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DEMENTIA AMONG STROKE PATIENTS AT CRP: A CROSS SECTIONAL STUDY

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Bachelor of Science in Physiotherapy (B. Sc. In PT)

DU Roll No: 1105

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We the undersigned certify that we have carefully read and recommend to the faculty of Medicine, University of Dhaka, for acceptable this disseration entitled

DEMENTIA AMONG STROKE PATIENTS AT CRP: A CROSS SECTIONAL STUDY

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Acronyms

BHPI: Bangladesh Health Profession's Institute

CRP: Centre for the Rehabilitation of the Paralysed

IRB: Institutional Review Board

WHO: World Health Organization

SPSS: Statistical Package for the Social Sciences

BMRC: Bangladesh Medical Research Council

TIA: Transient Ischemic Attack

BMI: Body Mass Index

PSD: Post Stroke Dementia

MMSE: Mini-Mental State Examination

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ABSTRACT

Purpose: The purpose of the study was to find out dementia among stroke patients at CRP. ***Objectives:*** The objectives of this study were to identify the prevalence of dementia among stroke patients, to find out severity level of dementia according to MMSE scale, to find out types of dementia, to identify which type of stroke shows more prevalence, to know association between level of dementia with sociodemographic information (e.g gender) and physical parameter related information (e.g types of stroke, previous history of stroke, comorbidity, taking sleeping pill, level of activity, smoking, food habit, body types etc). ***Methodology:*** The study design was a cross-sectional. Total 55 sample were selected convenitently for this study from the Neurology unit of Physiotherapy Department at CRP-Savar, Dhaka-1343 and Rajshshi CRP. Data was collected by using questionnaire, dementia level was measured by Mini-Mental State Examination (MMSE) scale. The study was conducted by descriptive and inferential analysis through using SPSS software 25.0 version. ***Results:*** This study indicate that 80% patient exhibit dementia after stroke among them 38.2% were found mild dementia, 27.3% were found moderate dementia and 14.5% were found severely dementia. ***Conclusion:*** The outcome of a stroke may be significantly impacted by dementia, which is a very common problem.It is essential to identify post-stroke risk factors and dementia predictors, as well as to evaluate cognitive function before a stroke occurs. The essential steps should be taken to decrease cognitive damage after a stroke in order to improve the affected person's quality of life, along with increased awareness and appropriate therapy.

Key word: Dementia, Stroke, MMSE scale

CHAPTER-I: INTRODUCTION

1.1 Background

Stroke is the second most common reason for death and injury in the world (Strong, Mathers and Bonita 2007, p.185). A stroke is the most dangerous heart event for both healthy people and those who already have heart problems (Kinlay, S 2011, p.496). After cancer and heart disease, stroke is the third leading cause of death in developed countries. It is also the leading cause of physical disability in people and the second leading cause of dementia (Murray and Lopez 1997, p.1437). The World Health Organization (WHO, 1980) defined stroke as 'rapidly developed clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than of vascular origin.

Strokes generally fall into two main groups. Ischemic strokes happen when an artery or in rare cases, a vein gets blocked. Ischemic strokes make up about 87% of all strokes. Ischemic stroke symptoms in the basal ganglia and subcortical white matter are caused by the blockage of small arteries and arterioles (small vessel disease) (Miller Fisher 1989, p.75). A stroke caused by bleeding is called a hemorrhagic stroke. Hemorrhagic strokes make up about 13% of all strokes. A hemorrhagic stroke can happen in the brain (intraparenchymal hemorrhage) or in the space between the brain and the spinal cord (subarachnoid hemorrhage) (Kanamaru & Suzuki 2019, p.1138).

A stroke is an umbrella word for a sudden localized loss of nerve function that lasts at least 24 hours and may be caused by a cerebrovascular disease. A cerebrovascular accident (CVA) is another name for it (Fagan et al. 2008, p.33). Stroke is one of the top reasons of disability, and having one doubles your chance of getting dementia. Lower education, older age, cognitive decline before the stroke that wasn't severe enough to be called dementia, dependence on others before the stroke, diabetes mellitus, myocardial infarction, atrial fibrillation, epileptic seizures, sepsis, cardiac arrhythmias, congestive heart failure, global cerebral atrophy and medial temporal lobe atrophy, and white matter changes have all been linked to an increased risk of dementia after a stroke. There is a link between dementia and stroke risk factors like how bad the stroke was, what caused it

and where it happened (Leys et al. 2005, p.754). Dementia is marked by the development of multiple cognitive problems, such as memory loss and at least one of aphasia, apraxia, agnosia, or a problem with executive functioning. Dementia could be caused by a general health problem, the effects of drug use (including exposure to toxins), a mix of these things, or something else. Alzheimer's dementia and vascular dementia are the two most common types of dementia and loss of brain function. Alzheimer's dementia, a neurodegenerative disease, is the more common of the two (Aggarwal and DeCarli 2007, p.70). But people still think that vascular dementia is the main cause of up to 30% of people with dementia. Vascular dementia usually affects older people, but it can also affect younger people.

