy Association's Gerontology Group (2003) (Appendix GI). Eight physical mobility-related aspects constitute this measure, that is supine to side lying, supine to sit, sitting balance, sitting to standing, standing to sitting, standing balance, transfers, and ambulation/mobility. Total scores can vary from 0 to 45, with 0 representing very low mobility functioning and 45 independent mobility functioning (Appendix FII).

3.6.2.3. Third part [Berg Balance Scale (BBS)]:

The Berg Balance Scale (BBS), established by Katherine Berg in 1989 to assess balance capabilities (Miranda-Cantellops &Tiu, 2023) (Appendix GII), this scale includes a 14 item, each question consists of a Likert scale with a five-point range from 0–4, the zero reflecting a low value of compete while 4 reflecting a high value of functioning and it require about 12- 15 minutes to respond to all questions (Appendix FIII).

3.6.2.4. Fourth part (Modified Barthel index scale):

This scale used to determine the dependency in activity of everyday life, it was published for the first time by Barthel and Mahoney in the Maryland State Medical Journal in 1965 and was modified by Collin et al. 1988(Appendix GIII). This scale includes grades that can measure the degree of dependency (from 0 to 3 grades) according to the need for assistance in ADL. The degree divided from 0 to 100 with 0 indicate total dependence and 100 indicate independence and take about 8-10 minutes to complete all item (Appendix FIV).

3.7. Testing of instruments validity and reliability:

3.7.1. Validity of study instruments:

The instrument verification demonstrates the proficiency of tool in identification of the phenomenon under study. The validation process considered the outcome of research. Verification of research refers about how thoroughly a study explores the assumption and provides evidence for the study's conceptual framework. A group of sixteen specialists' experts with a minimum of 10 years of professional expertise in the field revised the interventional protocol and study instrument. The research instrument's content, simplicity, relevance, design, and application were all requested to be evaluated by each expert (Appendix H).

3.7.1.1. The validation of content:

Described as the relationship and articulation of the targeted concept by the questionnaire's parts for the purpose of a particular evaluation. Content validity index and content validation were carried out by the researcher. Both PMS and Modified Barthel index scale was translated into Arabic by using the back translation model of Brisilin. The following actions were done in order to implement the content validity process:

1. The researcher spread questionnaires to eight experts who each had a minimum of 10 years of professional expertise in the areas they researched. These specialists comprised four from the University of Baghdad's Nursing College and one expert from each College of Nursing at the Universities of Babylon and Kufa, one expert from the Colleges of Nursing at the Universities of Al Ameed and the Imam Al-Hussein Medical City (Appendix H).
2. An expert meeting with researcher allowed for face-to-face content validity testing.
3. The experts were given the review items in a concise manner, and they scored each one and offered comments on some of them, which the researcher took into account. The expert-provided ratings on each independent item were calculated using appropriate scales. The rating consists of four score include: the item not related with study, the item

related to some extent with study, the item not related with study, and the item closely related with study.

4. Furthermore, determine the content validity index (CVI) as follow:

a) Physical Mobility Scale (PMS): There were eight experts professionals in all, and the specialists who agreed on all of the items were (8,8,8,8,7,8,8,8). Each item had universal agreement (UA), and it was (1,1,1,1,0,1,1, and 1). Every item's I-CVR (Item Level Content Validity Index) was (1,1,1,1,0.87,1,1, and 1). Levels of Content Validation Index (CVI) Based on an Average Method) score for the rating scale had been (0.98), and the CVI identified the number to be satisfactory. The scale-level content validity index based on the universal agreement method, or S-C.VI.UA, has a value of (0.87) (Yusoff, 2019). Eight experts were consulted, and the average percentage of all elements deemed significant was (0.96) (Appendix I).

b) Berg Balance Scale (BBS): Eight experts were present and they all approved on each question. (8,8,8,8,6,8,8,7,8,8,8,8,8, and 8). Every item's UA were (1,1,1,1,0,1,1,0,1,1,1,1,1, and 1). I-CVR for each item was (1,1,1,1,0.75,1,1,0.87,1,1,1,1,1,1, and 1). S-CVI-Ave was (0.97), and CVI considered this result acceptable. It was revealed that the value of S-CVI\UA was (0.85). Eight experts were consulted, and the average percentage of all elements deemed significant was (0.96) (Appendix II).

c) Modified Barthel index scale: Eight specialists were involved, and everyone complied on every point (7,7,8 ,8,8,8,8,8,8,7). Every item's UA was (0,0,1,1,1,1,1,1,1, and 0). I-CVR for each item was (0.87,0.87,1 ,1,1,1,1,1,1 and 0.87) was (0.96) and this amount is suitable for CVI. The S-CVI/UA word was defined as (0.7) and was used in the explanation. Eight experts were consulted, and the average proportion was relevant (0.96) (Appendix III).

3.7.1.2. Face validity:

The degree to which a test looks to assess what it is supposed measure can be described as face validity. A questionnaire would have possessed great face validity if the majority of respondents believed that the test items seemed to assess what the test was designed to evaluate (Johnson, 2020). The procedure for determining answer validity consists of the following six steps:

1. The first phase consisted of obtaining completed answers from the validity form, so that those giving ratings, who understood this method and had clear expectations, could use them.
2. The researcher distributed questioners to eight experts who have at least ten years of professional experience including (1) faculty members from the university of Kerbela College of Nursing, (1) expert from the College of Nursing /Al-Ameed University, (2) experts from Al-Safwa University/ College of Nursing, (1) expert from the university of Baghdad/ Department of Nursing, and (1) expert from the Warrth Alanbiaa University / College of Nursing (Appendix H).
3. Responding validity testing was conducted using a face-to-face or online evaluation direction.
4. The panel of reviewers was provided with the domain of the items being evaluated in this phase. Reviewers are urged to offer a written material critique in order to make each thing more understandable and clearer.
5. The reviewers received a request to present the scores for all items after carefully evaluating each one of them. The reviewers then provided ratings of replies to the researcher.
6. The Face Validity Index (FVI) originated in two distinct forms, Scales Levels of FVI (S-FVI) for scale, and Item Level Face Validity Index (I-FVI) for the items. Percentage of scale that receives a three or four on the clarity scale from each reviewer (S-FVI/UA). The Face Validity Index (FVI) was computed in this final stage.:

a. Physical Mobility Scale (PMS): There were eight experts, and the experts who accepted each question were (8,8,7,8,8,8,8,8). Each item had universal agreement (UA), and it was (1,1,0,1,1,1,1, and 1). I-FVI for each item was

(1,1,0.87,1,1,1,1, and 1). The scale's S-FVI-Ave based on an Average Method, the Scales Levels of Face Validation Index (FVI) value was (0.98), which is acceptable for FVI. S-CVI-UA was defined as the "Scale-Level Face Validity Index Based on the Universal Agreement) Method" and it had a 0.87 score. The proportion of all things that 8 experts agreed were relevant on average was (0.96) (Appendix JI).

b. Berg Balance Scale (BBS): Eight experts were present, and they all approved on each question (8,8,8,8,8,7,8,8,7,8,8,8,8, and 8). For each item, there was universal agreement (UA) was (1,1,1,1,1,0,1,1,0,1,1,1,1 and 1). For every item, the I-FVI (Item Level Face Validity Index) was (1,1,1,1,1,0.87,1,1,0.87,1,1,1,1, and 1). The S-FVI\Ave (The Scales Levels of the scale's Face Validation Index (FVI) value, which is based on an average method, was (0.98), and for FVI, this number was regarded as satisfactory. It has been reported that the value for S-FVI-UA was (0.85). The percentage of all factors that were regarded as relevant on average by the 8 experts were (0.97) (Appendix JII).

c. Modified Barthel index scale: The team consisted of a total of 8 experts, and the experts whoever approved every query was were (6,8,8,8,7,8,8,8,8,8). Each item had universal agreement (UA), and it was (0,1,1,1,0,1,1,1,1 and 1). I-FVR (Item Level Face Validity Index) was calculated for each item as (0.75,1,0.87,1,1,1,1,1,1 and 1). The S-FVI-Ave value for this scale was computed based on the Scales Levels of Face Validation Index (FVI) utilizing an average method (0.96), and this quantity was thought to be suitable for FVI. Scale-Level Face Validity Index Based on the Universal Agreement Method, and S-FVI\UA value was (0.8). Eight experts' judgements on the relevance of each item as a whole were averaged out to be (0.96) (Appendix JIII).

3.7.2. Pilot study:

Eight patients that met the requirements for the research sample and received care in medical ward of Imam Al-Hussein medical city Kerbela City was selected in the pilot study. It was carried out from the 25th of January until the 2nd of February 2023. The sample was collected by a non-probability purposive sampling method and wasn't included in the research's original sample.

Performing the pilot study was initiated by checking instrument items and collect data by the researcher through an observing and interview at one time. The pilot study's conclusions implied that the questionnaire is simple for patients to understand. The questionnaire for each patient took the researcher between 20 and 25 minutes to answer completely. The questions on the questionnaires are precise and understandable.

3.7.2.1. Pilot study purposes:

a. To assess whether it is feasible and compute the time needed for filling out the questionnaire.

b. To enable the participants to inform the researcher whether questionnaire's content's is clear and usefulness.

c. To figure out the reliability of this questionnaire.

3.7.2.2. Pilot study results:

1. The instrument was easy for anyone to comprehend.
2. It lasted 20 -25 minutes to complete all three scales (the Physical Mobility Scale (PMS), Berg Balance Scale (BBS), and Modified Barthel index scale, in addition to the socio-demographic and medical data section.

3.7.3. Reliability of questionnaire format items:

Among the most widely employed techniques for gathering data is the instrument. In research, a questionnaire's principal purpose is to collect relevant data in the most accurate and reliable way possible. The capacity of an instrument to consistently replicate a result from different observers or across a wide range of time and location is referred to as an instrument's reliability. Internal consistency, test-retest reliability (stability test), and inter-rater reliability are all appropriate methods to assess reliability since measurement error is present in answers (de Sá-Caputo, et al., 2020).

Reliability refers to the manner in which of how an examination of a phenomenon produces an uninterrupted and constant outcome. The conformance of a diagnostic instrument's parts is referred to as reliability, therefore investigating for reliability considered critical (Taherdoost, 2016). According to Arof, et al., (2018) reliability is recommended to be equivalent to 0.70 to 0.79 for a preliminary or pilot investigation.

Study instrument had excellent level of reliability for all scale and its coefficient of Cronbach's alpha value was shown in table (3-1) and through calculating the results in which the questionnaire was successful, meaningful, as well as reliable to the research phenomenon of (effect of sitting balance exercise on level of mobility, postural control, and dependency among patients with stroke).

Scale	Actual value (Alpha Cronbach)	Minimum Acceptable value	Assessment
Physical mobility scale (PMS)	0.91	0.70	Excellent
Berg balance scale (BBS)	0.96	0.70	Excellent
Modified Barthel index scale	0.75	0.70	Acceptable

Table (3-1): Assessment of reliability of scale using Coefficient of Cronbach's alpha.

3.8. Data collection and follow up method:

Using the question-and-answer method, the data gathering procedure was performed out. The interventional protocol for this study was prepared by the researcher after reviewing related previous studies. During their hospital stay and subsequently twice session daily for 14 days at home, for 20 to 30 minutes each session, all the intervention group participants were educated the way to carry out sitting balancing exercises. The investigator spending about twenty to twenty-five minutes gathering information and properly completing each questionnaire as shown in figure (3-7). The data collection process was carried out from 16 February 2023 to 8 May 2023.

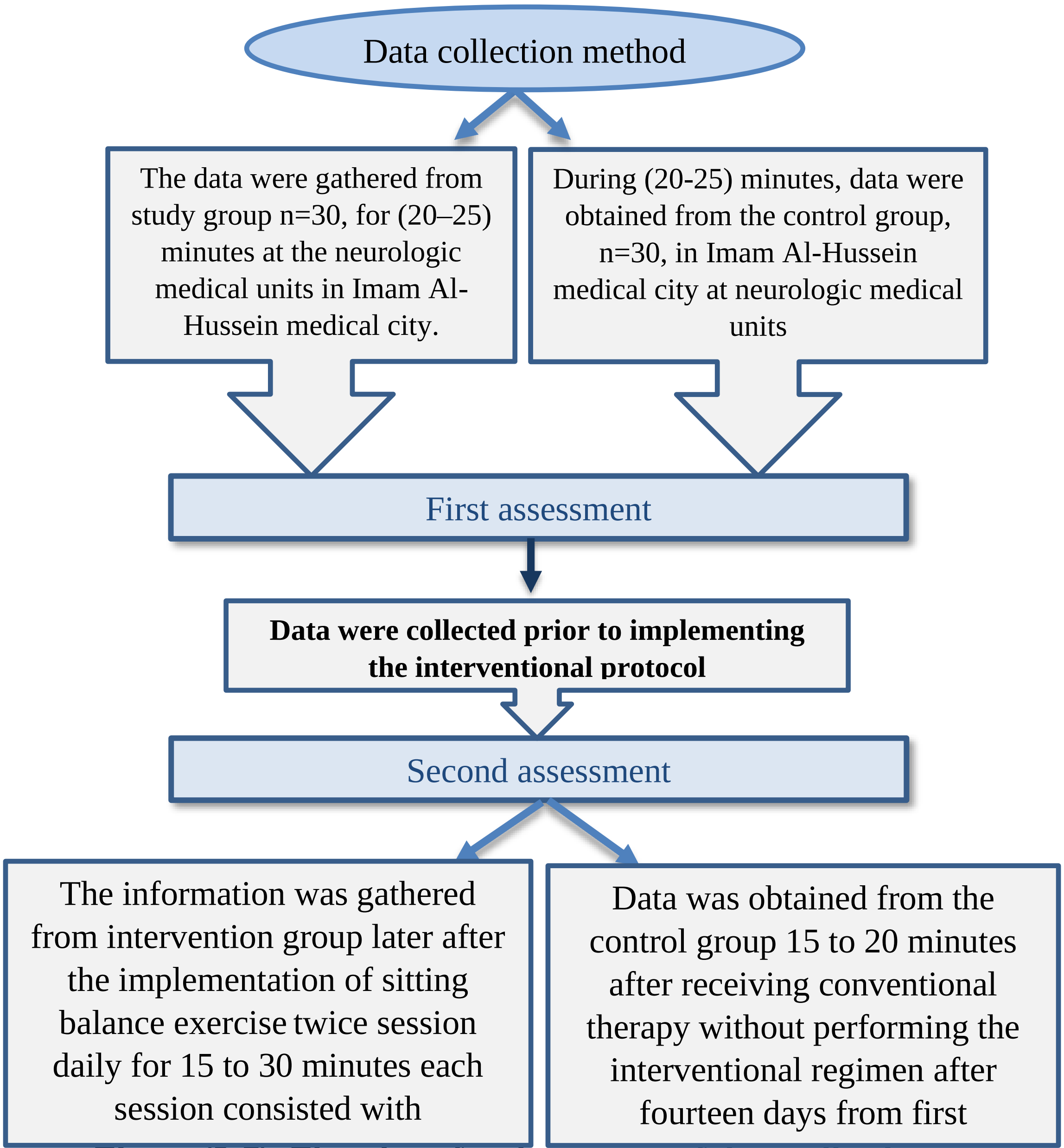

Figure (3-7): Flowchart for the process of data collection

The patients follow up process carried out through the researcher by reminding them twice during a day to perform the exercises and to instruct them on the protocol. The follow-up method was done in the hospital and by creating chat channels on social networking platforms including WhatsApp and Telegram and by communicating with patients through the telephone (SIM-card). During this follow-up, the researcher monitored the patient's adherence and responses to the intervention. Patients in the control group just received the routine care provided to all patients in the study setting. The level of mobility, postural control, and dependency level were measured for all patients in the control and intervention groups before the intervention and immediately 14 days after the completion of the intervention; all participants continued to receive their conventional stroke care such as range of motion exercises and others.