Seven million Americans have dementia, 4.5 million of whom have Alzheimer's disease, according to estimates. People with vascular dementia frequently exhibit cognitive decline, dementia, behavioral alterations, mood disorders, and specific neurological symptoms (Papademetriou et al. 2004, p.1178). Individuals diagnosed with Alzheimer's disease often have reduced blood flow, known as hypoperfusion, in the temporal and parietal regions, in contrast to individuals without the condition who serve as healthy controls. The manifestation of language impairments can be more prominent in either the temporal or parietal lobes, with the coexistence of apraxia. Nevertheless, individuals with vascular dementia commonly display regions of hypoperfusion in both the superficial and deep gray matter, affecting many brain regions (Casolla and Leys 2019, p.282).

Globally the most common cause of mortality and physical disability is cerebral vascular disease (stroke) (Guerchet et al. 2010, p.263). Stroke is recognized as the second leading cause of mortality and lifelong disability on a global scale (Damasceno and Damasceno 2020, p. 215-236). In 2016, 41.1 million women and 39.0 million men all over the world had a stroke. In the US, 7 million people aged 20 and up have strokes, which is about 3% of the population (Saini, Guada and Yavagal 2021, p.S10). In In Thailand, there was an observed increase in the fatality rate among stroke patients, rising from 20.8 per 100,000 individuals in 2008 to 31.7 per 100,000 individuals in 2012.

In Asian countries, stroke is a far more prevalent cause of mortality compared to cardiovascular disease (Surawan et al. 2017, p.7216). The incidence of stroke in India has

fluctuated between 105 and 152 per 100,000 people annually over the past decade, with regional variations in the crude prevalence of stroke ranging from 44.3 to 559 per 100,000 people (Saini, Guada and Yavagal 2021, p.S12). Even though a stroke has been recognized, the World Health Organization puts Bangladesh 84th in the world for stroke deaths. Even though stroke data has not been collected, it is said that 0.3% of Bangladeshis have had a stroke (Teo et al. 2013, p.1617).

In community-based studies that account for age as a confounding factor, the observed prevalence of dementia among individuals with a prior history of stroke is approximately 30%. The prevalence of post-stroke depression (PSD) in hospital-based studies varies between 5.9% and 32%. The occurrence of stroke significantly elevates the likelihood of developing dementia by a factor of up to 12. The estimated prevalence of dementia in India is 3.36% (Salahuddin et al. 2022, p.106616).

Poststroke dementia (PSD) is one of the main reasons why stroke patients need help, and it includes all types of dementia that happen after a stroke, whether they are caused by the stroke itself, by aging, or by a mix of both. Because stroke deaths are getting less common and people are living longer, PSD is expected to become much more common and cause a lot more trouble (Broomfield et al. 2011, p.205). PSD is made up of all dementias that happen after a stroke, no matter what caused them. In studies of incidence, PSD included both dementia that was already there and dementia that started after a stroke. People who have had a stroke are about 30% more likely to have dementia in community-based studies that account for age. In tests done in hospitals, the number of people with PSD ranges from 59% to 32% (Khedr et al. 2009, p. 103-116). Up to 12 times more likely to get Alzheimer's after a stroke. India is thought to have had 3.36 percent of all cases of dementia.

Based on a prior investigation that monitored stroke patients over a span of three months, it was observed that a majority of patients (57.2%) exhibited mild disabilities, while a smaller proportion experienced severe disabilities (18.6%) and moderate disabilities (9.4%). Furthermore, the presence of a stroke significantly amplified the likelihood of developing dementia and experiencing memory impairment, with a 9.4-fold increase in risk compared to individuals who just experienced a stroke. The prevalence of memory

loss exhibited an increment ranging from 20 to 80 percent, while the occurrence of dementia had an increase ranging from 5 to 48 percent (Surawan et al. 2017, p.7216).

Leys et al. (2005, p.754) showed that in community-based studies, PSD was seen in about 30% of people, but in hospital-based studies, it was seen in anywhere from 6% to more than 32% of people. So, according to the study we just talked about, dementia is a common result of a stroke, and it has a big effect on quality of life and how well recovery goes. It is important to find out if someone has dementia after a stroke so that care and prevention plans can be made. The goal of the study is to find out how many stroke people have dementia (Gorelick et al. 2011, p.2672).

1.2 Rationale

There is a little information on the prevalence of post-stroke dementia in Bangladesh. There aren't enough reports on these subjects that have been published. From this study a researcher will be able to know about relationship between dementia with stroke, neurological findings and clinical risk factors about post stroke dementia. This study would find out the prevalence of dementia among stroke patients, so that physiotherapist can work on this by rehabilitation of post stroke dementia play significant role in preventing further complications such as dementia and get the optimum treatment outcome.

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1.3 Research Question

What is the prevalence of dementia among stroke patients at CRP?

What is the severity level of dementia?

1.4 Study Objectives

1.4.1 General Objectives

To find out dementia among stroke patients at CRP.

1.4.2 Specific Objectives

To identify the prevalence of dementia among stroke patients.

To find out severity level of dementia.

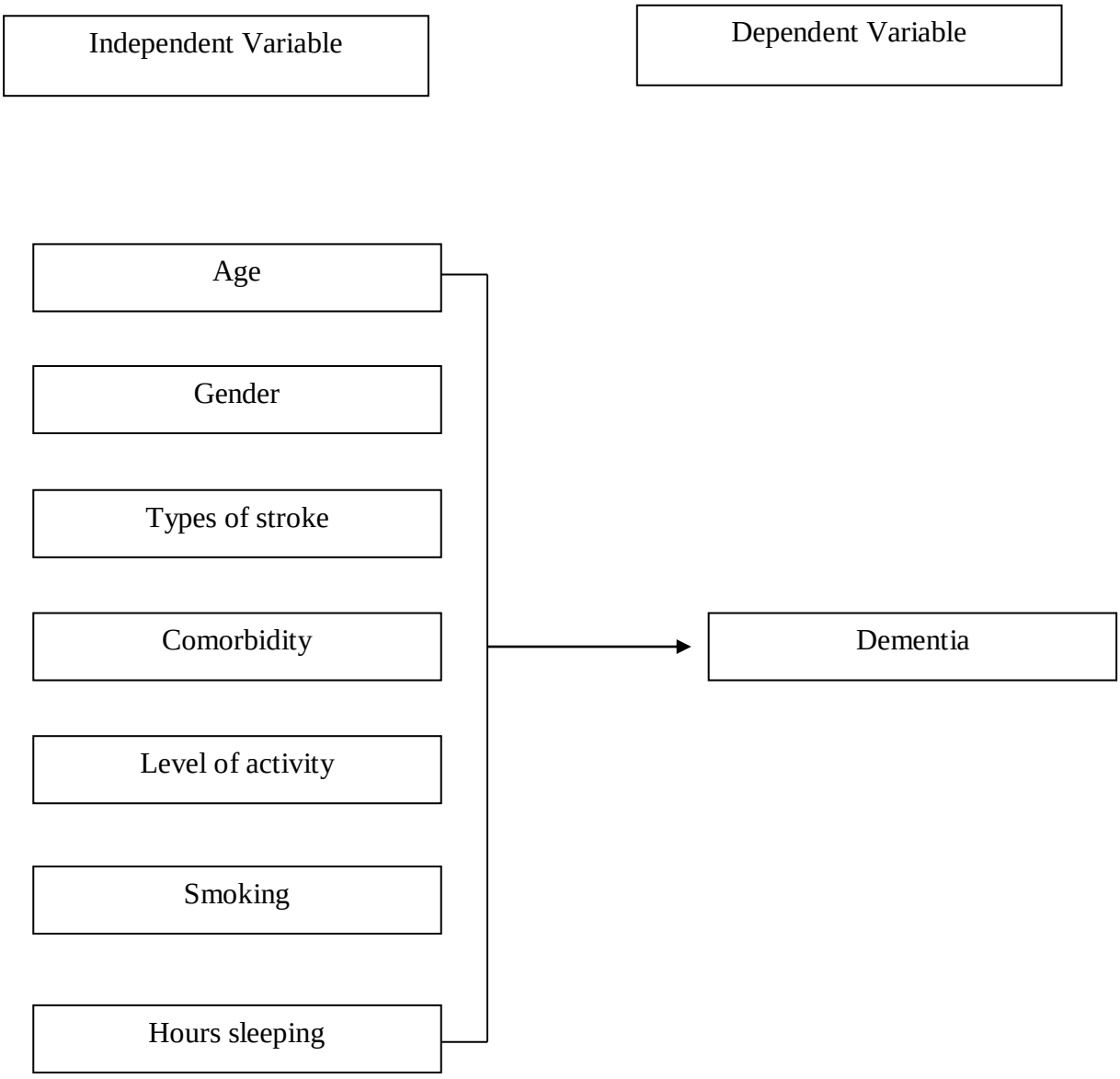
To determine sociodemographic information (age, sex and types of stroke).

To find out types of dementia.

To identify which type of stroke shows more prevalence.

The likelihood of dementia can be distinguished according to MMSE scale.

1.5 Conceptual Framework



1.6 Operational Definition

Stroke: The current World Health Organization (WHO) defines a stroke as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin."

Dementia: The word "dementia" is used to describe a group of signs that make it hard to remember, think, and get along with other people. There is no one disease that causes dementia. Instead, it is caused by a number of illnesses.

MMSE: The Mini-Mental State Examination (MMSE) is a set of 11 questions that doctors and other health care workers often use to test patients for cognitive impairment (problems with thinking, communication, understanding, and memory).

Ischemic stroke: A person has an ischemic stroke when blood clots or other things stop the blood vessels that bring blood to the brain.

Haemorrhagic stroke is a type of stroke that happens when a blood vessel in the brain or on the surface of the brain leaks or breaks open causing bleeding in or around the brain.

TIA: A transient ischemic attack (TIA) happens when blood flow to a part of the brain stops for a short time. It can take up to 24 hours for someone to show signs of a stroke. Most of the time, the symptoms only last for an hour or two.

Comorbidity: It is a term for when a person has more than one illness or disease at the same time. Comorbidities are often long-term or chronic health problems.

Schizophrenia: It is a mental disorder that causes problems with how a person thinks, what they see, how they react to their emotions, and how they connect with other people.

Bipolar disorder: Acute sadness or schizophrenia can happen at the same time as bipolar disorder. Anxiety: Anxiety is a feeling that causes tension, worried thoughts, and changes in the body, like a rise in blood pressure.

Stress: Tension or worry in the body or mind are caused by physical, mental, or emotional factors.

Depression: It is a common and important medical illness that makes you feel, think, and act in bad ways.