3.9. Rating and scoring: The items have been examined and graded using the following directions:

3.9.1. Rating and scoring for body mass index (BMI):

Body mass index was measured by measuring weight and height and applying this formula:

BMI = weight in kilograms / (height in meters)^2. According to Hughes, et al., (2022) BMI was categorized as following:

- “Underweight= less than18.5”
- “Normal weight =between 18.5–24.9”
- “Overweight =about 25.0–29.9”
- “Obese class I =between 30.0–34.9”
- “Obese class II =about 35.0–39.9”
- “Obese class III =more than 40”

3.9.2. Rating and scoring for Physical mobility scale (PMS):

The mobility level had been evaluated using 8 domains, each of which had 5 mobility-related items that were classified based on the way they were constructed, sum of these parts ultimately established the degree of mobility as follows: Total scores can vary from 0 to 45, with 0 suggesting very low mobility performance and 45 independent mobility performance. According to Mangoff and McCurdy, (2017) mobility impairment categorized into:

- “0 – 18 =Severe Independence”
- “19 – 27 =Moderate Independence”
- “28 – 36 =Mild Independence”
- “37 – 45 =Highest Independence”

3.9.3. Rating and scoring berg balance scale (BBS):

The postural control level score through each of the fourteen questions that made up of a five-point ordinal magnitude, alongside Zero signifying the least amount of functionality and 4 signifying the most functionality. El-Gilany, et al., (2012) stated that risk of falling related to balance impairment can be classified according to Berg balance scale (BBS) as follow:

- “0 –20 high fall risk”
- “21-40 medium fall risk”, and
- “Highest possible score 56 indicating low fall risk”

3.9.4. Rating and scoring of Modified Barthel index scale:

Dependency level score through a ten item some of items which involves four points with values comprising 0 to 3 in which zero indicate fully dependent and 3 indicate independent and some points consist of 2 or 3 points sum of these points is classified according to Shah and Cooper, (1989) as follow:

- “0 - 20 =Total Dependence”
- “21 - 60= Severe Dependence”
- “61 - 90 =Moderate Dependence”
- “91 - 99 =Slight Dependence”
- “- 100 = Independence”

3.10. Statistical Data Analysis:

Through implementation of the Statistical Package of Social Sciences Programme (S.PSS version 26), the data analytic procedure was employed in the current investigation to evaluate the following research's results and conclusions as follow:

3.10.1. Descriptive statistical data analysis:

Standard deviation, percentage (%), frequency (f), and mean of score (MS) have been utilized through tables to obtain the overall findings of the study's participants and compare the variables. The percentage was calculated according to the following formula:

$$\% = \frac{\text{ferequences}}{sample\ size} \times 100 = \% = \text{Percentage}$$

3.10.2. Inferential statistical analysis:

- Use the chi-square test (χ^2) for looking into variations in demographic data on patients among the various research groups.
- Paired sample t-test used in order to investigate the distinctions across the mean degree of mobility, postural control, and dependency within the same group before and after applying the intervention protocol.
- Independent sample t-test for comparing the levels of dependence, postural control, and mobility severity between the two distinct groups before and after the procedure was performed.
- To determine if the mean varied between groups, the analysis of variance (ANOVA) statistic was implemented.
- “A p-value of 0.05 or less was regarded as statistically significant”.

3.11. Limitations:

There are a few essential limitations to take into account:

1. The main limitations in the current study were that included patients were self-administered of sitting balance exercises at home, thus, they may not have followed the intervention closely because of some physical or psychological issues.
2. This study is carried out in a single hospital, involving patients suffering from a stroke. Thus, generalization of research findings among different stroke patients in other setting is difficult.
3. Limited the facilities such as place and privacy in hospital that support application of intervention protocol.

Chapter four

Study Result

Chapter four

Study Result

This chapter focuses on the results of data analysis that are in accordance with the previously stated objectives. These results are organized as follows:

Table 4-1: Distribution of patients in two groups according to their socio demographic characteristics:

Variables		Intervention group		Control group		P-value
		f	%	f	%	
Age groups	19 -29	0	0	2	6.7	0.242 NS
	30 -39	2	6.7	0	0	
	40 -49	4	13.3	6	20.0	
	50 – 59	8	26.7	11	36.7	
	60 -69	16	53.3	11	36.7	
	MS ± SD	57.1± 9.54		54.0±11.4		
Sex	Male	13	43.3	14	46.7	0.687 NS
	Female	17	56.7	16	53.3	
Marital status	Single	0	0	2	6.7	0.569 NS
	Married	20	66.7	19	63.3	
	Divorced	1	3.3	0	0	
	Widowed	9	30.0	9	30.0	
Educational status	Illiterate	10	33.3	7	23.3	0.789 NS
	Read and write	3	10	3	10.0	
	Primary school	9	30.0	13	43.3	
	Middle school	5	16.7	4	13.3	
	Secondary school	1	3.3	2	6.7	
	Diploma	2	6.7	0	0	
	Bachelor's and above	0	0	1	3.3	
Occupation	Worker	9	30.3	7	23.3	0.138 NS
	Farmer	0	0	3	10.0	
	Governmental employee	5	16.7	3	10.0	
	Retired	2	6.7	3	10.0	
	Housewife	14	46.7	14	46.7	

f= frequencies; %=Percentages; MS = Mean of score; SD = Standard Deviation; χ^2: chi square Test;
NS=Non- significant (P-value>0.05).

Table 4-1 indicates that more than one-half of the patients in the intervention group were within the age groups of 60–69 years old and accounted for 53.3%, while more than one-third of the control group were within the age groups of 50–59 and 60–69 years old and accounted for

36.7%. Regarding the patient's sex, 56.7% and 53.3% of the intervention and control groups, respectively, are female. Concerning educational levels, this table shows that 30.0% and 43.3% of patient participating in the intervention and control groups, respectively, have primary school levels, and 46.7% for both intervention and control groups, respectively, are housewives.

Table 4-2: Distribution of patients based on their clinical data:

Variables		Intervention group		Control group		P-value
		f	%	f	%	
Pre-exciting chronic diseases	Hypertension	11	36.7	6	20.0	0.667 NS
	Diabetic	6	20.0	7	23.3	
	Hypertension and diabetic	12	40.0	15	50.0	
	None	1	3.3	2	6.7	
Type of stroke	Ischemic stroke	10	33.3	14	46.7	0.150 NS
	Hemorrhagic stroke	20	66.7	16	53.3	
Site of stroke	Right brain lobe	19	63.3	15	50.0	0.463 NS
	Left brain lobe	11	36.7	15	50.0	
Time period after stroke (days)	2-12	19	63.3	23	76.7	0.440 NS
	13-22	3	10.0	2	6.7	
	23-32	2	6.7	3	10.0	
	>33	6	20.0	2	6.7	
Number of stroke incidence	One time	23	76.7	22	73.3	1.000 NS
	Two time	6	20.0	7	23.3	
	Three time	1	3.3	1	3.3	

f= frequencies; %=Percentages; X2: chi square Test; NS=Non- significant (P-value>0.05).

Table 4-2 indicates that 40.0% of the patients in the intervention group and 50.0% of the control groups had hypertension and diabetes. About two-thirds (66.7%) of the intervention group and more than one-half (53.3%) of the control group had hemorrhagic strokes. Approximately three-quarters (76.7%) and seventy-three percent (73.3%) of patients in the intervention and control groups, respectively, have been exposed to stroke for the first time with less than 12 days' duration.

Table 4-3: Distribution of patients based on their body mass index (BMI):

Body mass index	Intervention group (N=30)		Control group (N=30)		P-value
	F	%	f	%	
Underweight	0	0	0	0	0.866 NS
Within normal	6	20.0	5	16.7	
Overweight	15	50.0	12	40.0	
Obesity Class I	6	20.0	10	33.3	
Obesity Class II	2	6.7	2	6.7	
Obesity Class III	1	3.3	1	3.3	

f= frequencies; %=Percentages; X2: chi square Test; NS=Non- significant (P-value>0.05).

Table 4-3 reveals that no significant difference was seen between the intervention and control groups regarding patient body mass index (P-value > 0.05). About one-half (50%) of patients in the intervention group were overweight, and 20% were within normal, while more than one-third of patients in the control group (40%) were overweight. The obesity class I accounts for one-third (33.3%) of the control group and 20% of the intervention group.

Table 4-4: Summary statistical analysis of physical mobility for patients in the intervention and control groups:

Variables		Intervention group (N=30)						Control group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		f.	%	MS	f.	%	MS	f.	%	MS	f.	%	MS
Supine to Side lying	No active participation in rolling.	4	13.3	2.1	0	0	3.4	3	10.0	1.8	3	10.0	1.7
	Requires facilitation at shoulder and lower limb but actively turns head to roll.	6	20.0		2	6.7		11	36.7		12	40.0	
	Requires facilitation at shoulder or lower limb to roll.	4	13.3		1	3.3		6	20.0		5	16.7	
	Requires equipment (e.g. bedrail) to pull to side lying	14	46.7		10	33.3		8	26.7		9	30.0	
	Requires verbal prompting to roll.	2	6.7		16	53.3		1	3.3		1	3.3	
	Independent—no assistance or prompting.	0	0		1	3.3		1	3.3		0	0	
Supine to Sit	Maximally assisted, no head control.	2	6.7	2.3	0	0	3.3	3	10.0	2.5	4	13.3	1.8
	Fully assisted but controls head position.	4	13.3		1	3.3		4	13.3		10	33.3	
	Requires assistance with trunk and lower limbs or upper limbs.	12	40.0		2	6.7		7	23.3		7	23.3	
	Requires assistance with lower or upper limbs only.	7	23.3		17	56.7		7	23.3		5	16.7	
	Supervision required	5	16.7		7	23.3		9	30.3		4	13.3	
	Independent and safe	0	0		3	10.0		0	0		0	0	

Table 4-4: Continue……

Variables		Intervention group (N=30)						Control group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		f.	%	MS	f.	%	MS	f.	%	MS	f.	%	MS
Sitting Balance	Sits with total assistance, requires head support.	3	10.0	2.4	0	0	3.3	4	13.3	2.5	5	16.7	**1.9**
	Sits with assistance, controls head position.	5	16.7		0	0		4	13.3		9	30.0	
	Sits using upper limbs for support.	8	26.7		7	23.3		7	23.3		7	23.3	
	Sits unsupported for at least 10 seconds.	3	10.0		8	26.7		3	10.0		1	3.3	
	Sits unsupported, turns head and trunk to look behind to left and right.	11	36.7		12	40.0		11	36.7		8	26.7	
	Sits unsupported, reaches forward to touch floor and returns to sitting position independently.	0	0		3	10.0		1	3.3		0	0	
Sitting to Standing	Unable to weight bear.	6	20.0	1.9	1	3.3	3.2	6	20.0	2.2	11	36.7	**1.3**
	Gets to standing with full assistance from therapist.	8	26.7		3	10.0		6	20.0		8	26.7	
	Requires equipment to pull to standing.	3	10.0		4	13.3		3	10.0		5	16.7	
	Pushes to stand, weight unevenly distributed, standby assistance required.	7	23.3		9	30.0		7	23.3		2	6.7	
	Pushes to stand, weight evenly distributed, may require frame or bar to hold onto once standing.	6	20.0		11	36.7		7	23.3		4	13.3	
	Independent, even weight bearing, hips and knees extended, not use upper limbs.	0	0		3	10.0		1	3.3		0	0	

Table 4-4: Continue……

Variables		Intervention group (N=30) Pre-test f.	%	MS	Post-test f.	%	MS	Control group (N=30) Pre-test f.	%	MS	Post-test f.	%	MS
Standing to Sitting	Unable to weight bear.	5	16.7	1.9			3.0	5	16.7	2.3	6	20.0	1.9
	Gets to sitting with full assistance from therapist.	8	26.7		3	10.0		3	10.0		6	20.0	
	Can initiate flexion, requires help to complete descent, holds arms of chair, weight unevenly/evenly distributed.	6	20.0		5	16.7		6	20.0		7	23.3	
	Poorly controlled descent, stand-by assistance required, holds arms of chair, weight evenly/unevenly distributed.	7	23.3		12	40.0		10	33.3		5	16.7	
	Controls descent, hold arms of chair, weight evenly distributed.	4	13.3		9	30.0		5	16.7		6	20.0	
	Independent and does not use upper limbs, weight evenly distributed.	0	0		1	3.3		1	3.3		0	0	
Standing Balance	Unable to stand without hands-on assistance.	12	40.0	1.3	1	3.3	2.8	9	30.0	1.6	9	30.0	1.6
	Able to safely stand using aid	6	20.0		3	10.0		4	13.3		7	23.3	
	Able to stand independently for 10 seconds, no aid.	5	16.7		5	16.7		7	23.3		2	6.7	
	Stands, turns head and trunk to look behind left or right.	5	16.7		15	50.0		8	26.7		9	30.0	
	Able to bend forwards to pick up object from floor safely.	2	6.7		4	13.3		2	2.7		3	10.0	
	Single limb balance.	0	0		2	6.7		0	0		0	0	

Table 4-4: Continue……

Variables		Intervention group (N=30)						Control group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		f.	%	MS	f.	%	MS	f.	%	MS	f.	%	MS
Transfers	Non-weight bearing, hoist required.	9	30	1.9	1	3.3	3.2	8	26.7	1.8	7	23.3	1.5
	Weight bearing, hoist required.	9	30		2	6.7		3	10.0		9	30.0	
	Assistance of two persons required.	8	26.7		1	3.3		7	23.3		5	16.7	
	Assistance of one person required.	4	13.3		15	50.0		11	36.7		9	30.0	
	Stand-by assistance/prompting required.	0	0		8	26.7		1	3.3		0	0	
	Independent.	0	0		3	10.0		0	0		0	0	
Ambulation/ Mobility	Bed/chair bound.	7	23.3	1.4	1	3.3	3.1	7	23.3	2.0	6	20.0	1.8
	Wheelchair mobile.	13	43.3		9	30.0		4	13.3		7	23.3	
	Ambulant with assistance of two persons.	4	13.3		8	26.7		5	16.7		6	20.0	
	Ambulant with assistance of one person.	2	6.7		9	30.0		10	33.3		9	30.0	
	Stand-by assistance/prompting required.	4	13.3		3	10.0		4	13.3		2	6.7	
	Ambulates independently.	0	0		1	3.3		0	0		0	0	
Overall mean of score (MS ± SD)		1.9±1.11			3.18±0.80			2.1±1.15			1.7±1.01		

frequency; %: percentage, MS: mean of score, SD=Standard deviation.

Table 4-4 by using physical mobility scale, shows a significant improvement in the physical mobility for patients in the intervention group after 14 days of the application of sitting balance exercises, compared with the patients in the control group. The total MS ± SD of physical mobility is 1.9±1.11, 3.18±0.80 for the pre-test and post-test, respectively, for the intervention group; conversely, the total MS ± SD of physical mobility is 2.1±1.15, 1.7±1.01 for the pre-test and post-test, respectively, for the control group.

Table 4-5: Summarize statistical analysis of physical mobility levels for the control and intervention groups in the pre-test and post-test periods with significant comparisons for each group:

Physical mobility	Control group (N=30)					Intervention group (N=30)				
	Pre-test		Post-test		P-Value	Pre-test		Post-test		P-Value
	f	%	f	%		f	%	f	%	
Severe level of impairment	16	53.3	20	66.7	0.230 NS	20	66.7	3	10.0	0.000 S
Moderate level of impairment	11	36.7	7	23.3		8	26.7	15	50.0	
Mild level of impairment	3	10.0	3	10.0		2	6.7	12	40.0	
Highest level of independence	0	0	0	0		0	0	0	0	

NS: Non-Significant (P value >0.05); S: Significant (P value ≤ 0.05), f.: frequency; %: percentage, *= Paired sample t-test.

Table 4-5 reveals that there are significant statistical differences in the physical mobility levels between the pre-test and 14 days after the application of sitting balance exercises at P-value of 0.230, 0.000 for the study and control groups respectively.

Table 4-6: Comparison the effect of sitting balance exercises on the physical mobility levels between the intervention and the control groups:

Physical mobility level	Pre-test					Post-test				
	Control group		Intervention group		P-Value	Control group		Intervention group		P-Value
	f	%	f	%		f	%	f	%	
Severe level of impairment	16	53.3	20	66.7	0.533 NS	20	66.7	3	10.0	0.000 S
Moderate level of impairment	11	36.7	8	26.7		7	23.3	15	50.0	
Mild level of impairment	3	10.0	2	6.7		3	10.0	12	40.0	
Highest level of independence	0	0	0	0		0	0	0	0	
MS	2.1		1.9			1.7		3.1		

NS: Non-Significant (P value >0.05); S: Significant (P value ≤ 0.05), f.: frequency; %: percentage, MS=Mean score, *= Independent sample t-test.

Table 4-6 exposes no significant statistical difference at P-value=0.533 in physical mobility levels before application of the interventional protocol between intervention and control groups; conversely, after 14 days of intervention, there is a significant statistical difference at P-value=0.000 between both groups. Therefore, the application of sitting balance exercises may be effective in improving physical mobility for patients with stroke.

Table 4-7: Summarize statistical analysis of postural control for patients in the intervention and control groups:

Variables		Control group (N=30)						Intervention group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		f	%	MS	f	%	MS	f	%	MS	f	%	MS
Can you sit to stand	Moderate or maximal assistance to stand	9	30.0	1.0	11	36.7	0.8	10	33.3	1.1	8	26.7	2.5
	Minimal assistance to stand or stabilize	13	43.3		13	43.3		11	36.7		5	16.7	
	Stand using hands after several tries	5	16.7		5	16.7		5	16.7		11	36.7	
	Stand independently using hands	3	10.0		1	3.3		4	13.3		6	20.0	
	No hands and stabilizes independently	0	0		0	0		0	0		8	26.7	
Can you standing unsupported	Unable to stand 30 seconds unassisted	12	40.0	0.9	12	40.0	1.4	11	36.7	1.0	0	0	2.4
	Several tries to stand 30 seconds unsupported	12	40.0		13	43.3		11	36.7		7	23.3	
	Able to stand 30 seconds unsupported	2	6.7		3	10.0		4	13.3		8	26.7	
	Able to stand for 2 minutes with supervision	3	10.0		1	3.3		4	13.3		10	33.3	
	Able to stand safely for 2 minutes	1	3.3		0	0		0	0		5	16.7	
Sit unsupported with feet on floor	Unable to sit without support for 10 seconds	8	26.7	1.3	15	50.0	0.7	13	43.3	1.4	1	3.3	2.5
	Able to sit 10 seconds	13	43.3		9	30.0		3	10.0		4	13.3	
	Able to sit 30 seconds	4	13.3		5	16.7		5	16.7		9	30.0	

	Able to sit 2 minutes under supervision	1	3.3		1	3.3		6	20.0		9	30.0	
	Able to sits safely and securely for 2 minutes	4	13.3		0	0		3	10.0		7	23.3	
	Needs assistance to sit	11	36.7		16	53.3		11	36.7		2	6.7	
	Sits independently, uncontrolled descent	8	26.7		6	20.0		11	36.7		4	13.3	
Stand to sitting	Uses back of legs against chair to control descent	6	20.0	1.1	6	20.0	0.8	5	16.7	1.0	10	33.3	2.2
	Controls descent by using hands	5	16.7		2	6.7		3	10.0		8	26.7	
	Sits safely with minimal use of hands	0	0		0	0		0	0		6	20.0	

f.: frequency; %: percentage, MS: mean of score.