CHAPTER-II: LITERATURE REVIEW

Stroke, also known as cerebrovascular accident (CVA) is a clinical term used to describe a specific medical condition (Smith et al. 2017, p.50). The World Health Organization (WHO, 1980) definition of stroke is a rapidly developed clinical sign of focal disturbance of cerebral function of presumed vascular origin and of more than 24 hrs duration. This definition does not include `transient ischaemic attacks' (Coupland et al. 2017, p.11).

A transient ischemic attack (TIA) refers to a brief event characterized by stroke symptoms that endure for a duration of less than 24 hours, with the majority of TIAs resolving within a single hour. Irrespective of the presence of imaging evidence indicating fresh and lasting brain damage, the established definition of Transient Ischemic Attack (TIA) stipulates that any neurological manifestations must completely resolve within a 24-hour timeframe. Should these signs and symptoms linger beyond this duration, it is indicative of a stroke having taken place (Tasang et al. 2003, p.1204). It is the most typical clinical symptom of conditions affecting the cerebral blood vessels (Cannistraro et al. 2019, p.1148).

Some of the most common and life-threatening diseases are cerebrovascular diseases. These include ischemic stroke, hemorrhagic stroke, and cerebrovascular abnormalities like intracranial aneurysms and arteriovenous malformations (AVMs). Because the brain and its blood vessels have a complicated structure, the symptoms of a stroke can be very different (Boon et al. 1999, p.225). Brain attacks, also called strokes or CVAs, happen when the brain quickly stops working because it doesn't get enough oxygen. There are two main types of strokes:

An ischemic stroke, also known as a cerebral infarct, is caused by an obstruction or reduction in blood flow in the artery supplying the brain. Ischemic strokes account for eighty percent of all strokes. They may be caused by a thrombus which obstructs the blood vessel, or by plaque buildup which is frequently caused by elevated cholesterol levels in the arteries and narrows blood vessels, thereby reducing blood flow (Gomes and Wachsman 2013, p.21). Haemorrhagic strokes occur as a consequence of arterial rupture within the brain leading to the occurrence of an intracerebral hemorrhage, accounting for

around 15% of all strokes. Alternatively, they can be caused by the rupture of an aneurysm or an arteriovenous malformation (AVM), resulting in a subarachnoid hemorrhage, which accounts for approximately 5% of all strokes (Smith and Eskey 2011, p.38). There exist two distinct categories of stroke risk factors. Both of these parameters can be modified. Non-modifiable characteristics that contribute to an individual's health profile include age, gender, race (with Afro-Caribbean individuals having a higher risk compared to Asian and European individuals), heredity or family history, sex, ethnicity, prior vascular events (such as myocardial infarction, stroke, or peripheral embolism), and high levels of fibrinogen. The modifiable factors associated with high blood pressure include hyperlipidemia, smoking, physical inactivity, obesity, bad food, excessive alcohol use, polycythemia, and diabetes mellitus (Elkind and Sacco 1998, p.435).

Not modifiable risk factors:

Older age: Older age (over 65)- increase the of heart disease-increase the risk of stroke.

Gender: Men are more likely to have a stroke because they smoke and have high blood pressure, but women who take the contraceptive pill are more likely to have a stroke. Above, we talked about how smoking cigarettes can cause a stroke. Here, we'll talk about how strokes happen in women: Taking birth control pills helps fat build up on the walls of arteries.-make the walls of the arteries thicker -raise blood pressure -cause a stroke (Wyller 1999, p.44).

Heredity/Family history: If a first-degree blood relative has had coronary heart disease or a stroke before the age of 55 (if the relative is a man) or 65 (if the relative is a woman), the risk is higher for the woman (Petrović 2000, p.212).

Sex: In the years before menopause, men are more likely than women to get coronary heart disease, but both men and women are equally likely to have a stroke

Ethnicity: Strokes happen more often in black, Hispanic-American, Chinese, and Japanese people, and South Asian and black Americans are more likely to die from heart disease (Puthenpurakal and Crussell 2017, p.45).

Modifiable risk factors:

High blood pressure: Increased blood pressure means that our blood is moving harder against the walls of our arteries. This means that the heart has to work harder to move

blood through the body, blood vessels get weaker, and major organs like the brain are damaged (Mensah 2008, p.697).

Hyperlipidemia: High total cholesterol, low-density lipoprotein cholesterol, triglycerides, and low HDL cholesterol all raise the chance of heart disease and ischemic stroke (Meyer et al. 1987, p.419).

Tobacco smoking: Nicotine is a strong bone marrow stimulant that leads to more red blood cells, thicker blood, blood clots, and embolisms.- Blockage of a vessel in the brain - stroke. Stroke risk is doubled for people who smoke (Wolf et al. 1988, p.1027).

Obesity/Excessive Weight: Excess weight makes people more likely to have high cholesterol; high blood pressure and diabetes- these cause increase your risk for stroke.

Alcohol Intake: Drinking lots of alcohol- increase blood pressure- increase the risk of stroke by 50%

Diabetes Mellitus: Diabetes mellitus happens when the amount of sugar in the blood rises, fat builds up in the walls of the arteries, the walls of the arteries become stiffer and thicker, blood pressure goes up, and a stroke happens. The most important risk factors for heart disease and stroke (Stegmayr and Asplund 1995, p.1068).

Most often, a hemorrhagic stroke is caused by high blood pressure (hypertension), a heart attack (myocardial infarction), or the use of thrombolytics. Ischemic strokes are caused by low blood flow, embolism, and thrombosis, with thrombosis being the most common (Ojaghihaghighi et al. 2017, p.34).