Table (4-7): Continue……..

Variables		Control group (N=30)						Intervention group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		F	%	MS	F	%	MS	f	%	MS	f	%	MS
Transfers from chair to chair	Two people to assist or supervise to be safe	12	40.0	1.1	15	50.0	0.7	18	60.0	0.5	1	3.3	2.3
	Needs one person to assist	5	16.7		9	30.0		9	30.0		7	23.3	
	Transfers with verbal cueing and/or sitting balance	11	36.7		4	13.3		1	3.3		7	23.3	
	Transfers safely with definite need of hands	2	6.7		2	6.7		2	6.7		10	33.3	
	Transfers safely with minor use of hands	0	0		0	0		0	0		5	16.7	
Stand unsupported with eyes closed	Needs help to keep from falling	11	36.7	0.9	18	60.0	0.5	14	46.7	0.9	0	0	2.4
	Eyes closed < 3 seconds but stays steady	11	36.7		8	26.7		9	30.0		11	36.7	
	Able to stand 3 seconds	6	20.0		4	13.3		3	10.0		4	13.3	
	Able to stand 10 seconds with supervision	2	6.7		0	0		2	6.7		7	23.3	
	Able to stand 10 seconds safely	0	0		0	0		2	6.7		8	26.7	
Stand unsupported with feet together	Assistance to attain position, stand < 15s	20	66.7	0.4	18	60.0	0.6	24	80.0	0.3	1	3.3	2.1
	Assistance to attain position, stand > 15s	7	23.3		5	16.7		4	13.3		11	36.7	
	Feet together independently, stand < 30s	2	6.7		6	20.0		1	3.3		4	13.3	

	Feet together independently, stand for 1m + sitting balance	1	3.3		1	3.3		1	3.3		10	33.3	
	Feet together independently, stand for > 1m	0	0		0	0		0	0		4	13.3	
Reach forward with outstretched arm	Needs help to keep from falling	10	33.3	0.9	12	40.0	0.8	14	46.7	0.6	1	3.3	2.4
	Reaches forward but needs supervision	12	40.0		12	40.0		12	40.0		5	16.7	
	Can reach forward >5 cm	7	23.3		6	20.0		4	13.3		11	36.7	
	Can reach forward > 13 cm	1	3.3		0	0		0	0		7	23.3	
	Can reach forward confidently > 26cm	0	0		0	0		0	0		6	20.0	

f.: frequency; %: percentage, MS: mean of score.

Table (4-7): Continue…...

Variables		Control group (N=30)						Intervention group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		F	%	MS	F	%	MS	f	%	MS	f	%	MS
Pick up object from the floor	Unable to try and max assist	7	23.3		9	30.0		12	40.0		2	6.7	
	Unable to pick up and needs sitting balance	12	40.0		16	53.3		12	40.0		9	30.0	
	Unable to pick up but keeps balance	9	30.0	1.2	5	16.7	0.8	5	16.7	0.8	5	16.7	2.2
	Able to pick up object but needs sitting balance	1	3.3					1	3.3		9	30.0	
	Able to pick up object safely and easily	1	3.3					0	0		5	16.7	
Look over left and right shoulder	Needs assistance while turning	9	30.0		15	50.0		16	53.3		0	0	
	Needs sitting balance when turning	7	23.3		11	36.7		5	16.7		5	16.7	
	Turns sideways only but maintains balance	6	20.0	1.5	3	10.0	0.6	3	10.0	0.9	9	30.0	2.5
	Looks behind one side only, - weight shift	5	16.7		1	3.3		6	20.0		11	36.7	
	Look behind from both sides + weight shift	3	10.0		0	0		0	0		5	16.7	
Turn 360 degrees, left and right side	Needs assistance while turning	10	33.3		16	53.3		14	46.7		1	3.3	
	Needs close sitting balance or verbal cueing	13	43.3	1.0	8	26.7	0.7	8	26.7	0.9	8	26.7	2.3
	Able to turn 360 degrees safely and slowly	4	13.3		5	16.7		5	16.7		5	16.7	

	Able to turn 360 degrees one side only < 4s	2	6.7		1	3.3		3	10.0		11	36.7	
	Able to turn 360 degrees < 4s	1	3.3					0	0		5	16.7	
Alternate stepping on 26cm stool	Needs assistance to keep from falling	14	46.7	0.7	15	50.0	0.7	18	60.0	0.6	1	3.3	2.2
	Completes 2 steps needs minimal assistance	10	33.3		9	30.0		8	26.7		11	36.7	
	Completes 4 steps without aid + sitting balance	6	20.0		6	20.0		2	6.7		4	13.3	
	Safely completes 8 steps > 20s	0	0		0	0		2	6.7		8	26.7	
	Safely completes 8 steps < 20s	0	0		0	0		0	0		6	20.0	

f.: frequency; %: percentage, MS: mean of score.

Table (4-7): Continue……..

Variables		Control group N=30						Intervention group N=30					
		Pre-test			Post-test			Pre-test			Post-test		
		F	%	MS	F	%	MS	f	%	MS	f	%	MS
Stand unsupported with foot in front	Loses balance while stepping or standing	14	46.7	0.8	18	60.0	0.5	19	63.3	0.7	0		2.3
	Needs help to step, hold for > 15s	9	30.0		8	26.7		4	13.3				
	Small step in front > 30s	5	16.7		3	10.0		4	13.3				
	Foot in front > 30s	2	6.7		1	3.3		3	10.0				
	Tandem step independently > 30s	0	0		0	0		0	0				
Stand on one leg (weakest)	Unable to try	23	76.7	0.3	21	70.0	0.3	26	86.7	0.3			2.0
	Attempts to lift leg independently, hold < 3s	5	16.7		7	23.3		1	3.3				
	Able to lift leg independently, hold > 3s	2	6.7		2	6.7		1	3.3				
	Able to lift leg independently, hold > 5s	0	0		0	0		2	6.7				
	Able to lift leg independently, hold > 10s	0	0		0	0		0	0				
Overall mean of score (MS ± SD)		0.97 ± 0.74			0.74 ± 0.79			0.81 ± 0.75			2.3 ± 0.99		

f.: frequency; %: percentage, MS: mean of sore, SD=Standard deviation.

Table 4-7 by using the berg balance scale, shows a significant improvement in the postural control among patients in the intervention group after 14 days of the application of sitting balance exercises, compared with the patients in the control group. A total MS ± SD of postural control is 0.81±0.75, 2.3±0.99 for the pre-test and post-test, respectively, for the intervention group; conversely, a total MS ± SD of postural control is 0.97±0.74, 0.74±0.79 for the pre-test and post-test, respectively, for the control group.

Table 4-8: The frequency and percentage of balance levels for the control and intervention groups in the pre and post-test periods with comparison significant for each group:

Balance levels	Control group					Intervention group				
	Pre-test		Post-test		p-value	Pre-test		Post-test		p-value
	f	%	f	%		f	%	f	%	
High fall risk	25	83.3	26	86.7	0.186 NS	24	80.0	9	30.0	0.000 S
Moderate fall risk	5	16.7	3	10.0		6	20.0	8	26.7	
Low fall risk	0	0	1	3.3		0	0	13	43.3	

NS: Non-Significant (P value >0.05); S: Significant (P value ≤ 0.05), f.: frequency; %: percentage, *= Paired sample t-test.

Table 4-8 demonstrates the frequency and percentage of balance levels for the control and intervention groups between the pre-test and 14 days after the implementation of sitting balance exercises. There is a significant difference in the balance levels between pre- and post-sitting balance exercises at P-value of 0.000 in the intervention group. Conversely, a non-significant difference in the balance levels between pre-test and after 14 days period at P-value of 0.186 in the control group.

Table 4-9: Comparison the effect of sitting balance exercises on the balance levels between the intervention group and the control group:

Balance levels	**Pre-test**					**Post-test**				
	Control group		Intervention group		P-value	Control group		Intervention group		P-value
	f	%	F	%		f	%	f	%	
High fall risk	25	83.3	24	80.0	0.393 NS	26	86.7	9	30.0	0.000 S
Moderate fall risk	5	16.7	6	20.0		3	10.0	8	26.7	
Low fall risk	0	0	0	0		1	3.3	13	43.3	
M±SD	**1.1±0.37**		**1.2±0.40**			**1.1±0.46**		**2.1±0.86**		

NS: Non-Significant (P value >0.05); S: Significant (P value ≤ 0.05), f.: frequency; %: percentage, MS: mean, SD=Standard deviation, *= Independent sample t-test.

Table 4-9 exposes a non-significant statistical difference at P-value=0.393 in balance levels before the application of interventional protocol between intervention and control groups; conversely, after 14 days of intervention, there is a significant statistical difference at P-value=0.000 between both groups. Therefore, the application of sitting balance exercises may be effective in improving balance levels for patients with stroke.

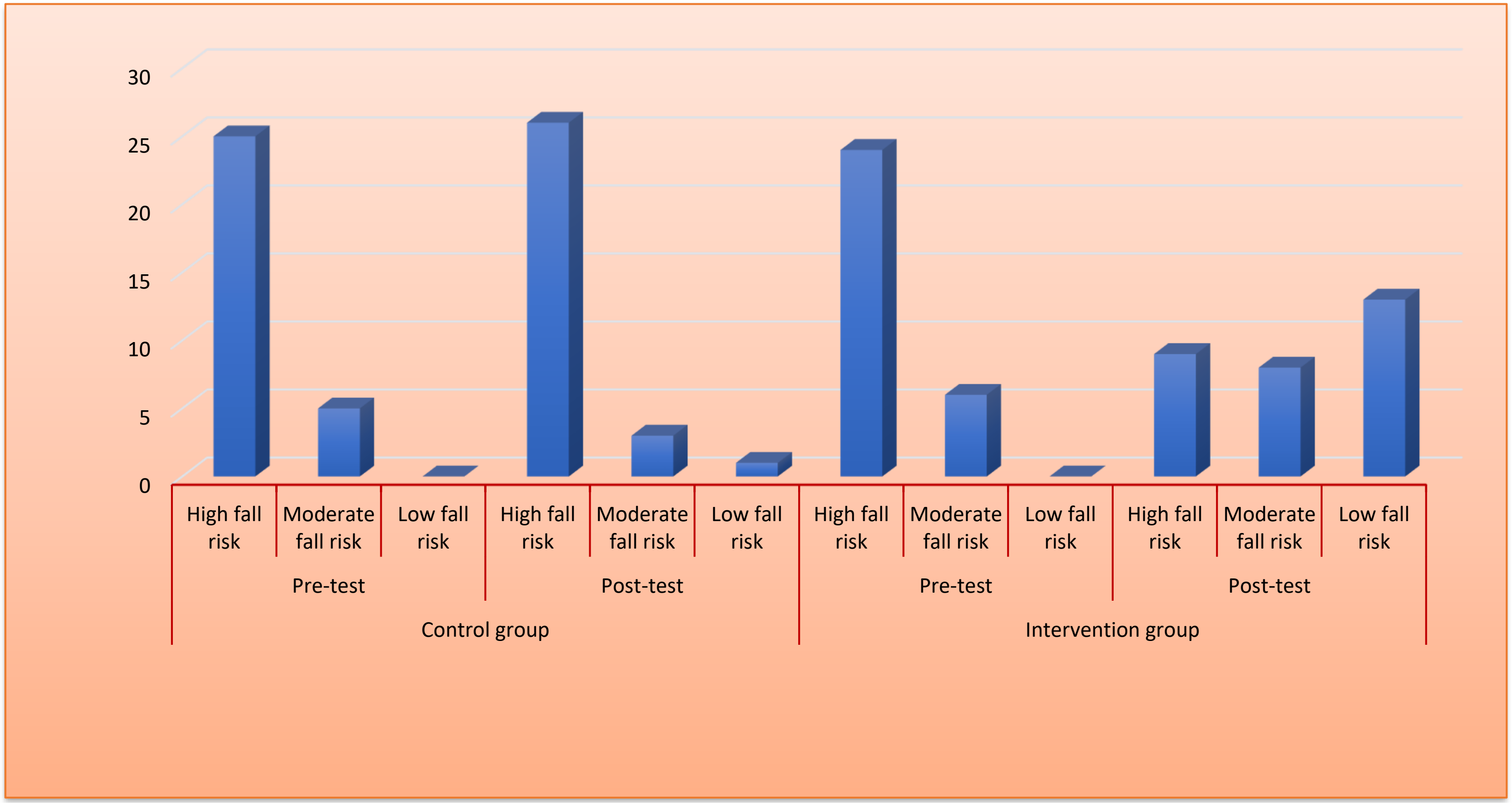

Figure 4-1: Balance levels for the patients between intervention and the control groups at pre-test and post-test period.

Figure 4-1 shows the improvement in the patient's level of balance for the patients in the intervention group between pre and post-test in compare with patients in the control group.

Table 4-10: Distribution of patients in two groups according to their dependency level:

Items		Control group (N=30)						Intervention group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		f	%	MS	f	%	MS	f	%	MS	f	%	MS
Bowel	Incontinent or needs enemas	7	23.3	1.1	3	10.0	1.1	8	26.7	1.1	2	6.7	1.7
	Occasional accident (1x/wk.) 2	12	40.0		21	70.0		10	33.3		5	16.7	
	Continent	11	36.7		6	20.0		12	40.0		23	76.7	
Bladder	Incontinent or needs enemas	12	40.0	0.9	6	20.0	0.9	12	40.0	0.8	2	6.7	1.6
	Occasional accident (1x/wk.)	8	26.7		21	70.0		10	33.3		7	23.3	
	Continent	10	33.3		3	10.0		8	26.7		21	70.0	
Grooming	Needs help with personal care	27	90.0	0.1	18	60.0	0.4	29	96.7	0.03	9	30.0	0.7
	Independent (including face, hair, teeth, shaving	3	10.0		12	40.0		1	3.3		21	70.0	
Toilet use	Dependent	11	36.7	0.6	16	53.3	0.5	15	50.0	0.5	0	0	1.6
	Needs some help	18	60.0		13	43.3		14	46.7		10	33.3	
	Independent	1	3.3		1	3.3		1	3.3		20	66.7	
Feeding	Unable	7	23.3	0.8	9	30.0	0.7	7	23.3	0.7	1	3.3	1.8
	Needs help, e.g. cutting	21	70.0		19	63.3		23	76.7		6	20.0	
	Independent	2	6.7		2	6.7		0	0		23	76.7	
Transfer (bed to chair and back)	Unable, no sitting balance	3	10.0	1.1	8	26.7	1.0	8	26.7	1.0	0	0	2.4
	Major help (1 or 2 people), can sit	20	66.7		12	40.0		15	50.0		1	3.3	
	Minor help (verbal or physical)	7	23.3		10	33.0		5	16.7		15	50.0	
	Independent	0	0		0	0		2	6.7		14	46.7	
Bathing	Independent (bath or shower)	5	16.7	0.1	24	80.0	0.2	27	90.0	0.1	5	16.7	0.8
	Dependent	25	83.3		6	20.0		3	10.0		25	83.3	

Table 4-10: Continue……..

Items		Control group (N=30)						Intervention group (N=30)					
		Pre-test			Post-test			Pre-test			Post-test		
		f	%	MS	f	%	MS	f	%	MS	f	%	MS
Mobility	Immobile	4	13.3	1.4	6	20.0	1.0	7	23.3	1.4	0	0	2.5
	Wheelchair independent (including corners)	12	40.0		17	56.7		9	30.0		2	6.7	
	Walks with the help of 1 person (physical or verbal help)	10	33.3		6	20.0		9	30.0		10	33.3	
	Independent (may use aid)	4	13.3		1	3.3		5	16.7		18	60	
Dressing	Dependent	14	46.7	0.5	8	26.7	0.7	16	53.3	0.5	1	3.3	1.5
	Needs help – can do ~ ½ unaided	16	53.3		22	73.3		13	43.3		12	40.0	
	Independent (including buttons, zips, laces, etc.)	0	0		0	0		1	3.3		17	56.7	
Stairs	Unable	24	80.0	0.2	19	63.3	0.4	26	86.7	0.1	5	16.7	1.1
	Needs help (verbal or physical)	6	20.0		10	33.3		4	13.3		17	56.7	
	Independent	0	0		1	3.3		0	0		8	26.7	
Overall mean of score (MS ± SD)		0.72 ± 0.40			51.0 ± 15.9			0.65 ± 0.38			83.8 ± 14.7		

f.: frequency; %: percentage, MS: mean of score, SD: Standard deviation.

By using a modified Barthel index for ADL, the result in table 4-10 reveals a significant difference in the mean of score for the patient's dependency level assessment in the pre-test and post-test period of the intervention group, the total MS ± SD of dependency level is 0.65±0.38, 83.8±14.7 for the pre-test and post-test, respectively, for the intervention group. Conversely, a non-significant difference in the mean of score during the patient's dependency level assessment in the pre-test and post-test period of the control group, the total MS ± SD of dependency level is 0.72±0.40, 51.0±15.9 for the pre-test and post-test, respectively, for the control group.

Table 4-11: The frequency and percentage of dependency levels for the control and intervention groups in the pre and post-test periods with comparison significant for each group:

Dependency level	Control group					Intervention group				
	Pre-test		Post-test		*p-value	Pre-test		Post-test		*p-value
	f	%	f	%		f	%	F	%	
Total dependence	0	0	0	0	0.565 (NS)	0	0	0	0	0.000 (S)
Severe dependence	23	76.7	24	80.0		26	86.7	2	6.7	
Moderate dependence	7	23.3	6	20.0		4	13.3	16	53.3	
Slight dependence	0	0	0	0		0	0	6	20	
Independence	0	0	0	0		0	0	6	20	

NS: Non-Significant (P value >0.05); S: Significant (P value ≤ 0.05), f.: frequency; %: percentage, *= Paired sample t-test.

Table 4-11 exposes a significant statistical difference (at p-value of 0.000) in the dependency level between the pre-test and 14 days after the application of sitting balance exercises of intervention group, while a non-significant statistical difference (at p-value of 0.56) in the dependency level between the pre-test and post-test period for control group.

Table 4-12: Comparison the effect of sitting balance exercises on the dependency levels between the intervention and the control groups:

Dependency level	Pre-test					Post-test				
	Control group		Intervention group		*p-value	Control group		Intervention group		*p-value
	f	%	f	%		f	%	f	%	
Total dependence	0	0	0	0	0.362 (NS)	0	0	0	0	0.000 (S)
Severe dependence	23	76.7	26	86.7		24	80.0	2	6.7	
Moderate dependence	7	23.3	4	13.3		6	20.0	16	53.3	
Slight dependence	0	0	0	0		0	0	6	20.0	
Independence	0	0	0	0		0	0	6	20.0	
MS±SD	2.23±0.43		2.13±0.34			2.20±0.40		3.53±0.89		

NS: Non-Significant (p-value >0.05); S: Significant (p-value ≤ 0.05), f; frequency; %: percentage, MS: mean of score; SD: Standard devastation, *= Independent sample t-test.

Table 4-12 shows non-significant statistical differences at p-value 0.36 that are observed in the dependency level between intervention and control groups before interventional protocol, while after 14 days of intervention a significant statistical difference at P-value 0.000 is observed between both groups.

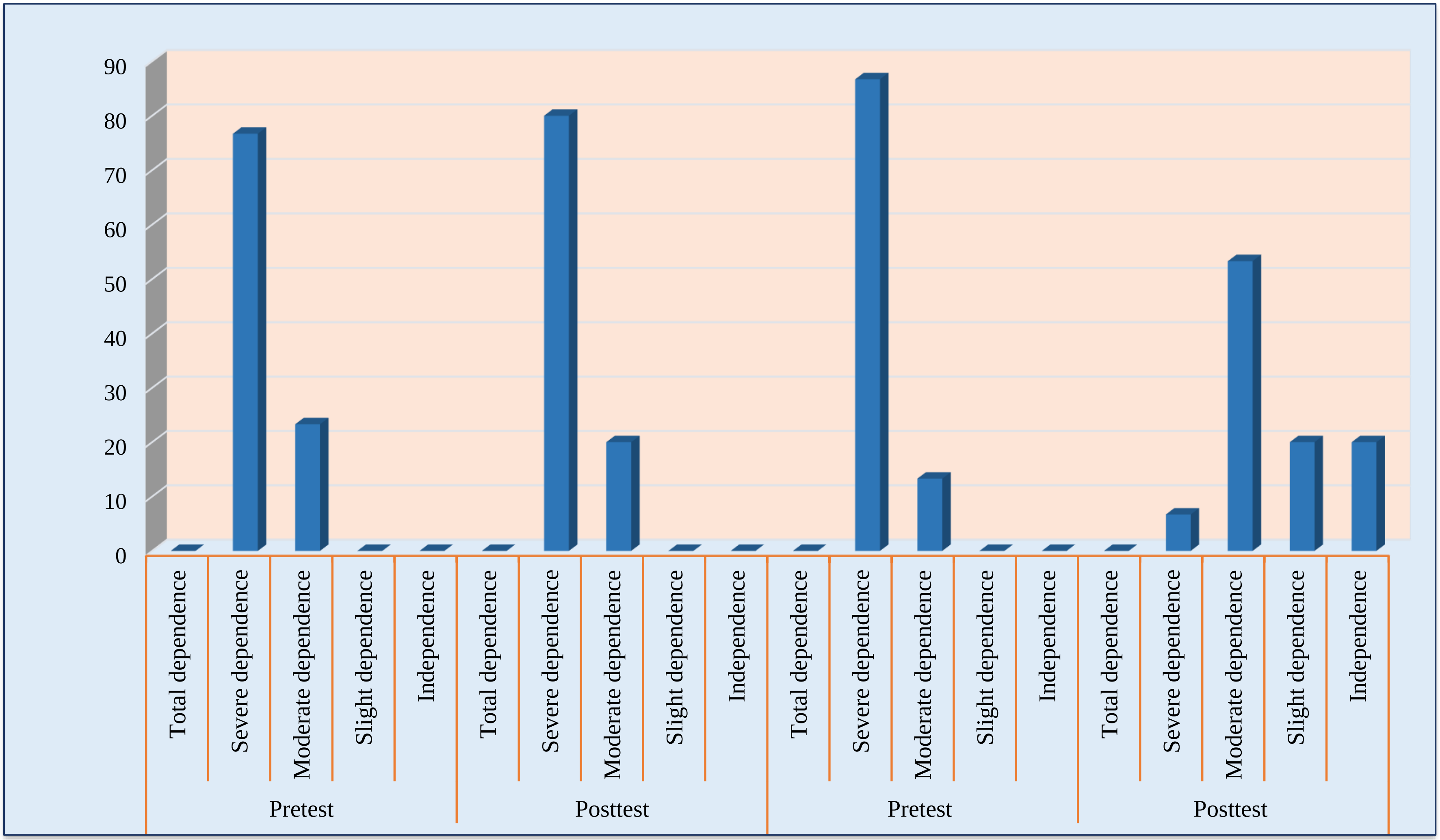

Figure 4-2: Levels of dependency for the patients in the intervention and the control groups at pretest and post-test period.

Table 4-13: Differences between the effect of sitting balance exercises on physical mobility among patients with stroke and their socio-demographic characteristics and clinical data:

Socio-demographic data	Comparative patterns	df	F-value	p-value	Sig.
Age groups	Between groups	16	**0.85**	**0.62**	**NS**
	Within groups	13			
Marital status	Between groups	2	**1.15**	**0.33**	**NS**
	Within groups	27			
Educational status	Between groups	5	**1.81**	**0.14**	**NS**
	Within groups	24			
Occupation	Between groups	3	**8.85**	**0.000**	**S**
	Within groups	26			
Pre-exciting chronic diseases	Between groups	4	**1.7**	**0.17**	**NS**
	Within groups	25			
Number of stroke incidence	Between groups	2	**0.70**	**0.50**	**NS**
	Within groups	27			
Time period after stroke	Between groups	15	**1.1**	**0.39**	**NS**
	Within groups	14			
BMI	Between groups	4	**0.32**	**0.86**	**NS**
	Within groups	25			

df=Degree of Freedom; F=statistics P-value= Probability value; *= analysis of variance (ANOVA); NS=non-significant (p-value > 0.05); S= Significant (p-value ≤0.05).

Table 4-13 exposes significant statistical differences at a P-value=0.000 between the effect of sitting balance exercises on physical mobility and the patient's occupation, while non-significant differences are present between the effect of sitting balance exercises on physical mobility and the other socio-demographic characteristics and clinical data of patients with stroke.

Table 4-14: Differences between the effect of sitting balance exercises on postural control among patients with stroke and their socio-demographic characteristics and clinical data:

Demographic data	Comparative patterns	df	F-value	p-value	Sig.
Age groups	Between Groups	16	1.5	0.20	NS
	Within Groups	13			
Marital status	Between Groups	2	0.39	0.67	NS
	Within Groups	27			
Educational status	Between Groups	5	1.1	0.36	NS
	Within Groups	24			
Occupation	Between Groups	3	2.5	0.07	NS
	Within Groups	26			
Pre-exciting chronic diseases	Between Groups	4	0.5	0.69	NS
	Within Groups	25			
Number of stroke incidence	Between Groups	2	0.3	0.74	NS
	Within Groups	27			
Time period after stroke	Between Groups	15	2.3	0.05	S
	Within Groups	14			
BMI	Between Groups	4	0.26	0.90	NS
	Within Groups	25			

df=Degree of Freedom; F=statistics; P-value= Probability value; *= analysis of variance (ANOVA); NS=Non-significant (p-value > 0.05); S=Significant (p-value ≤0.05)

Table 4-14 shows a significant statistical difference at P-value=0.05 between the effect of sitting balance exercises on postural control and the time period after stroke. In contrast, non-significant differences are present among the effect of sitting balance exercises on postural control and the other socio-demographic characteristics and clinical data of patients with stroke.

Table 4-15: Differences between the effect of sitting balance exercises on dependency level among patients with stroke and their socio-demographic characteristics and clinical data:

Demographic data	Comparative patterns	df	F-value	p-value *	Sig.
Age groups	Between Groups	16	0.790	0.677	NS
	Within Groups	13			
Marital Status	Between Groups	2	2.045	0.149	NS
	Within Groups	27			
Educational status	Between Groups	5	0.904	0.495	NS
	Within Groups	24			
Occupation	Between Groups	3	1.248	0.313	NS
	Within Groups	26			
Comorbidities	Between Groups	4	1.069	0.393	NS
	Within Groups	25			
Number of stroke incidence	Between Groups	2	0.719	0.426	NS
	Within Groups	27			
Time period after stroke	Between Groups	15	1.633	0.174	NS
	Within Groups	14			
BMI	Between Groups	4	0.740	0.574	NS
	Within Groups	25			

df=Degree of Freedom; F=statistics; P-value= Probability value; *= analysis of variance (ANOVA); NS=Non-Significant (p-value > 0.05); S=Significant (p-value ≤0.05)

Table 4-15 displays a non-significant difference between the effect of sitting balance exercises on dependency level and the patient's socio-demographic characteristics and clinical data of patients with stroke.

Table 4-16: Differences between the effect of sitting balance exercises on physical mobility for patients with stroke and their sex, type and site of stroke:

Variables	Classes	F	MS	SD	df.	p-value	Sig.
Sex	Male	13	1.5	0.50	15	0.16	NS
	Female	17					
Type of stroke	Ischemic stroke	10	1.6	0.46	15	0.13	NS
	Hemorrhagic stroke	20					
Site of stroke	Right lobe of the brain	19	1.3	0.49	15	0.86	NS
	Left lobe of the brain	11					

f=Frequency; MS=Mean of score; SD=Standard deviation; df=Degree of Freedom; P-value= Probability value; NS=Non-Significant (P-value > 0.05).

Table 4-16 reveals a non-significant difference between the effect of sitting balance exercises on physical mobility and the patient's sex, type, and site of stroke.

Table 4-17: Differences between the effect of sitting balance exercises on postural control for patients stroke and their sex, type and site of stroke:

Variables	Classes	F	MS	SD	df.	p-value	Sig.
Sex	Male	13	1.5	0.50	21	0.49	NS
	Female	17					
Type of stroke	Ischemic stroke	10	1.6	0.46	21	0.14	NS
	Hemorrhagic stroke	20					
Site of stroke	Right lobe of the brain	19	1.3	0.49	21	0.39	NS
	Left lobe of the brain	11					

f=Frequency; MS=Mean of score; SD=Standard deviation; df=Degree of Freedom; P-value= Probability value; NS=Non-Significant (P-value > 0.05).

Table 4-17 illustrates a non-significant difference between the effect of sitting balance exercises on postural control and the patient's sex, type, and site of stroke.

Table 4-18: Differences between the effect of sitting balance exercises on dependency level for patients stroke with their sex, type and site of stroke:

Variables	Classes	F	MS	SD	df.	p-value	Sig.
Sex	**Male**	13	1.5	0.50	17	0.47	NS
	Female	17					
Type of stroke	**Ischemic stroke**	10	1.6	0.46	17	0.43	NS
	Hemorrhagic stroke	20					
Site of stroke	**Right lobe of the brain**	19	1.3	0.49	17	0.54	NS
	Left lobe of the brain	11					

f=Frequency; MS=Mean of score; SD=Standard deviation; df=Degree of Freedom; P-value= Probability value; NS=Non-Significant (P-value > 0.05).

Table 4-18 reveals a non-significant difference between the effect of sitting balance exercises on dependency level and the patient's sex, type, and site of stroke.

Chapter Five

Discussion of the Results

Chapter Five

Discussion of the Results

This chapter will provide a well-structured discussion that provides a systematic interpretation of the findings from chapter four, supplemented by recent research.

5.1. Discussion of socio-demographic data of patients in the intervention and control group:

Regarding the socio-demographic data as listed in the table (4-1), that are among the participants taking part in the intervention group's more than one-half were within the age groups of 60-69 years old and accounted for 53.3%, the mean age of patients in the intervention group's patients was 57.1± 9.54, while about most of patients in the control group were 50 years old and older and accounted for 72.4%, the mean of age for patients in the control group is 54.0±11.4. This result corresponding with the result of a randomized controlled trial that was conducted by Lee, (2019) reported that the within intervention group patients, the mean of age was 59.7 while 61.2 in the control group. Alnaami, et al., (2021) conducted a retrospective study in Aseer (Southwestern) area, in Kingdom of Saudi Arabia, to detect the demographic features and stroke types of 562 patients, exposed that 45.7% were between the ages of 60 and 79 and the mean of age was 62.6 ± 17.0, and 62.6% of patients were males.

Regarding the patient's sex as shown in table (4-1), our results demonstrated that 56.7% and 53.3% of the intervention and control groups, respectively, are female. A similar pattern of results was obtained through cross-sectional study conducted by Lee, et al., (2021) on fifty-five patients with stroke, reported that about 56% of participants were females, and stroke prevalence was more common in women than in men. Concerning to the marital status, the greater percentage (66.7 %), and (63.3%) among the patients in the both the intervention group and control group, there were married. These findings are directly in line with previous findings of the study conducted by Andersen and Olsen, (2018) reported that 51.19% of stroke patients were married and concluded that the one-week and one-month case fatalities from stroke were lower among the single, divorced, and widowed stroke patients.

These results may be due to sedentary lifestyle of females in Iraqi society that support risk of stroke incidence. This opinion is directly in line with previous findings of the study conducted by Sattelmair, et al. (2010) that reveals the likelihood for women's risk for stroke to be reduced when they engage in physical exercise during their free time. Walking in particular was typically linked to decreased chances of hemorrhagic, ischemic, and total stroke.

Furthermore, patients in both the intervention and control groups ,30.0% and 43.3% have primary school levels, while 46.7% of patients among those groups, respectively, are housewives. These results go beyond the results of a prospective cohort study, conducted by Jackson, et al., (2018) to investigate the relationship between education and stroke showing that the total stroke incidence was lower and was associated with higher education.

The educational level can promote the awareness of person about the risk factors of stroke that help to decrease stroke incidence, thus, primary school levels have higher incidence. The study conducted by Al-Obaidi, et.al (2023) concluded that lack of participants' awareness regarding stroke risk factors. There is a need for a promotion of awareness among Iraqi's people to improve stroke awareness and lower stroke mortality and morbidity.

5.2. Discussion of clinical data of patients in the intervention and control group:

Regarding the participant's clinical data as listed in the table (4-2), the results indicate that 40.0%, and 50.0% of the patients in the intervention and control groups had hypertension and diabetic. Our results come in agreement with the results of the study conducted by Chang, et al., (2021) reported during a 1-year follow-up, it was found that persons who suffer from hypertension and type 2 diabetes had a higher rate of new strokes and recurrences, with 51% of participants having hypertension and 37.3% having both hypertension and diabetes.

Regarding the type of stroke, our results demonstrated that about two-thirds (66.7%) among the patients in the intervention group and greater than one-half (53.3%) of the control group patients had hemorrhagic stroke. These findings are directly in line with the results of a previous study done by Lee, et al., (2021) reported that 64% of the control group had a hemorrhagic stroke, compared to 85% of the intervention group. Concerning site of stroke, the present study confirmed that about two-thirds (63.3%) of intervention group patients and one-half (50.0%) of the control group patients, respectively, were had right brain lobe stroke. A similar result was obtained in previous research carried out by Kim, et al. (2019), which stated that left hemisphere was impacted in 46.6 percent and the right hemisphere in 53.4% and our results also agree with Kossi, et al. (2021) that stated a total of 54 stroke survivors at the University Hospital of Parakou were included, 30.77% had right cerebral hemisphere injured and only17.86 % were left hemisphere injured.