People who have had a Cerebrovascular Accident (CVA) may have problems with their senses and minds, but the most common problems are motor problems like muscle weakness, hypertonia, odd movement patterns, and being out of shape. People with CVA often have trouble doing things like walking and going up and down stairs (Nascimento et al. 2012, p.275-280). These people also frequently have musculoskeletal disorders that are considered significant impairments. Stroke can also cause language problems like aphasia, which means you can't understand what people say or write, and dysarthria, which means you can't say things clearly (Weiss 2010, p.401). It can also cause memory loss, dementia, trouble thinking or learning, trouble understanding objects, trouble

recognizing or understanding commands, and trouble swallowing. Other problems include not being able to control your bowels or bladder, being tired, depressed, losing body functions, and needing help from others (Stokes, Combes and Stokes 2014, p.60). Brain imaging is used to look at pictures of the brain, and strokes can be found with a physical check. Doctors can check for stroke using blood tests to measure cholesterol and blood sugar levels, pulse checks to look for an abnormal heartbeat, and blood pressure readings (Alberts, Faulstich and Gray 1992, p.666).

Even if the physical symptoms of a stroke are clear, a brain scan should be done to find out if it was caused by a blocked artery or a burst blood vessel, what part of the brain was affected, how bad the stroke was, and how likely a transient ischemic attack (TIA) is (Zhang et al. 2012, p.2012). Because there are different ways to treat each type of stroke, a quick evaluation will make treatment easier.Stroke is a medical issue that needs to be looked into and treated right away (Amanullah et al. 2009, p.762). There is no way to heal someone who has had a stroke. Strokes can be avoided if risk factors that can be changed are found early and taken care of. This is very important in our country, where there aren't many health care facilities or supplies and most people live below the poverty line (Hossain et al. 2011, p.22).

The process of post-stroke recovery is subject to the influence of several biological and environmental factors, resulting in significant variations in recovery patterns among people (Hendricks et al. 2003, p.1376). Stroke is the main cause of long-term disability in the West, and how well someone can live after a stroke depends on how bad the stroke was. Estimates show that 460 out of every 100,000 stroke patients will not fully recover, and one-third will be able to do at least one ADL. In the three months after a stroke, 50% to 70% of survivors recover functional independence, but 15% to 30% are totally disabled (Hankey et al. 2002, p. 1034-1040). The other 20% need care in a facility. At the start of the disease, 85% of people who have a stroke can't use their upper limbs (Carod-Artal and Egido 2009, p.204). The goal of rehabilitation is to get people back home while helping them get better as much as possible. To reach these goals, a safe, step-by-step treatment plan is made for each patient. Physical therapy uses any untapped neural paths to reach these goals (Bohula et al. 2017, p.2455). Physical treatment is an important part

of getting better. Exercise, manipulation, massage, skill development, and treatment with electrical modalities are all ways to help the body heal and recover movement. The main goal of physical therapy for people who have had a stroke is to help them get as strong and mobile as possible by teaching them how to use both sides of their bodies again (Connolly Jr et al. 2012, p.1725). The physiotherapist makes a big difference in the physical care of stroke patients by using the skills they've learned in school and on the job to evaluate and treat stroke-related problems in line with science principles (Lenon 2003, p.458).

Stroke is the most common cause of impairment and the second most common cause of death around the world (Johnson et al. 2016, p.634). The Global Stroke Factsheet, which came out in 2022, shows that the chance of having a stroke in a person's lifetime has gone up by 50% in the last 17 years, and it is now thought that 1 in 4 people will have a stroke in their lifetime. From 1990 to 2019, the number of strokes has gone up 70%, stroke-related deaths have gone up 43%, stroke frequency has gone up 102%, and Disability Adjusted Life Years (Daily) have gone up 143% (Feigin et al. 2021, p.815). The most surprising thing is that most strokes (86 percent of stroke deaths and 89 percent of daily strokes) happen in low-income and low-middle-income countries. This unfair load on low- and low-middle-income countries has caused a problem for low-income families that has never been seen before.

In 2005, about 16 million people around the world had their first stroke, and 62 million people are thought to have survived a stroke (Katan and Luft 2018, p.211). If nothing is done to improve clinical or public health, this number is projected to rise to about 23 million first-time strokes and 7.8 million deaths by 2030. About 56 million people die every year around the world, and about a quarter of these deaths are due to (Mukherjee and Patil 2011, p.588).

85.5% of all stroke deaths around the world happened in countries with low or middle incomes. One in twenty people (14 and older) in developed countries has a stroke, according to evidence. Even though stroke death and load rates vary greatly between low-income countries (Feigin et al. 2009, p.368). Even though stroke is a long-term neurological problem, most studies have focused on how it affects people in the short

term in terms of impairments and disabilities. In 1980, the World Health Organisation (WHO) made the first international list of impairments, disabilities, and handicaps. Based on the results of 174 thorough stroke tests, 76% of stroke victims died, 76% had disabilities, 42% had impairments, and only 2% had handicaps (Patel et al. 2006, p.275).