Hypertension and diabetes are correlated to obesity, low physical activity and low awareness about risk factors, all these causes contribute to stroke. The study conducted by Boehme, et.al., (2017) stated that obesity has been associated to stroke risk factors including diabetes and hypertension. Physical inactivity is linked to several negative health impacts.

Concerning homogeneity between intervention and control groups related to their socio demographic characteristics, the results indicated that no significant difference were found at p-value>0.005. These results may be related to researcher efforts and similarity among persons characteristics in the community such as in life style.

These results corresponding to the result of quasi-experimental research conducted by Mohammed, et al. (2021) at the Benha University Hospital's Neurological Department to examine the double demand exercise training program's impact on stroke patients' balance, mobility, and risk of falling as well as how it affected ADL. About 104 adult stroke patients using purposive sample that was evenly separated into groups for intervention and control revealed that no significant difference was present in sociodemographic features between the two groups (p-value > 0.05). The similar result was obtained by randomized controlled trial study conducted in Thailand by Phiphaksakul& Siriphorn (2022) that examined the effects of exercise at home using data from a mobile device's inclinometer app and a balance plate on stroke patients' sitting balance and daily tasks. The study found no statistically significant changes in the general characteristics of participants in the intervention and control groups.

Regarding the patients, BMI as shown in table (4-3) suggests that there is no discernible difference was seen between intervention and control groups with relation to patient body mass index at P-value of > 0.05. About one-half (50%) of intervention group participants were overweight, and 20% were within normal, whereas over one-third of the participants in the control group (40%) were overweight. The obesity class I accounts for one-third (33.3%) of the control group and 20% of the intervention group. These results go beyond previous study conducted by Weidman and MacDonald (2022), showing that 35.6% of the patients who were classified into 4 groups based on classifications of BMI with the normal body mass index as the reference group were overweight and within the normal range.

5.3. Discussion of physical mobility level for patients in the intervention and control groups:

Concerning the level of physical mobility for participants in the intervention and control groups as shown in table (4-4) and (4-5), the results of present study suggests that by using physical mobility scale, the total MS

± SD of physical of mobility is (1.9±1.11) and (2.1±1.15) in regard to the patients in the two groups, the intervention and the control. The result of our study shows that most (53.3%), and (66.7%) for patients in intervention and control groups, respectively, had a severe level of impairment in physical mobility at pre-test period, and 36.7, 26.7% of patients who participated in the experimental and control groups, respectively, had a moderate level of impairment in physical mobility at pre-test period. These results may be related to use of efficient scale that suitable to study field and subject.

A similar result was obtained by randomized controlled trial study analysis comprised 497 patients conducted in Germany by Zirnsak, et al., (2022) they investigated the relationship between physical activity before to a stroke and physical quality of life three months afterwards. According to the study's findings, pre-stroke physical activity appears to have a significant and favorable relationship with physical quality of life in patients with modest disabilities three months after the stroke.

These results go beyond previous longitudinal registry-based research with a cohort that is conducted by Reinholdsson, et al. (2021) in Sweden, to examine the relationships between pre-stroke physical activity and mobility, walking ability, and self-perceived upper extremity function during stroke unit treatment, about one thousand ninety-two persons have stroke who were hospitalized to three stroke departments in Swede were studied. Physical activity levels and mobility changes over time appeared to differ between active and inactive groups at p-value=0.062, however, the variations were not statistically significant.

5.4. Discussion the effect of sitting balance exercises on physical mobility level for patients with stroke:

Regarding statistical analysis of physical mobility for the control and intervention groups in the pre-test and post-test periods as shown in the table (4-4) and (4-5), our results demonstrated that there is a non-significant statistical difference in the physical mobility levels between the pre-test and after 14^{th} days at P-value of 0.23 within the control group. Conversely, a significant statistical distinction in the level of physical mobility were found between the pre-test and post-test of the intervention group at P-value of 0.001.

As reported in table 4-6, the result exposed a non-significant statistical difference at P-value of 0.533 in the level of physical mobility among the intervention and control groups, while a significant statistical distinction in the level of physical mobility was found at P-value of 0.001 between the control and intervention groups after 14 days of the application of sitting balance exercises. These findings suggest that performing of sitting balance exercises for patients with stroke is very effective in improving the level of physical mobility among this type of patients. These results may be related to early application of exercises that improve circulation and decrease joint stiffness.

A similar pattern of results was obtained in single-center, randomized controlled study that is blind to patients was conducted by Komiya, et al. (2021) in the Japanese prefecture of Hiroshima, Kure City, 30 participants were randomly and a final evaluation was performed by 11 participants from each of the intervention (n = 15) and control (n = 15) groups. The study came to the conclusion that balancing training with an immediate posture system for feedback can enhance the ambulatory capability for chronic stroke patients.

These results come in contact with systematic review and meta-analysis that was conducted by Mackie and Eng (2023) to investigate how sitting activities affect mobility, balance, and cardiometabolic health indicators in stroke survivors and found that sitting exercises can improve mobility outcomes among patients with stroke. Therefore, sitting exercises demonstrate clinical importance on mobility, balance, and cardiometabolic health as compared with conventional therapy.

These results go beyond previous reports, showing that an assessor-blinded, randomized controlled trial conducted by Haruyama, et al. (2016) in which 32 people were divided into two groups at random: the experimental group (n = 16) and (n = 16) among control group. Exercise in core stability for 400 minutes was given to the experimental group throughout the course of the training period instead of the conventional programs, whereas the control group only received the conventional programs. Training in core stability increases the ability to move around while standing and their trunk function after a stroke. Our study inconsistent applying a longitudinal, registry-based research using a cohort that was acquired in a timely manner conducted by Reinholdsson, et al. (2021) to examine links between pre-stroke physical activity and mobility while receiving treatment in a stroke unit. The study showed that all patients among groups had increases in mobility (p=0.001). The mobility and the progression of walking ability varied between the physically sedentary and active groups (p = 0.062) but were not significant.

5.5. Discussion of postural control for patients in the intervention and control groups:

Regarding the postural control among patients in the intervention and control groups as shown in table (4-7), and (4-8) by using the berg balance scale, the result shows a severe impairment in the level of postural control, the total MS ± SD of postural control for both intervention and control groups participants was 0.81±0.75, 0.97±0.74, respectively, at pre-test period. As shown in table (4-8), the result at pre-test period represents that the majority (83.3%), and (80%) of patients in the control and intervention groups, respectively have a high fall risk, and 16.7%, 20.0% of patients in the control and intervention groups, respectively have a moderate fall risk. These results may be related to site and degree of damage in the brain that affect balance abilities among stroke patients.

The results of this study correspond with the result of a single centered, prospective and definitive study conducted in Turkey conducted by Ersöz Huseyinsinoglu, et al. (2022) to estimate correlations between sitting balance performance and fall risk in stroke patients. A total of 52 patients with early-stage (acute and subacute) stroke were included. For the measurement of all trunk muscle groups, the individual was sitting on a chair without a back. The measurements were made three times in each direction, and the average score was determined. The study's findings indicate that sitting balance is linked to a higher risk of falling, however this link is tempered by the strength of the lateral flexors and extremities on the side with difficulties with balance.

A retrospective case-control research design comes into contact with the findings of Yu, et al. (2021) examined the variations in balance function and fall risk between patients with and without cognitive impairment after stroke in 32 patients with hemiplegic gait in China. According to the study's conclusions, individuals with post-stroke cognitive impairment (CI) had worse balance and a higher chance of falling. The risk of falling increases during posture control in regular tasks, such as turning and sitting.

These findings are consisted with a multivariable proportional odds analyses conducted in Singapore by Pua, et.al (2017), the study including 247 older persons who had visited the emergency room because of a fall, the interplay between fall efficacy and postural balance and its link to further falls were explored. According to the study's findings, older persons with poor postural balance and high falls efficacy were more likely to fall than those with low falls efficacy.

5.6. Discussion of effect of sitting balance exercise on postural control for patients with stroke:

The results of our study as presented in table (4-7) show a significant improvement in the postural control among intervention group participants after 14th days from the application of sitting balance exercises compared with patients in the control group. The total MS ± SD of postural control is 0.81±0.75, 2.3±0.99 for the pre-test and post-test, respectively, for the intervention group; conversely, the total MS ± SD of postural control is 0.97±0.74, 0.74±0.79 for the pre-test and post-test, respectively, for the control group.

The findings of this research correspond with the results of study performed by Ordahan, et al. (2015) that involved a selection at random of fifty hemiplegics patients to research or the control groups. Participants at the study group received balance training using a balance trainer during the program's 30 sessions in addition to the conventional recovery program. The research group showed statistically significant improvement when using the berg balance scale. Our study inconsistent with the results of an assessor-blinded, placebo-controlled randomized controlled trial conducted by Sheehy, et al. (2020) to determine if additional sitting balance exercises delivered by VRT enhance control over the upper arms and sitting balance in individuals receiving stroke therapy. The results showed that there were no significant differences (P >.006) between the groups. The study found that both groups' results for sitting balance were equal; as a result, it didn’t confirm the use of sitting balancing training offered by VRT following stroke to restoration of sitting balance.

Our result exposed a significant difference in the balance levels between pre and post performing of sitting balance exercises (P-value=0.001) in the experimental group. Conversely, a non-significant difference in levels of balance between pre- and post-sitting balance exercises (P-value= 0.186) in the control group. The findings of the present study support the result of study conducted by Junata, et al. (2021) in which the balance control among chronic stroke survivors were significantly improved ability to maintain balance (BBS: pre = 49.13, post = 52.75; P =.001) through preforming Kinect-based Rapid Movement Training (RMT) program. The improvements BBS score indicate improve balance ability among stroke survivors.

The improvement in balance levels between pre- and post-sitting balance exercises may result from compliance of patients, their desire to improve their postural control and minimize fear from fall related balance. The study conducted by Gusi, et al., (2012) concluded that training programme was practical and successful in lowering fall-related fear and enhancing dynamic balance and isometric strength in hospitalized older individuals with fall-related fear.

As shown in the table (4-9) our results demonstrated that a non-significant statistical difference at P-value=0.393 in balance levels among the participants in intervention and control group before the application of intervention; but after fourteen days of intervention, there is a statistically significant difference across the two groups with a P-value of 0.001. Therefore, application of sitting balance exercises may be effective in improving balance levels for patients with stroke.

These findings are directly in line with previous study findings in China conducted by Tan, et.al (2023) which revealed that non-significant statistical difference in balance function and fall risk ability within the two groups' scores. Among a total of 112 stroke patients who were at high risk for falls prior to treatment ($P > 0.05$). After three months of therapy, the study group's balance function ability scores were higher than those of control group, and their fall risk ratings were significantly reduced ($P < 0.05$). Also correspond with a parallel-group, single-center, randomly assigned controlled trial with assessor blinding study conducted by Thijs, et al., (2021) using technology-supported sitting balance training to investigate exercise therapy's impact on balance in the chronic stage after a stroke, after balance training there were significant improvement across BBS ($p < 0.01$). Thus, our study demonstrated that standing balance can be improved through preforming further sitting balance intervention to improve functionality performance.

5.7. Discussion of the dependency level for patients in intervention and control groups:

Regarding dependency level for patients with stroke in intervention and control groups, and by using a modified Barthel index for activity of daily living, the result in table (4-10), and (4-11) demonstrates that this group of patients had a severe level of dependency at pre-test period. The total MS ± SD of dependency level is 0.65±0.38 for the intervention group and 0.72±0.40 as regards the control group. Based on the table (4-11) the result of present study exposed that the majority (76.7%), and (86.7%) of patients with stroke in the control and intervention groups, respectively, had severe dependency level at pre-test period, and 23.3%, 13.3% of them had a moderate level of dependency at the same time.

These results go beyond previous reports, conducted by Lestari and Sunaryo (2021) in which the population that receives balancing exercises has a higher Barthel value than the population that does not receive balance exercises (or other types of exercise), enhancing the independence of everyday tasks, when two populations are compared. Our results also agree with research conducted by Thijs, et al., (2021) in which a four-week programme was compared to usual care in an assessor-blinded, single-center, parallel-group randomly assigned controlled trial to see if technology-based sitting balance training was practical and safe for chronic stroke patients. The level of independence in ADL was measured in the study using the Modified Barthel Index. When making use of an independent sample T test to compare the experimental and control groups, it was shown that a significant statistical difference was found in the Modified Barthel Index (P= 0.49), indicating ADL at a high degree of functioning. As a result, chronic stroke survivors who were in the late stages of recovery might benefit considerably from this technology-supported sitting balancing treatment.

The findings are directly in line with previous findings of the descriptive quantitative study in Indonesia that was done by Whitiana, et al., (2017) in which 31 post-stroke outpatients participated. About 18 (58.1%) of the 31 patients were categorized as independent in ADL. In the Neurology unit, the majority of post-stroke patients were independent in ADL.

5.8. Discussion of the effect of sitting balance exercises on the level of dependency for patients with stroke:

As shown in the table (4-11) the current study confirmed that there is a significant statistical difference within dependency level was found between the pretest and posttest period for the application of sitting balance exercises of intervention group for14th days at p-value of 0.001, while a statistically non-significant differences in the level of dependency at p-value of (0.565) was found between the pretest and posttest period for control group. The findings are directly in line with previous findings of the study that was done by Wurzinger, et al., (2021) in which 36–48 hours following a stroke, the two-third (60%) of the 366 eligible patients were dependent in activity of daily living. Both univariable and multivariable logistic regression analyses revealed that patients who were dependent within the first two days after stroke had increased probabilities of remaining dependent three months after stroke as well as one year later. Thereby, not implementing the treatment protocols would obviously enhance the level of dependency.

When comparing the effect of sitting balance exercise on dependency level in comparison with the intervention and control groups, the findings as shown in the table (4-12) revealed a non-significant statistical difference at p-value 0.36 were observed in the dependency level between intervention and control groups before interventional program, while after 14th days of intervention a statistically significant difference at P-value 0.001 were observed between the two groups. The findings of the present inquiry go beyond those of the study conducted by Lestari and Sunaryo (2021), reported that the results of statistical tests in the control and intervention groups indicated that the balance exercise had an effect on patients' improvement in independence in carrying out daily tasks, with a p value of 0.047. These findings are directly in line with a retrospective analysis conducted by Yu, et.al (2021) was done on 96 individuals who had ischemic strokes in China to assess effect of the recovery program delivered in the dependency unit for stroke patients on dependence which revealed that at discharge, the difference between the experimental and control groups' Barthel index scores was statistically significant (P 0.05), with the experimental group's score being higher.

The improvement of independence levels between pre- and post-sitting balance exercises may be as a result of effectiveness of protocol, supervision and family supportive environment to compliance these exercises, the study conducted by Collado-Mateo, et al., (2021) concluded that exercise compliance is influenced by a number of factors, including social support, intimacy, and supervision.

5.9. Discussion the differences between the effect of sitting balance exercises on physical mobility among patients with stroke and their socio-demographic characteristics and clinical data:

Regarding the differences between the effectiveness of sitting balance exercises on physical mobility among patients with stroke and their sociodemographic and medical data as shown in table (4-13), this result highlights a significant statistical difference at a P-value=0.001 between the effect of sitting balance exercises on physical mobility and the patient’s occupation, a non-significant differences are present between the effect of sitting balance exercises on physical mobility and the other socio-demographic characteristics and clinical data of patients with stroke.

The findings of this research interfere with the result of the study conducted by Kostadinovic, et al., (2019) that recruited 3540 individuals over the age of 65 from Serbia. This study also looked into other predictors:

age, sex, education level, marital status, well-being index, and residence location are all factors. Both univariate and multivariate analyses revealed significant associations between the difficulty of walking a half kilometer on level ground without assistance and sociodemographic factors after taking into account the factors that had a significant impact on age, sex, BMI, marital status, and educational attainment.

Our results also agree with a study conducted in Physical Medicine and Rehabilitation at Cukurova University Faculty of Medicine, Adana, Turkey, carried out a cross-sectional clinical investigation. The study conducted by Memis, et al. (2016) revealed that a non-statistically significant variations in mobility during the subacute phase of stroke among patients who performed any physical activity and exhibited a disease that lasted more than or less than a year (P>0.05).

A considerable difference that was found between the effect of sitting balance exercises on physical mobility and the patient's occupation can be related to the nature of occupation before incidence of stroke that require physical effort may cause effective restoring of muscle control and movement and minimize the risk of recurrence.

5.10. Discussion the differences between the effect of sitting balance exercises on postural control among patients with stroke and their socio-demographic characteristics and clinical data:

Concerning to the differences between the effect of sitting balance exercises on postural control among patients with stroke and their socio-demographic characteristics and clinical data as shown in the table (4-14), exposed a significant statistical difference at P-value=0.05 between the effect of sitting balance exercises on postural control and the time period after stroke. On the other hand, non-significant differences are present between the effect of sitting balance exercises on postural control and the other socio-demographic characteristics and clinical data of patients with stroke. These findings are directly in line with previous findings of a cross-sectional study included adult stroke survivors that conducted by Kossi, et al. (2021) revealed that balance impairments were significantly ($p < 0.01$) correlated with post-stroke duration.