Studies of how often dementia happens showed that having a stroke doubles your chance of getting it, and that this risk is biggest in the first 6–12 months. Also, the chance of dementia in the future, including what was thought to be Alzheimer's disease, doubled after a stroke (Hachinski 2021, p.278). In the frequency studies that were looked at, the follow-up times went up to 36 months. Pendlebury and Rothwell's systematic review and meta-analysis showed that the prevalence rates of PSD range from 7% to 41%. The lower rate was seen in population-based studies of first-time stroke patients, while the higher rate was seen in hospital-based studies of recurrent stroke patients with prestroke dementia (Lawrence et al. 2001, p.1280). Ten percent of people who had their first stroke soon got new-onset dementia, and more than one-third of people who had a second stroke had dementia. In most hospital-based studies, the follow-up lasted up to one year, but in population-based studies, it lasted up to 25 years (Henon, Pasquier, & Leys 2006, p.65).

In the United States, stroke is the third top cause of death for women and the fourth for men. Men may have a slightly higher rate of stroke but women have a higher total stroke death rate because their average age is higher. Several studies show that women have a smaller chance of surviving a stroke than men do. Activities of daily living (ADL), which are the most important parts of self-care, are harder for women to do than for men (Gargano & Reeves 2007, p.2542). In the United States each year there are more than 700,000 strokes more than 4.8 million people live through them, and more than 160,000 people die from them.Stroke is a major cause of illness and death in the United Kingdom.

Recent studies show that in England, where about 110,000 strokes happen every year, the rates were 1.36 per 1000 people per year and 1.62 per 1000 people per year between 2002 and 2004 (Krock and Massaro 2008, p.525). In 2008, almost 46,000 people died in England and Wales, which is 9 percent of all deaths.Strokes are the third most common cause of death in Thailand. Even though people were initially resistant to change, many of the effects of a stroke have gotten worse: About half of the people who have lived for a

year after having a stroke rely on others for personal care and daily activities (Mayo et al. 2002, p.1042). Through re-hospitalization, the need for social support, and therapy organisations, it continues to create a large demand for health care. Stroke patients have to deal with the fact that they can't do as much and don't see as many people as they used to (Van der Riet et al. 2015, p. 45).

A 2017 study found that between 105 and 152/100,000 people in India had a stroke each year, with a frequency of 44.29 to 559/100,000 people in different parts of the country over the past ten years. These numbers were higher than what high-income countries had (Kamalakannan et al. 2017, p.175). From 2000 to 2016, 95 out of every 100,000 people in Pakistan had a stroke. The biggest rate was among people aged 75 to 85, with 584,000 out of 650,000 people having a stroke (Benjamin et al. 2019, p. e58).

There isn't much known about how often strokes happen in Bangladesh, but one study found that there were three cases for every 1,000 people. The expected stroke rate in each South Asian country is a little different (Wasay, Khatri and Kaul 2014, p.137). Afghanistan, Nepal, Bhutan, and the Maldives have not given any details. Estimates show that 0.20 percent, 0.30 percent, 0.20 percent, 1.0 percent, and 1.0 percent of people aged 40 to 49, 50 to 59, 60 to 69, 70 to 79, and 80 and older in Bangladesh have had a stroke. Islam et al. (2013, p.211-213) Overall, 0.30 percent of people had a stroke, and the number of men to women was 3.44:2.41.

In Western countries, people are ten times less likely to have a hemorrhagic stroke than an ischemic stroke (Teasell et al. 2016). People think that the risk of dying from a hemorrhagic stroke is higher than the risk of dying from an ischemic stroke.As of February 2007, there were 39,484 people in the register, and 3,993 of them had hemorrhagic strokes.The World Health Organisation says that 86% of all stroke-related deaths happen in poor countries. It is thought that more than 40% of all stroke deaths in the world happened in South Asia, making it the area with the highest stroke death rates (Reddy 2002, p.236).

MMSE:

The MMSE is a well-known psychometric screening test used to measure cognitive ability (Dong et al. 2010, p.17). It is meant to be used in memory evaluations to make figuring out how the disease is getting worse and how fast it is getting worse easier. The MMSE tests a number of skills, such as memory, attention, and speaking (Myrberg, Hydén and Samuelsson 2020, p.655). The Mini-Mental State Examination (MMSE), which is used in clinical situations to test for dementia or cognitive impairment. The MMSE is a good and useful tool. The tool is split into two parts. Each part has 11 cognitive tasks that add up to a total number between 0 and 30. According to the claim, people with scores of 26 or higher have normal cognitive function, while scores of 15 or less are signs of dementia or cognitive decline. Where a score of 20 to 25 means mild dementia, 10 to 19 means moderate dementia, and 9 or less means serious dementia (Larner 2012, p.395).

CHAPTER-III: METHODOLOGY

3.1 Study design

Cross sectional study was selected for conducting the study. A cross-sectional study is a descriptive study in which disease and exposure status are measured concurrently in a given population and the main advantages are that it is quick and inexpensive (Bailey, 1997). The purpose of the study was to find out dementia among stroke patients at CRP.

3.2 Study population and sampling

Sampling refers to the process of selecting the subjects/individual (Hicks, 1999). Stroke patient were the study population and sample was taken by using convenience sampling technique due to time limitation and to perform sampling easily. The study population were stroke and selected from the Neurology unit of Physiotherapy Department at CRP-Savar, Dhaka-1343 and Rajshshi CRP from May 2023 to July 2023. Sample size was 45 which were selected randomly.

3.3 Sampling technique

The study was conducted by using the convenient sampling technique.

3.4 Study site and study area

The researcher collected data from the Neurology unit of Physiotherapy Department at CRP-Savar , Dhaka-1343 and Rajshshi CRP. The study area was Neurological condition (stroke) of the patient.

3.5 Sample size calculation

Sampling procedure for cross sectional study done by following equation-

Where,

$$n = \frac{z^{2pq}}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.03 \times 0.97}{(0.05)\text{^}2}$$

= 44.72

= 45

The actual number might vary due to the pandemic situation and the availability of the patients.

z= Confidence level, A 95% confidence level gives us Z values of 1.96

P is the (estimated) proportion of population which has the attribute in question. P (Prevalence)=3% (Avan et al., 2019)

q=1-p=(1-0.3)=0.97

d is the desired level of precision (i.e. the margin of error), 50%= 0.05

n= The actual sample size was, n=44.7=45

3.6 Inclusion Criteria

1. Patients diagnostic with ischemic & hemorrhagic stroke .
2. Medically stable people.
3. Both Male & Female participants will be included.
4. Patients who are will participate willingly.

3.7 Exclusion Criteria

1. Patient who have communication problem-aphasia, apraxia, visual disturbances, hearing loss.
2. Patient who have other neurological problems for example meningitis, Guillain-Barre syndrome, head injury patients.

3.8 Outcome measurement Tool

Mini-Mental State Examination scale (MMSE)

MMSE:

The MMSE is a well-known psychometric screening test used to measure cognitive ability (Dong et al. 2010, p.17). It is meant to be used in memory evaluations to make figuring out how the disease is getting worse and how fast it is getting worse easier. The MMSE tests a number of skills, such as memory, attention, and speaking (Myrberg, Hydén and Samuelsson 2020, p.655). The Mini-Mental State Examination (MMSE), which is used in clinical situations to test for dementia or cognitive impairment. The MMSE is a good and useful tool. The tool is split into two parts. Each part has 11 cognitive tasks that add up to a total number between 0 and 30. According to the claim, people with scores of 26 or higher have normal cognitive function, while scores of 15 or less are signs of dementia or cognitive decline. Where a score of 20 to 25 means mild dementia, 10 to 19 means moderate dementia, and 9 or less means serious dementia (Larner 2012, p.395).

3.9 Data collection tools

A consent form, self structure questionnaire, pen, pencils, white paper, approved forms and consent forms, clip board and a bag for storing these tools.

3.10 Data collection procedure

A written consent was taken from the patients. A Questionnaire was used to accumulate data by face to face conversation. Prior to data collection, researchers thoroughly trained data collectors and explained the entire data collection process to them. To prevent mistakes, all of the data were gathered by carefully chosen, trained data collectors in the presence of the researcher. The researcher went over each questionnaire again to look for any missing or unclear information.

3.11 Data Analysis

Each response was double checked after the initial data collection to identify any errors or ambiguous information. The collected data was then entered into SPSS version 25 for analysis. Most of the graphs and charts were made using Microsoft Word 2007 as the

software.Then data was analyzed through descriptive and interferential statistics. In descriptive part in case of parametric data the central tendency and the measure of dispersion was presented through mean and standard deviation. The categorical data was presented as frequency and percentage of proportion through different visualization tool such as pie chart, bar chart. To find out the relationship among sociodemographic, physical parameters and level of dementia. Chi- square test for independence and Pearson's co-relation test was applied. In case of two categorical variable chi- square test and for two continuous variable pearson correlation test was applied. In this study the level of significance is considered as 5% (p= <.05).

3.12 Informed consent

In this study, consent forms were given to interested participants after verbal explanations of the research's goals and the consent forms were given to them. They were informed that their participation was entirely voluntary and that they could revoke it at any time. Additionally, they were informed that privacy would be maintained. Though they won't be identified, information may be published in any writing or presentations. The findings of the study might not directly affect them, but the population of physiotherapists may one day reap the benefits of it.

Chi-Square test (x2)

The Chi-Square test is a way to use statistics to find out the difference between what was seen and what was predicted. You can also use this test to see if it has a relationship with the categorical factors in our data. It helps figure out if a difference between two categorical variables is just a coincidence or if they are related in some way.

A chi-square test is a type of statistical test that compares what was seen with what was predicted. The goal of this test is to figure out if a difference between what happened and what was predicted was just a fluke or if there was a link between the factors being looked at. So, the chi-square test is the best way to help us figure out what the relationship between our two category variables means.

To test a theory about the distribution of a categorical variable, you need to use the chi-square test or a similar nonparametric test. Categorical variables, like "animals" or "countries," can be either word or ordinal. They can only have a few different numbers, so they can't have a normal distribution.

It is used to figure out how much different two categorical values are.

- As a matter of luck or
- Because they knew each other

Calculation of Chi-Square

Chi square (x2) is the sum of the square difference (O —E)2 between observed (O) and the expected (E) data divided expected (E) in all possible data completing by the following equation-

(Observed count – Expected count)2/Expected count

$(x2)=(O-E)2/E$

The mathematical notation, the formula looks like this:

$x2=\Sigma(O-E)2Eki=1$

3.13 Ethical Consideration

As per the rules, the study plan was sent to the BHPI review board for approval. This study strictly followed the rules set by the World Health Organisation (WHO) and the Bangladesh Medical Research Council (BMRC). For the study to be done, permission was asked from the person in charge of the Physiotherapy department at CRP. Before the interviews began, each participant signed a written consent form (appendix) and was told about the purpose of the study, their right to not answer any questions, their ability to leave the study at any time, and other things that were written on the form. The people who took part were told very clearly that their information would be kept private and safe. The person should be told that his or her name or address will not be shared. The participant will also be told that the outcome of the study won't hurt them in any way.