Another study conducted by Khan and Chevidikunnan, (2021) to determine the prevalence of balance impairment in stroke patients. This study reported that female patients were more likely than male patients to exhibit balance impairment. Balance problems affect about half of stroke patients, with females having a higher incidence.

The significant association between the effect of sitting balance exercises on postural control and the time period after stroke may be related to early application of sitting balance exercises that promote recovery of brain tissue and restoring the neuromuscular functions with time. The study performed by Geng, et al. (2022) demonstrating the benefits of physical exercise 24 hours after stroke in improving the recovery of patients' neurological function.

5.11. Discussion the differences between the effect of sitting balance exercises on dependency level among patients with stroke and their socio-demographic characteristics and clinical data:

Concerning to the differences between the effect of sitting balance exercises on dependency level among patients with stroke and their socio-demographic characteristics and clinical data as shown in the table (4-15) the results show that a non-significant difference between the effect of sitting balance exercises on dependency level and the patient's socio-demographic characteristics and clinical data of patients with stroke.

The findings of this study correlate with study established by Campos, et al. (2017) which examined the variables that could be linked to functional dependence in newly diagnosed ischemic stroke patients at 12, 24, and 36 months. Sociodemographic characteristics, risk factors, and clinical severity were not linked to functional dependence in 303 of them 1 to 3 years after hospital discharge.

The results of this study disagree with a prospective cohort study conducted by Liljehult, et al., (2021)36 reported that among the 206 stroke survivors admitted to the hospital's rehabilitation ward, a homogeneous sample of stroke survivors undergoing specialized 24-hour stroke rehabilitation for 11 to 14 days, females were more dependent on ADL than males.

Our results inconsistent with a cross-sectional clinical study conducted by Memis, et al. (2016) that showed that there were statistically significant differences (p=0.005) were identified between individuals with ischemic and hemorrhagic stroke considering the activities of daily life conducted by using modified Barthel index scale.

Chapter Six
Conclusions & Recommendations

Chapter Six

Conclusions & Recommendations

6.1. Conclusions: This chapter will summarize an important point which discuss and interprets in chapter five.

The present study was concluded that:

1. Most of patient with stroke have a severe level of impairment in physical mobility.
2. The majority of patients with stroke have a deterioration in balance level; therefore, this type of patients may be at a high fall risk.
3. The majority of patients with stroke have a severe dependency level.
4. Performing the sitting balance exercises within 24-48 hours after stroke for 15-30 minute/two session a day for 14 day was effective in:
   a. Improving the level of physical mobility in patient with stroke.
   b. Restoring of postural control in patient with stroke.
   c. Minimizing the dependency level and achieve independence in personal activities of daily livening.
5. The effect of sitting balance exercises on level of mobility was different among patients' occupations.
6. The effect of sitting balance exercises on level postural control was different regarding time period after stroke among intervention group.
7. The effect of sitting balance exercises on level of dependency was not different between sociodemographic characteristics and clinical data as it was positively effective on all intervention group's category evenly.
8. The study accepted alternative hypothesis.

6.2. Recommendations:

According to the study's findings and conclusion, the researcher recommends the subsequent issues as follow:

1. All patients with stroke can be instructed to perform a sitting balance exercises early post stroke within 24-48 hours, for 15–30-minute, two time

per day for 14 days to improve level of physical mobility, postural control, and decrease dependency level.

2. Further studies can be done to investigate the long -term effects of sitting balance exercises on physical mobility, postural control, and dependency level.
3. Further study is recommended to assess the long -term effects of sitting balance exercises on other physical limitations after stroke.
4. All nursing staff in the neurology wards can be encouraged to implement sitting balance exercises as a routine care practice for patients with stroke to improve the physical mobility, postural control, and decrease level of dependency for this type of patients.

6.3. Implications:

Nursing practices: patients with stroke complain of many physical disabilities. Thus, the nurse must act to provide holistic care for patients with stroke by enabling them to perform activities of daily living independently as much as possible, thereby enhancing their functional abilities and decreasing the risk of falling. Therefore, the application of sitting balance exercises in the hospital care is essential in delivering practical nursing care for such patients, and this intervention could help improve the standard of nursing care.

Nursing education: Sitting balance exercises can be done individually anytime and anywhere, which expands their applicability; therefore, these exercises can be taught to patients with stroke to decrease their dependency level and consequently improve their functional abilities. In educational institutions it should establish a sitting balance exercise as a protocol to be learned for nursing student.

Nursing researches: There are many researches concentrating on exercises to improve mobility, balance, and dependency but it is necessary to establish techniques to improve them after a stroke, particularly during the sub-acute phase, when there is the greatest opportunity for healing and neuroplasticity. Many researches in this area can be performed to improve patients' recovery.

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Appendices

Appendix A

Arrangement of University of Kerbala \ collage of nursing

Republic of Iraq
Ministry of higher education & scientific research
University of Karbala
College of Nursing
Graduate studies Division

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جـــامعة كربلاء
كـلية التـمريــض
شعبة الدراسات العليا

التاريخ : 28/ 11/ 2022

العدد : د.ع/ 2841

الى / دائرة صحة كربلاء/ مركز التدريب و التنمية البشرية

م/ تسهيل مهمة

تحية طيبة...

يرجى التفضل بالموافقة على تسهيل مهمة طالبة الماجستير السيدة **(سرور خليل أبراهيم)** في مدينة الامام الحسين "عليه السلام" الطبية / مركز الامام الحسين "عليه السلام" لتأهيل المعاقين لإنجاز رسالتها الموسومة :

Effect of Sitting Balance Exercises on the Level of Mobility, Postural Control, and Level of Dependency among Patients with Stroke.

أثر تمارين توازن الجلوس في مستوى الحركة و التحكم في الوضعية ومستوى الاعتمادية بين مرضى الجلطة الدماغية

وهي احدى طلبة الدراسات العليا / الماجستير في كليتنا / للعام الدراسي (2022-2023) .

... مع التقدير ...

أ.م.د. سلمان حسين فارس الكريطي
معاون العميد للشؤون العلمية و الدراسات العليا
2022 / 11 / 28

نسخة منه الى :-
- مكتب السيد المعاون العلمي المحترم.
- شعبة الدراسات العليا.

العنوان : العراق - محافظة كربلاء المقدسة - حي الموظفين - جامعة كربلاء
Mail: nursing@uokerbala.edu.iq websitnursing.uokerbala.edu.iq

Appendix B

Arrangement of Ministry of Health / Kerbala Health Department / Training and Human Development Center

جمهورية العراق

محافظة كربلاء المقدسة
دائرة صحة كربلاء المقدسة
مركز التدريب والتنمية البشرية
شعبة ادارة المعرفة / وحدة ادارة البحوث

Holy Karbala governorate
Karbala Health Department
General manager's office
Training and Human Development Center

العدد: ٢١٦٢

التاريخ/ ١٩ / ١٢ / ٢٠٢٢

إلى / جامعة كربلاء/ كلية التمريض

الموضوع /تسهيل مهمة

دائرة صحة كربلاء المقدسة
قسم التدريب
والتنمية البشرية

تحية طيبة....

كتابكم المرقم د. ع /٢٨٤ في ٢٠٢٢/١١/٢٨
نود إعلامكم بأنه لا مانع لدينا من تسهيل مهمة طالبة ماجستير (سرور خليل ابراهيم) لإنجاز بحثها الموسوم:
(اثر تمارين توازن الجلوس في مستوى الحركة والتحكم في الوضعية ومستوى الاعتمادية بين مرضى الجلطة الدماغية)
في مؤسستنا الصحية وبأشراف الدكتور (مهند عبد الامير) على ان لا تتحمل دائرتنا اي نفقات مادية مع الاحترام .

الدكتورة
تقوى خضر عبد الكريم
طبيبة اختصاص

الدكتورة
تقوى خضر عبد الكريم
مدير مركز التدريب والتنمية البشرية
١٩ /١٢/ ٢٠٢٢

نسخة منه الى
- مدينة الامام الحسين (عليه السلام) الطبية اجراء اللازم مع الاحترام.
- مركز الامام الحسين (عليه السلام) لتأهيل المعاقين احيط بالامر مع الاحترام .

دائرة صحة كربلاء المقدسة
التنمية البشرية

Appendix C

Ethical consideration9

Ministry of Higher Education and Scientific Research
University of Karbala / College of Nursing
Scientific Research Ethics Committee

وزارة التعليم العالي والبحث العلمي
جامعة كربلاء / كلية التمريض
لجنة اخلاقيات البحث العلمي

استمارة اخلاقيات البحث العلمي

عنوان مشروع البحث	
Effect of Sitting Balance Exercises on the Level of Mobility, Postural Control, and Level of Dependency among Patients with Stroke أثر تمارين توازن الجلوس في مستوى الحركة و التحكم في الوضعية ومستوى الاعتمادية بين مرضى الجلطة الدماغية	
بيانات عن الباحث الرئيسي	
الاسم الثلاثي للطالب	مستوى الدراسة
سرور خليل ابراهيم	طالب دراسات عليا / ماجستير
بيانات الباحث او الباحثين المشتركين	
اسم الأستاذ المشرف	اللقب العلمي
د. حسن عبدالله عذبي	أستاذ مساعد
(Importance of the research and its objectives) اهمية موضوع البحث واهدافه	
Importance of the study: stroke is a serious life-threatening condition that happens when the blood supply to part of the brain is cut off, many clinical experiences may result from this condition, from these experiences weakness on one side of body that affect patient abilities to balance and independency, the sitting balance exercise can help to fix this problem after stroke. Objectives of the study: To determine the effect of sitting balance exercises on the level of mobility, postural control, and level of dependency among patients with stroke, and to find out the association between exercises outcomes and socio-demographic characteristics and clinical data of study participants.	
Time and Setting of the Research وقت ومكان اجراء البحث (الاماكن المقترحة لأجراء البحث فيها)	
وقت ومكان اجراء البحث: 2022/9/26 – 2023/9/19 ; مدينة الامام الحسين (ع) الطبية	
(Methodology) منهجية البحث	
Study design: Quasi-experimental design; Probability randomize sampling	
Sample of the study عينة الدراسة	
Sixty patients with acute stroke will participate in the study, the participants will be assigned randomly into two groups: 1) sitting balance exercises group, 2) control group (traditional care).	
(Ethical consideration during research) الاعتبارات الاخلاقية خلال اجراء البحث	
التعهد إني الموقع ادناه سرور خليل ابراهيم اتعهد بان اقوم بإجراء البحث وفقا لما ذكر في البروتوكول اعلاه وان التزم باتباع القوانين والتعليمات فيما يخص اجراء البحوث والالتزام بأخلاقياتها، كما واتعهد بأخذ الموافقة من افراد العينة للمشاركة في الدراسة واخذ موافقة من ولي أمر المشارك الشرعي في حال كون عمر الشخص المشارك اقل من 18 سنة، او كونه غير قادر على الفهم، وان أقدم الإيضاحات والمعلومات الخاصة بالدراسة لأفراد العينة للمشاركين في حال طلبها. وان اتعامل بسرية تامة مع بيانات افراد العينة. اسم وتوقيع الباحث	
توصية لجنة اخلاقيات البحث العلمي في الكلية	
قرار اعضاء لجنة اخلاقيات البحث العلمي حسب جلستها المنعقدة بتاريخ /10/ 2022 : ☑ الموافقة على اجراء البحث ☐ عدم الموافقة على اجراء البحث عضو عضو عضو عضو رئيس اللجنة	

Appendix D

Informed Consent form

موافقة خطية للمشاركة في بحث

الرجاء التوقيع اسفل الصفحة كي تشهد بان:

بعد ان قام طالبة الماجستير (**سرور خليل ابراهيم**) بشرح وتوضيح جميع التساؤلات بخصوص بحثه الموسوم (أثر تمارين توازن الجلوس في مستوى الحركة و التحكم في الوضعية ومستوى الاعتمادية بين مرضى الجلطة الدماغية)، حيث اطلعني صاحب البحث عن فائدة بحثه واهميته العلمية .كما واطلعني ان مشاركتي هذه هي تطوع مني وبمحض ارادتي وان بإمكاني رفض المشاركة او سحبها متى شئت ولأي سبب كان، او ان ارفض الاجابة على اي سؤال ، كما ان مشاركتي بالبحث لن تحملني اي نفقات او مسائلة من شئنها الضرر بمهنتي او شخصيتي، كما ان المعلومات الناتجة عن مشاركتي سوف تعامل بسرية تامة ولن يطلع عليها اي شخص وان هذه المعلومات ونتائجها هي للأغراض العلمية فقط ولن تكون هناك اي اشارة الى شخصي او عائلتي في اي منشور عن هذه الدراسة.

ولأجل هذا فاني اوقع على مشاركتي في هذا البحث

يرجى كتابة التاريخ بجانب التوقيع

توقيع ال التاريخ

توقيع الباحث .... التاريخ

Appendix EI

Application of the interventional protocol (Reaching exercise)

Appendix EII

Shifting weight from one side to another

Appendix EIII

Seated leg lift exercise

Appendix EIV

Single-leg knee extensions exercise

Appendix FI

The study instruments

Socio-demographic characteristics & medical information:

بسمه تعالى

الاستبانة في ادناه هي جزء من دراسة بعنوان" أثر تمارين توازن الجلوس في مستوى الحركة والتحكم في الوضعية ومستوى الاعتمادية بين مرضى الجلطة الدماغية "، أن كافة الاجابات ستعامل بسرية تامة ضمن إطار البحث العلمي فقط.

نشكر تعاونكم معنا...

استبانه رقم (١)// البيانات الديموغرافية - الاجتماعية:

١. العمر: .... سنة

٢. الجنس:

ذكر ☐ انثى ☐

٣. الحالة الاجتماعية:

أعزب/ باكر ☐ متزوج/ة ☐ أرمل/ة ☐

مطلق/ة ☐ منفصل/ة ☐

٤. المستوى التعليمي:

لا يقرأ ولايكتب ☐ يقرأ ويكتب ☐ ابتدائية ☐

متوسطة ☐ اعدادية ☐ معهد ☐

كلية فما فوق ☐

٥. المهنة: ....

٦. الامراض المزمنة:

٧. نوع الجلطة الدماغية: جلطة نزفية ☐ جلطة نقص التروية ☐

٨. موقع الجلطة الدماغية:

الفص الأيمن للدماغ ☐ الفص الايسر للدماغ ☐

٩. المدة الزمنية بعد الجلطة الدماغية: ايام ☐ أشهر ☐

١٠. عدد مرات الإصابة بالجلطة الدماغية:

١١. الوزن :

١٢. الطول:

Appendix FII

Physical Mobility Scale (PMS)

Physical Mobility Scale	Date:					
Supine to side lying	0: no active participation in movement 1: max assist, but turns head to roll 2: max assist, but rolls shoulder or legs 3: requires equipment (eg. Bed rail) to side-lie 4: requires verbal cueing to roll 5: independent- no assistance or prompting	(R) (L)	(R) (L)	(R) (L)	(R) (L)	(R) (L)
Supine to Sit	0: max assist, no head control 1: max assist, but controls head 2: requires assist with trunk & L/E or U/E 3: requires assist with L/E or U/E only 4: supervision required only 5: Independent and safe					
Sitting balance	0: total assistance, requires head support 1: sits with assistance, controls head 2: uses arms for support 3: unsupported for 10 sec. 4: unsupported, turns head & trunk to L & R 5: unsupported, touch floor & return to sit					
Sitting to Standing	0: unable to weight bear 1: full assistance of therapist, Describe: 2: requires equip (e.g.rail) to pull to stand. Describe. 3: push to stand, SBA, wt unevenly distributed 4: push to stand, wt evenly distributed, may require bar/frame to hold once standing 5: Independent, even wt bearing, hips and knees extended, no use of U/E					
Standing to Sitting	0: unable to weight bear 1: full assistance of therapist. Describe: 2: can initiate flexion, requires assist, holds arms of chair, wt evenly/unevenly distributed 3: poorly controls descent, SBA, holds arms of chair, wt evenly/unevenly distributed 4: controls descent, uses arms to lower, wt evenly distributed 5: Independent, no use of arms, wt evenly distributed					
Standing Balance	0: unable to stand without hands-on assist 1: able to safely stand using device/aid 2: stand indep for 10 sec without device 3: stand turn head & trunk look behind R&L 4: able to pick up object fm floor safely 5: single leg stance (Right & Left record time)	Left ____ Right____	Left ____ Right____	Left ____ Right____	Left ____ Right____	Left ____ Right____
Transfers	0: non-weight bearing hoist (full hoist) 1: weight bearing hoist (standing hoist) 2: assist required by 2 person. Describe: 3: assist required by 1 person. Describe: 4: SBA (prompting required only) 5: Independent					
Ambulation mobility	0: bed / chair bound 1: wheelchair mobile 2: ambulate with assist by 2 person 3: ambulate with assist by 1 person 4: SBA (prompting required only) 5: ambulates independently. Aid:					
Mobility Impairment 0 – 18 Severe = low fall risk 19 – 27 Moderate 28 – 36 Mild = highest fall risk 37 – 45 Highest Independence	**Total Score /45**					

Appendix FIII

Berg Balance Scale (BBS)

Appendix

مقياس بيرج للتوزان - الاصدار العربى - (A-BBS)

الأدوات المطلوبة :

كرسيين واحد له سنادات والأخر لا يوجد له سنادات - ساعة للوقت

قلم رصاص وورقة – مسطرة - جسم صلب أو وزن خفيف

الزمن : وقت التقييم من ١٥ إلى ٢٠ دقيقة

- عدد النقاط ١٤ نقطة من ٠ إلى ٤ درجة كل نقطة حسب تنفيذها (٥ مستويات للإجابة)
- يرجى شرح كل خطوة / أو إعطاء تعليمات كما هو مكتوب. عند التسجيل ، الرجاء تسجيل فئة أدنى ردا على ذلك ينطبق على كل بند.

	(النقاط من ٠-٤ لكل سؤال)	النقاط
١- الوقوف من وضع الجلوس : حاول عدم استخدام يديك للاعتماد أو (المساندة).	(٤) قادر على الوقوف بدون استخدام اليدين والثبات بدون مساندة . (٣) قادر على الوقوف بشكل ثابت باستخدام الأيدي. (٢) قادر على الوقوف باستخدام الأيدي بعد عدة محاولات. (١) يحتاج إلى مساعدة بسيطة للوقوف أو الثبات . (٠) يحتاج إلى مساعدة متوسطة أو قصوى للوقوف .	
٢- الوقوف بدون مساعدة . توصيات : الرجاء الوقوف لمدة دقيقتين دون أن تمسك أي شيء للثبات. (ملحوظة) إذا كان الشخص قادر على الوقوف ٢ لمدة دقيقتين دون مساعدة ، تسجل الدرجة كاملة أو أعلى درجة للجلوس دون مساعدة (وتنقل لسؤال رقم ٤) .	(٤) قادر على الوقوف بأمان لمدة دقيقتين . (٣) قادر على الوقوف لمدة دقيقتين مع المراقبة. (٢) قادر على الوقوف لمدة ٣٠ ثانية دون مساعدة. (١) يحتاج إلى عدة محاولات للوقوف لمدة ٣٠ ثانية دون مساعدة. (٠) غير قادر على الوقوف لمدة ٣٠ ثانية بدون مساعدة .	
٣- الجلوس مع عدم سند الظهر ولكن القدم مسنودة على الأرض أو مقعد توجيهات : يرجى الجلوس مكتوفي الأيدي لمدة ٢ دقيقة.	(٤) قادر على الجلوس في امن وأمان لمدة دقيقتين. (٣) قادر على الجلوس لمدة دقيقتين تحت الملاحظة (٢) قادر على الجلوس لمدة ٣٠ ثانية (١) قادر على الجلوس لمدة ١٠ ثوان . (٠) غير قادر على الجلوس دون دعم أو مساعدة لمدة ١٠ ثوان.	
٤- الجلوس من وضع الوقوف . توجيهات : أرجو الجلوس .	(٤) يجلس بأمان مع استخدامه البسيط للأيدي . (٣) التحكم بالنزول باستخدام اليدين. (٢) يستخدم ساقه من الخلف ضد كرسي للسيطرة على النزول. (١) يجلس بشكل ثابت ولكنه غير متحكم في نزوله . (٠) يحتاج لمساعدة في الجلوس .	
٥- عمليات النقل أو الحركة . توجيهات: ترتيب الكراسي لنقل محوري . نسأل الشخص إلى التحرك بطريقة واحدة تجاه كرسي بة سندات لمساندة الذراعين وأخر بدون سنادات (من الممكن استخدام كرسيين أو كرسي وسرير) .	(٤) قادر على الانتقال بأمان مع استخدام بسيط للأيدى . (٣) قادر على الانتقال بأمان وحاجة للاستخدام للأيدى. (٢) قادر على التنقل تحت الملاحظة أو التوجيه اللفظي . (١) يحتاج إلى شخص واحد للمساعدة . (٠) يحتاج إلى شخصيين للملاحظة أو للمساعدة ليكون بأمان.	
٦- الوقوف بدون مساندة أو مساعدة مع غمض العينين . توجيهات : الرجاء تغمض عينيك ، والوقوف بثبات لمدة ١٠ ثانية.	(٤) قادر على الوقوف لمدة ١٠ ثوان بأمان. (٣) قادر على الوقوف لمدة ١٠ ثوان مع الملاحظة. (٢) قادر على الوقوف لمدة٣ ثوان. (١) غير قادر على الوقوف مع الاحتفاظ مغمض العينين ٣ ثوان ولكنه يبقى ثابتا (٠) في حاجة إلى مساعدة للحفاظ علية من السقوط.	
٧- الوقوف بدون مساندة مع ضم الساقين توجيهات: ضع قدميك معا والوقوف من دون أن تمسك .	(٤) قادر على ضم القدمين بدون مساعدة " والوقوف دقيقة بأمان . (٣) قادر على ضم القدمين بدون مساعدة ، والوقوف دقيقة مع الإشراف أو الملاحظة . (٢) القدرة على ضم القدمين بدون مساعدة ولكنه غير قادر على الثبات لمدة ٣٠ ثانية	

	(١) يحتاج إلى مساعدة لثبات وضعة ولكن قادر على الوقوف لمدة ١٥ ثانية ضاما قدميه . (٠) يحتاج إلى مساعدة لثبات وضعة وغير قادر على الاستمرار لمدة ١٥ ثانية .	
٨. الوصول للأمام مع مد الذراع أثناء الوقـــــوف. توجيهات : ارفع ذراعك إلى ٩٠ أفرد أصـــابعك والوصـــول إلى الأمام بقدر ما تستطيع. (مدرب يضع مسطرة في نهاية الأصابع عندما يكون الذراع ٩٠ درجة. الأصابع لا ينبغي أن تلمس المسطرة أثناء الوصل إلى الأمام. المسافة المسجلة هي تلك المسافة التي يصل إليها الإصبع بينما الشخص في أكثر الأوضاع انحناء الأمام .	(٤) يمكن أن تصل إلى الأمام بثقة لمسافة اطول من ٢٥ سنتيمترا. (٣) يمكن أن تصل إلى الأمام بأمان لمسافة اطول من ١٢ سم. (٢) يمكن أن تصل إلى الأمام لمسافة اطول من ٥ سم بأمان. (١) قادر للوصول إلى الأمام لكنه يحتاج ملاحظة. (٠) يفقد توازنه بينما يحاول ويحتاج إلى مساعدة خارجية.	
٩. التقاط شيئا من الأرض من وضع الوقـــوف . توجيهات : التقاط الحذاء / النعال التي وضعت أمـــام قـــدميك.	(٤) قادر على التقاط الحذاء أو الشبشب بسهولة وأمان . (٣) قادر على التقاط شبشب لكنه يحتاج الإشراف. (٢) غير قادر على الالتقاط ولكن يقترب من ٢-٥ سم من النعال ويحتفظ بتوازنـــه بـــدون مســـاعدة. (١) غير قادر على الالتقاط ويحتاج إلى ملاحظة أثناء المحاولة. (٠) غير قادر على المحاولة / ويحتاج مساعدة للحفاظ علية من فقدان التوازن أو السقوط .	
١٠. اللف للنظر للوراء على يسار ويمين كتفة أثناء الوقوف . توجيهات : اتجه مباشرة إلى النظر خلفك على نحو كتفيه الأيسر وتكرر كتفية الأيمن . من الممكن يحمل الباحث شيئا خلف الشخص مباشرة للنظر إلية مما يشجع على التقاطه أفضل .	(٤) ينظر وراءه من كلا الجانبين مع التحكم الجيد بتوازن الجسم. (٣) ينظر وراء جانب واحد فقط والجانب الأخر يظهر أقل تحكما بالتوازن (٢) يلف بجانب واحد ، بل يحافظ على توازنه. (١) يحتاج إلى ملاحظة أثناء دورانه. (٠) يحتاج إلى مساعدة للحفاظ علية من فقدان التوازن أو السقوط .	
١١. يلـــف أو يـــدور ٣٦٠ درجـــة . توجيهات: يلف حول نفسه في دائرة كاملة. ويقف. ثم يلف دائرة كاملة في الاتجاه الآخر.	(٤) قادر على لفة أو دوران ٣٦٠ درجة بأمان في ٤ ثوان أو أقل. (٣) قادر على لفة ٣٦٠ درجة بأمان بجانب واحد فقط في ٤ ثوان أو أقل. (٢) قادر على لفة أو دوران ٣٦٠ درجة بأمان ولكن ببطء. (١) يحتاج إلى ملاحظة دقيقة وتوجيهات لفظية. (0) يحتاج مساعدة أثناء الدوران.	
١٢. وضع الأقدام بالتناوب على الأرض أو الكرسي أثناء الوقوف بدون مساندة . توجيهات : ضع القدم على درجة بالتناوب مع الأخرى . حتى تكون كل قدم قد لمست الدرجة أو الكرسي ٤ مرات.	(٤) قادر على الوقوف بدون مساعدة وأمن وإكمال ٨ خطوات في ٢٠ ثانية. (٣) قادر على الوقوف بدون مساعدة ، وإكمال ٨ خطوات في اكثر من ٢٠ ثانية . (٢) قادر على إكمال ٤ خطوات دون معونة وملاحظة. (١) قادر على إكمال اكثر من ٢ خطوات ويحتاج مساعدة ضئيلة. (٠) يحتاج إلى مساعدة لتجنب السقوط وغير قادر على المحاولة .	
١٣. الوقوف بدون مساندة وقدم واحدة للأمام . توجيهات : (ضع إحدى القدمين إمام الأخرى مباشرة إن لم تستطيع أن تضمها مباشرة أمامها حاول أن تباعد بين القدمين بمسافة كافية بحيث يكون كعب القدم الأمامية بعيدا عن أصابع القدم الأخرى) .	(٤) قادر على وضع القدم بثبات واحدة أمام الأخرى ، ويصمدا ٣٠ ثانية. (٣) قادر على وضع مقدمة قدمه عن الأخرى بشكل ثابت ، ويصمد ٣٠ ثانية. (٢) قادرا على اتخاذ خطوة صغيرة بدون مساعدة ، ويصمد ٣٠ ثانية. (١) يحتاج إلى مساعدة ولكن الخطوة يمكن أن تصمد ١٥ ثانية. (٠) يفقد التوازن مع الخطوة أو الوقوف .	
١٤. الوقوف على ساق واحدة . توجيهات : الوقوف على ساق واحدة تبعا لقدراته طالما يمكنه دون أن يمسك .	(٤) قادر على رفع الساق بدون مساعدة وتصمد اكثر من ١٠ ثانية . (٣) قادر على رفع الساق بدون مساعدة ويصمد ٥-١٠ ثانية. (٢) قادر على رفع الساق وبدون مساعدة أو يصمد اكثر من ٣ ثوان.	

	(١) يحاول رفع الساق وغير قادر على الاستمرار ٣ ثوان لكنة يظل واقفا بـــدون مســـاعدة. (٠)غير قادر على المحاولة أو يحتاج مساعدة لمنع السقوط .	
مجموع الدرجات (الحد الأقصى = ٥٦) . مدى العرضه للسقوط	٠-٢٠ درجة عرضة كبيرة للسقوط ٢١-٤٠ درجة عرضة متوسطة للسقوط ٤١-٥٦ درجة عرضة قليلة للسقوط	

Appendix FIV

Modified Barthel index scale

Modified Barthel ADL index* Measure of physical disability used widely to assess behaviour relating to activities of daily living for stroke patients or patients with other disabling conditions. It measures what patients do in practice. Assessment is made by anyone who knows the patient well.

Bowels 0 = Incontinent or needs enemas 1 = Occasional accident (1x/wk) 2 = Continent	**Transfer (bed to chair and back)** 0 = Unable, no sitting balance 1 = Major help (1 or 2 people), can sit 2 = Minor help (verbal or physical) 3 = Independent
Bladder 0 = Incontinent or needs enemas 1 = Occasional accident (1x/wk) 2 = Continent	**Mobility** 0 = Immobile 1 = Wheelchair independent (including corners) 2 = Walks with the help of 1 person (physical or verbal help) 3 = Independent (may use aid)
Grooming 0 = Needs help with personal care 1 = Independent (including face, hair, teeth, shaving	**Dressing** 0 = Dependent 1 = Needs help – can do ~ ½ unaided 2 = Independent (including buttons, zips, laces, etc.)
Toilet Use 0 = Dependent 1 = Needs some help 2 = Independent	**Stairs** 0 = Unable 1 = Needs help (verbal or physical) 2 = Independent
Feeding 0 = Unable 1 = Needs help, e.g. cutting 2 = Independent	**Bathing** 0 = Dependent 1 = Independent (bath or shower)

Appendix GI

Permission of physical mobility scale

place photo here

Name:

DOB: Room No:

PLACE ID LABEL HERE

PHYSICAL MOBILITY SCALE

Developed by the Gerontology Group of the Australian Physiotherapy Association

Supine to Side lying (*indicate left and right separately)

(0) No active participation in rolling
(1) Requires facilitation at shoulder and lower limb but actively turns head to roll
(2) Requires facilitation at shoulder or lower limb to roll
(3) Requires equipment (e.g. bedrail) to pull to side lying. Specify equipment used:
....
(4) Requires verbal prompting to roll —does not pull to roll
(5) Independent—no assistance or prompting

Supine to Sit

(0) Maximally assisted, no head control
(1) Fully assisted but controls head position
(2) Requires assistance with trunk and lower limbs or upper limbs
(3) Requires assistance with lower limbs or upper limbs only
(4) Supervision required
(5) Independent and safe

Sitting Balance

(0) Sits with total assistance, requires head support
(1) Sits with assistance, controls head position
(2) Sits using upper limbs for support
(3) Sits unsupported for at least 10 seconds
(4) Sits unsupported, turns head and trunk to look behind to left and right
(5) Sits unsupported, reaches forward to touch floor and returns to sitting position independently

Sitting to Standing

(0) Unable to weight bear
(1) Gets to standing with full assistance from therapist. Describe:
....
(2) Requires equipment (e.g. handrails) to pull to standing.
Specify equipment used: ....
(3) Pushes to stand, weight unevenly distributed, standby assistance required
(4) Pushes to stand, weight evenly distributed, may require frame or bar to hold onto once standing
(5) Independent, even weight bearing, hips and knees extended, does not use upper limbs

2 FUNC

Physical Mobility Scale

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(5) Independent and safe

Sitting Balance

(0) Sits with total assistance, requires head su
(1) Sits with assistance, controls head position
(2) Sits using upper limbs for support
(3) Sits unsupported for at least 10 seconds
(4) Sits unsupported, turns head and trunk to
(5) Sits unsupported, reaches forward to touch

Sitting to Standing

(0) Unable to weight bear
(1) Gets to standing with full assistance from
....
(2) Requires equipment (e.g. handrails) to pull
Specify equipment used: ....
(3) Pushes to stand, weight unevenly distribute
(4) Pushes to stand, weight evenly distributed,
(5) Independent, even weight bearing, hips an

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Appendix GII

Permission of berg balance scale

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Re: النسخة العربية لمقياس بيرغ للتوازن External Inbox x

Abdel-Hady El-Gilany Mon, Nov 14, 2022, 12:06 PM

WELCOME Attached Please confirm receipt On Mon, Nov 14, 2022 at 12:43 AM سرور خليل إبراهيم - Sero...

سرور خليل إبراهيم - Seror Khaleel Ibrahim <seror.kh@s.... Tue, Nov 15, 2022, 12:24 AM

to Abdel-Hady

السلام عليكم ورحمة الله وبركاته دكتور عبد الهادي الجيلاني :

I hope you will give me permission to use Arabic version of Berg Balanc Scale (A-BBS) as a tool to measure balance in my research about stroke. I hope that you will respond to my request as soon as possible, and I will be very grateful to you

Abdel-Hady El-Gilany <ahgilany@gmail.com> Tue, Nov 15, 2022, 9:11 AM

to me

Sure you can use it freely

Appendix GIII

Permission of Barthel index scale

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Permission for use barthel index scale

External Inbox x

سرور خليل إبراهيم - Seror Khaleel Ibrahim Tue, Nov 15, 2022, 11:39 PM

Good evening sir ; I hope you are always fine. I am Mrs. Seror Khalil Ibrahim/ a master's student from...

Damm, Jennifer <Jennifer.Damm@mapi-trust.org> Wed, Nov 16, 2022, 12:04 AM

to me

Thank you for your message.

Please note that all requests for questionnaires and translations must be submitted to Mapi Research Trust via our ePROVIDE™ platform at https://eprovide.mapi-trust.org/
Submitting a request is a simple process, completely free of charge and will ensure an optimized service.

1. Go to Submit a request
2. If you haven't registered yet, you'll be asked to sign up for free
3. Complete the request form. You may attach documents if need be.

This tutorial may guide you through the process.

Appendix H

Expert's list

ت	اسم الخبير	اللقب العلمي	التخصص	سنوات الخبرة	مكان العمل	الغرض
.1	د. هدى باقر حسن	أستاذ	تمريض صحة البالغين	٣٥ سنة	كلية التمريض/جامعة بغداد	Content validity
.2	د. وداد كامل محمد	أستاذ	تمريض صحة البالغين	٣٤ سنة	كلية التمريض / جامعة بغداد	Content validity
.3	د. سحر أدهم علي	أستاذ	تمريض صحة البالغين	٣٤ سنة	كلية التمريض / جامعة بابل	Content validity
.4	د. ضياء كريم عبد علي	أستاذ مساعد	تمريض صحة البالغين	١٦ سنة	كلية التمريض/جامعة العميد	Content validity
.5	د. محمد عبد الكريم مصطفى	أستاذ مساعد	تمريض صحة البالغين	١٥ سنة	كلية التمريض / جامعة الكوفة	Content validity
.6	د. محمد باقر عباس الجبوري	استاذ مساعد	تمريض صحة البالغين	١٣ سنة	كلية التمريض / جامعة بغداد	Content validity
.7	د. صادق عبد الحسين حسن	استاذ مساعد	تمريض صحة البالغين	١٣ سنة	كلية التمريض / جامعة بغداد	Content validity
.8	د. أكرم علي كرم	زميل المجلس العراقي للاختصاصات الطبية	طب جملة عصبية	٩ سنة	دائرة صحة كربلاء/مدينة الامام الحسين (ع) الطبية	Content validity
.9	د. علي كريم خضير	أستاذ	تمريض الصحة النفسية والعقلية	٣٠ سنة	كلية التمريض/ جامعة كربلاء	
.10	د. ابراهيم علوان كاظم	استاذ مساعد	تمريض صحة البالغين	١٧ سنة	كلية التمريض / جامعة الكوفة	Face validity (response process validity)
.11	د. وفاء عبد علي حطاب	استاذ مساعد	تمريض صحة البالغين	١٧ سنة	كلية التمريض /جامعة بغداد	Face validity (response process validity)
.12	د. جهاد جواد كاظم	استاذ مساعد	تمريض صحة البالغين	١٤ سنة	كلية التمريض /جامعة الكوفة	Face validity (response process validity)
.13	د. نسيم سمير علي صقر	استاذ مساعد	تمريض صحة البالغين/ باطني	١٣ سنة	كلية التمريض / جامعة وارث الانبياء	Face validity (response process validity)
.14	د. سمير رزاق عليوي الحلي	مدرس	تمريض صحة البالغين	٤٣ سنة	كلية الصفوة الجامعة/ قسم التمريض	Face validity (response process validity)
.15	د. علي سلام عبيد	مدرس	دكتوراه فلسفة في علوم تمريض البالغين	١٠ سنة	كلية الصفوة الجامعة/ قسم التمريض	Face validity (response process validity)
.16	د. احمد محمد جاسم	مدرس	تمريض صحة البالغين	٦ سنة	كلية التمريض/ جامعة العميد	Face validity (response process validity)

Appendix I

Content validity of Physical Mobility Scale

Expert / Item	1	2	3	4	5	6	7	8	ne	N	I-CVI	UA
Q1	1	1	1	1	1	1	1	1	8	8	1	1
Q 2	1	1	1	1	1	1	1	1	8	8	1	1
Q 3	1	1	1	1	1	1	1	1	8	8	1	1
Q 4	1	1	1	1	1	1	1	1	8	8	1	1
Q 5	1	1	1	1	1	1	0	1	7	8	0.87	0
Q 6	1	1	1	1	1	1	1	1	8	8	1	1
Q 7	1	1	1	1	1	1	1	1	8	8	1	1
Q 8	1	1	1	1	1	1	1	1	8	8	1	1
Proportion relevance	1	1	1	1	1	1	0.7	1				
	S-CVI/UA											**0.87**
	S- CVI/Ave											**0.98**
	Average proportion of items judged as relevance across the eight experts											**0.96**
	I-CVI = CVR= (ne – N/2) / (N/2), S- CVI/Ave= (∑CVR/ N), UA = Universal agreement, Content Validity Ratio CVR= I- CVI (item level content validity index), S-CVI\Ave =scale-level content validity index, ne= number of experts in agreement, ne = The number of experts who rated an item as “essential”, N = the total number of experts.											

Appendix II

Content validity of Berg Balance Scale

Item \ Expert	1	2	3	4	5	6	7	8	ne	N	I-CVI	UA
Q1	1	1	1	1	1	1	1	1	8	8	1	1
Q 2	1	1	1	1	1	1	1	1	8	8	1	1
Q 3	1	1	1	1	1	1	1	1	8	8	1	1
Q 4	1	1	1	1	1	1	1	1	8	8	1	1
Q 5	1	1	1	0	1	1	0	1	6	8	0.75	0
Q 6	1	1	1	1	1	1	1	1	8	8	1	1
Q 7	1	1	1	1	1	1	1	1	8	8	1	1
Q 8	1	1	1	0	1	1	1	1	7	8	0.87	0
Q9	1	1	1	1	1	1	1	1	8	8	1	1
Q10	1	1	1	1	1	1	1	1	8	8	1	1
Q11	1	1	1	1	1	1	1	1	8	8	1	1
Q12	1	1	1	1	1	1	1	1	8	8	1	1
Q13	1	1	1	1	1	1	1	1	8	8	1	1
Q14	1	1	1	1	1	1	1	1	8	8	1	1
Proportion relevance	1	1	1	0.8	1	1	0.9	1				

S-CVI/UA	**0.85**
S- CVI/Ave	**0.97**
Average proportion of items judged as relevance across the eight experts	**0.96**

I-CVI = CVR=(ne – N/2) / (N/2), S- CVI/Ave= (∑CVR/ N) , UA = Universal agreement, Content Validity Ratio CVR= I- CVI (item level content validity index), S-CVI\Ave =scale-level content validity index, ne= number of experts in agreement , ne = The number of experts who rated an item as “essential” , N = the total number of experts.

Appendix III

Content Validity of Barthel Index Scale

Item \ Expert	1	2	3	4	5	6	7	8	ne	N	I-CVI	UA
Q1	1	1	1	1	1	1	1	0	7	8	0.87	0
Q 2	1	1	1	1	1	1	1	0	7	8	0.87	0
Q 3	1	1	1	1	1	1	1	1	8	8	1	1
Q 4	1	1	1	1	1	1	1	1	8	8	1	1
Q 5	1	1	1	1	1	1	1	1	8	8	1	1
Q 6	1	1	1	1	1	1	1	1	8	8	1	1
Q 7	1	1	1	1	1	1	1	1	8	8	1	1
Q 8	1	1	1	1	1	1	1	1	8	8	1	1
Q 9	1	1	1	1	1	1	1	1	8	8	1	1
Q 10	1	1	1	1	1	1	0	1	7	8	0.87	0
Proportion relevance	1	1	1	1	1	1	0.9	0.8				
S-CVI/UA												**0.7**
S- CVI/Ave												**0.96**
Average proportion of items judged as relevance across the seven experts												**0.96**

I-CVI = CVR=(ne – N/2) / (N/2), S- CVI/Ave= (∑CVR/ N) , UA = Universal agreement, Content Validity Ratio CVR= I- CVI (item level content validity index), S-CVI\Ave =scale-level content validity index, ne= number of experts in agreement , ne = The number of experts who rated an item as “essential” , N = the total number of experts.

Appendix JI

Face validity of Physical mobility scale

Raters / Item	1	2	3	4	5	6	7	8	RA	UA	N	I-FVI
Q1	1	1	1	1	1	1	1	1	8	1	8	1
Q 2	1	1	1	1	1	1	1	1	8	1	8	1
Q 3	1	1	1	1	1	0	1	1	7	0	8	0.87
Q 4	1	1	1	1	1	1	1	1	8	1	8	1
Q 5	1	1	1	1	1	1	1	1	8	1	8	1
Q 6	1	1	1	1	1	1	1	1	8	1	8	1
Q 7	1	1	1	1	1	1	1	1	8	1	8	1
Q 8	1	1	1	1	1	1	1	1	8	1	8	1
Proportion clarity and comprehension	1	1	1	1	1	0.7	1	1				
S-FVI/UA												**0.87**
S-FVI/Ave												**0.98**
Average proportion of items judged as clarity and comprehension across the twelve experts												**0.96**

I-FVI = (agreed item)/ (number of rater), S-FVI/Ave = (sum of I-FVI scores)/ (number of item), S-FVI/UA = (sum of UA scores)/ (number of item), UA = Universal agreement = raters in agreement, I-FVI = item face validity, S-FVI =scale face validity.

Appendix JII

Face validity of Berg Balance Scale

Raters / Item	1	2	3	4	5	6	7	8	RA	UA	N	I-FVI
Q1	1	1	1	1	1	1	1	1	8	1	8	1
Q 2	1	1	1	1	1	1	1	1	8	1	8	1
Q 3	1	1	1	1	1	1	1	1	8	1	8	1
Q 4	1	1	1	1	1	1	1	1	8	1	8	1
Q 5	1	1	1	1	1	1	1	1	8	1	8	1
Q 6	1	1	1	1	0	1	1	1	7	0	8	0.87
Q 7	1	1	1	1	1	1	1	1	8	1	8	1
Q 8	1	1	1	1	1	1	1	1	8	1	8	1
Q9	1	0	1	1	1	1	1	1	7	0	8	0.87
Q10	1	1	1	1	1	1	1	1	8	1	8	1
Q11	1	1	1	1	1	1	1	1	8	1	8	1
Q12	1	1	1	1	1	1	1	1	8	1	8	1
Q13	1	1	1	1	1	1	1	1	8	1	8	1
Q14	1	1	1	1	1	1	1	1	8	1	8	1
Proportion clarity and comprehension	1	0.9	1	1	0.9	1	1	1				
S-FVI/UA												**0.85**
S-FVI/Ave												**0.98**
Average proportion of items judged as clarity and comprehension across the twelve experts												**0.97**

I-FVI = (agreed item)/ (number of rater), S-FVI/Ave = (sum of I-FVI scores)/(number of item), S-FVI/UA = (sum of UA scores)/(number of item), UA = Universal agreement = raters in agreement, I-FVI = item face validity, S-FVI =scale face validity.

Appendix JIII

Face validity of Barthel index scale

Raters / Item	1	2	3	4	5	6	7	8	RA	UA	N	I-FVI
Q1	0	1	1	1	1	0	1	1	6	0	8	0.75
Q 2	1	1	1	1	1	1	1	1	8	1	8	1
Q 3	1	1	1	1	1	1	1	1	8	1	8	1
Q 4	1	1	1	1	1	1	1	1	8	1	8	1
Q 5	0	1	1	1	1	1	1	1	7	0	8	0.87
Q 6	1	1	1	1	1	1	1	1	8	1	8	1
Q 7	1	1	1	1	1	1	1	1	8	1	8	1
Q 8	1	1	1	1	1	1	1	1	8	1	8	1
Q 9	1	1	1	1	1	1	1	1	8	1	8	1
Q 10	1	1	1	1	1	1	1	1	8	1	8	1
Proportion clarity and comprehension	0.8	1	1	1	1	0.9	1	1				
S-FVI/UA												**0.8**
S-FVI/Ave												**0.96**
Average proportion of items judged as clarity and comprehension across the twelve experts												**0.96**

I-FVI = (agreed item)/ (number of rater), S-FVI/Ave = (sum of I-FVI scores)/(number of item), S-FVI/UA = (sum of UA scores)/(number of item), UA = Universal agreement = raters in agreement, I-FVI = item face validity, S-FVI =scale face validity.

Appendix K

Patient's follow up method

Appendix L-I

The statistician's certificate

Republic of Iraq
Ministry of higher education & scientific research
University of Kerbala
College of Nursing

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جامعة كربلاء
كلية التمريض
الدراسات العليا

اقرار الخبير الاحصائي

اشهد بان الرسالة الموسومة :

Effect of Sitting Balance Exercises on the Level of Mobility, Postural control and Level of Dependency among patients with stroke

قد تم الاطلاع على الاسلوب الاحصائي المتبع في تحليل البيانات واظهار النتائج الاحصائية وفق مضمون الدراسة ولأجله وقعت.

توقيع الخبير الاحصائي:
الاسم واللقب العلمي: ا.م.د
الاختصاص الدقيق:
مكان العمل: جامعة كربلاء / كلية الادارة والاقتصاد
التاريخ: 4 / 7 / 2023

Appendix L-II

The linguistics' certificate

Ministry of Higher Education
And Scientific Research
College of Education for
The Human Sciences
Postgraduate Studies

وزارة التعليم العالي والبحث العلمي
جامعة كربلاء
كلية التربية للعلوم الانسانية
الشؤون العلمية
الدراسات العليا

كلية التربية للعلوم الانسانية

التاريخ: 2023/8/

العـدد: ع/6/ 2161

الى/ جامعة كربلاء/ كلية التمريض
م/ تقويم لغوي

تحية طيبة...

نعيد اليكم رسالة الماجستير الموسومة بـ (اثر تمارين توازن الجلوس في مستوى الحركة والتحكم ..) للطالب/ـة (سرور خليل ابراهيم) بعد أن تم تقويمها لغوياً من لدن التدريسي في كليتنا (م. ضياء خليل نائل) ، راجين تفضلكم الاخذ بالتصويبات المثبتة على متن الرسالة.

مع التقدير ....

أ.د. مؤيد عمران جياد
معاون العميد للشؤون العلمية و الدراسات العليا
2023/8/7

نسخة منه إلى/
- الدراسات العليا.
- الصادر.

العراق- كربلاء المقدسة- جامعة كربلاء- كلية التربية للعلوم الانسانية- المدينة الجامعية (فريحة) info@uokerbala.edu.iq

جامعة كربلاء

كلية التمريض

أثر تمارين توازن الجلوس في مستوى الحركة والتحكم في الوضعية ومستوى الاعتمادية بين مرضى الجلطة الدماغية

رسالة مقدمة الى مجلس كلية التمريض / جامعة كربلاء وهي جزء من متطلبات نيل درجة الماجستير في علوم التمريض

كُتب بواسطة

سرور خليل ابراهيم

بإشراف

أ.م. د. حسن عبد الله عذبي

تموز- 2023 م **محرم- 1445**

الخلاصة

غالبا ما تؤدي الجلطة الدماغية إلى مشـــاكل في التوازن، مما يزيد من خطر الســـقوط، ويحد من الحركة الجسـدية، ويزيد من الاعتمادية. يمكن للمرضــى الذين يعانون من الجلطة الدماغية تحسـين توازنهم من خلال المشــاركة في تمارين التوازن. تهدف هذه الدراســة إلى التعرف على أثر تمارين التوازن أثناء الجلوس في الحركة والتحكم في وضــعية الجسـم ومسـتوى الاعتمادية لدى مرضـــى الجلطة الدماغية. أجريت دراســـة شـــبه تجريبية في مدينة الإمام الحســـين(ع) الطبية، للمدة من 26 أيلول 2022 إلى 15 تموز 2023. تألفت العينة غير الاحتمالية المقصودة من ستون مريضًا مصابًا بالجلطة الدماغية وتم تقسـيمهم إلى مجموعتي التداخل والضــابطة. تألفت أدوات الدراسـة من مقياس الحركة البدنية ومقياس بيرج للتوازن ومقياس مؤشـر بارثل المعدل. تم التحقق من مصـداقية ادوات القياس من قبل لجنة مكونة من سبعة عشر خبيراً اما الثبات تم اختباره من خلال الدراسة التجريبية. تم فحص وقياس نتائج الدراســـة باسـتخدام طريقة التحليل الوصـــفي بالإضـــافة إلى طريقة التحليل الاســتنتاجي (اختبار المتوسـطات لعينتين مسـتقلتين، اختبار المتوسـطات لعينة واحدة، والاختبار أحادي الاتجاه)؛ تم تحديد قيمة الدلالة إحصـــائية بمســـتوى معنوية اقل من 0.05. أظهرت نتائج الدراسـة ان 53.3% و66.7% من المرضــى في المجموعة الضــابطة ومجموعة التداخل في التقييم القبلي يعانون من ضـــعف شـــديد في الحركة، بينما 83.3% و80% لديهم مخاطر عالية للســقوط. بالإضـافة إلى ذلك، كان 76.7% و86.7% لديهم مستوى شديد من الاعتمادية. كما أظهرت النتائج وجود فرق كبير بمســـتوى معنوية 0.000 بين التقييم القبلي والبعدي في الحركة البدنية والتوازن ومســتوى الاعتمادية. أداء تمارين توازن الجلوس بعد الجلطة الدماغية لمدة 15-30 دقيقة، وبمعدل جلسـتين يوميًا ولمدة 14 يومًا يمكن ان تسـاعد بشـكل كبير في تحسـين مستوى الحركة والتحكم في الوضـع وتقليل مسـتوى الاعتمادية من أجل تحقيق الاسـتقلالية في أداء أنشـطة الحياة اليومية للفرد. يوصــــي الباحث بأهمية إجراء دراســـات أخرى لبحث تأثير تمارين توازن الجلوس في الاعاقات الجسـدية الأخرى لمرضــى الجلطة الدماغية مثل ضـعف العضـلات، أو لمنع ضـمور العضـلات أو تصلب المفاصل.