CHAPTER-IV: RESULTS

Table-1: Socio-demographic information

SL No.	Variable	Types of Variable	Mean/SD	Median	Frequency(n)/ Percentage(%)
1	Age	Continuous	Mean=52.67 ; SD=12.039		
2	Gender	Nominal			Male=40/72.7% Female=15/27.3%
3	Educational Level	Nominal			No education= 2/3.6% Primary=14/25.5% Secondary=19/34.5% High Secondary= 8/14.5% Graduate=6/14.9% Post Graduate= 6/14.9%
4	Occupation	Nominal			Housewife=15/27.3% Farmer=2/3.6% Shopkeeper=2/3.6% Business=14/25.5% Service Holder=13 /23.6% Others=9 (16.4%)
5	Marital Status	Nominal			Married= 54 (98.2%) Unmarried=1 (1.8%)
6	Monthly income	Continuous		30,000	
7	Cost monthly current treatment	Continuous		15,000	
8	Residential	Nominal			Urban=13/23.6%

	Area		Semi- Urban=10 /18.2% Rural= 32/58.2%
9	Family Types	Nominal	Joint Family=35/63.6% Nuclear Family=20 /36.4%

Table-1: Socio-demographic information

**Median value was considered in case of non-normally disributed continuous data.

1.Age

Among the 55 participants in the study, minimum age was of participants 27 and the maximum age of the participants was 75. Their mean was 52.67 and standard deviation was 12.039.

Fig 1: Age of the participants

2. Gender of the participants:

Among the 55 participants 72.7% (n=40) are male and 27.3% (n=15) were female.

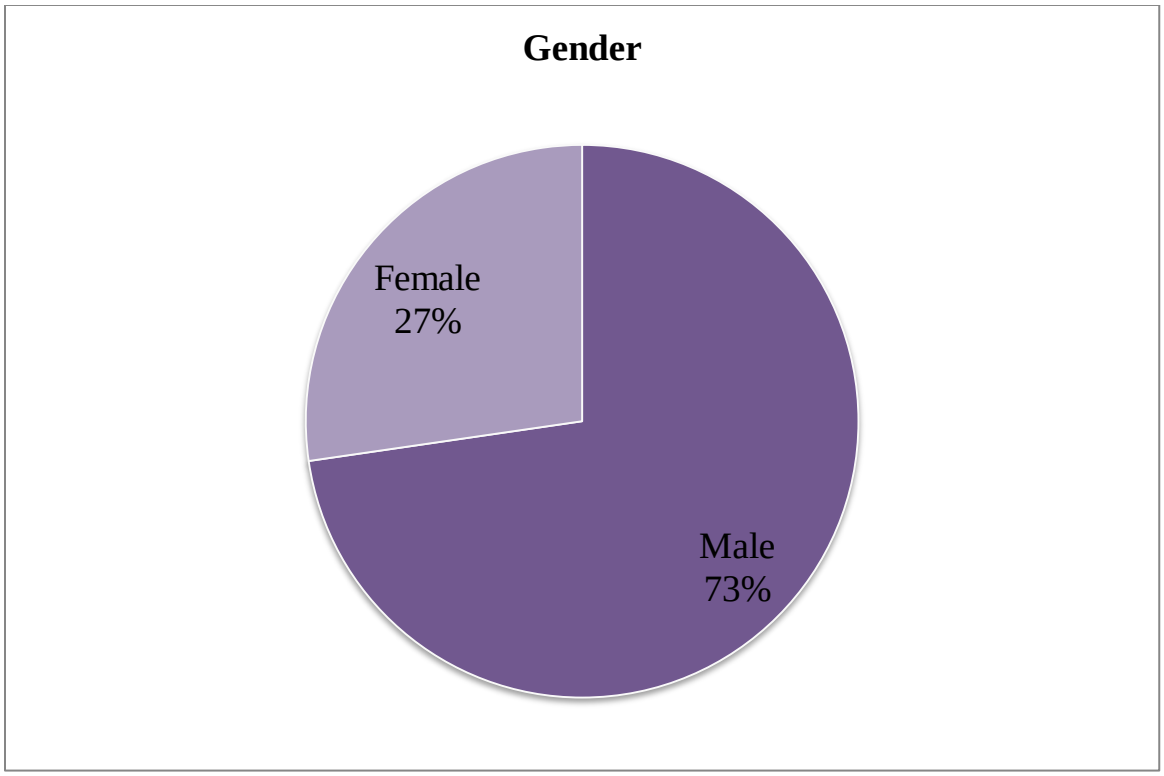


Fig 2: Gender of the participants

3. Educational Level:

Among 55 stroke participants 3.6% (n=2) are no formal education, 25.5% (n=14) were primary, 34.5% (n=19) were secondary, 14.5% (n=8) were higher Secondary, 14.9% (n=6) were graduate and 14.9% (n=6) were post graduate.

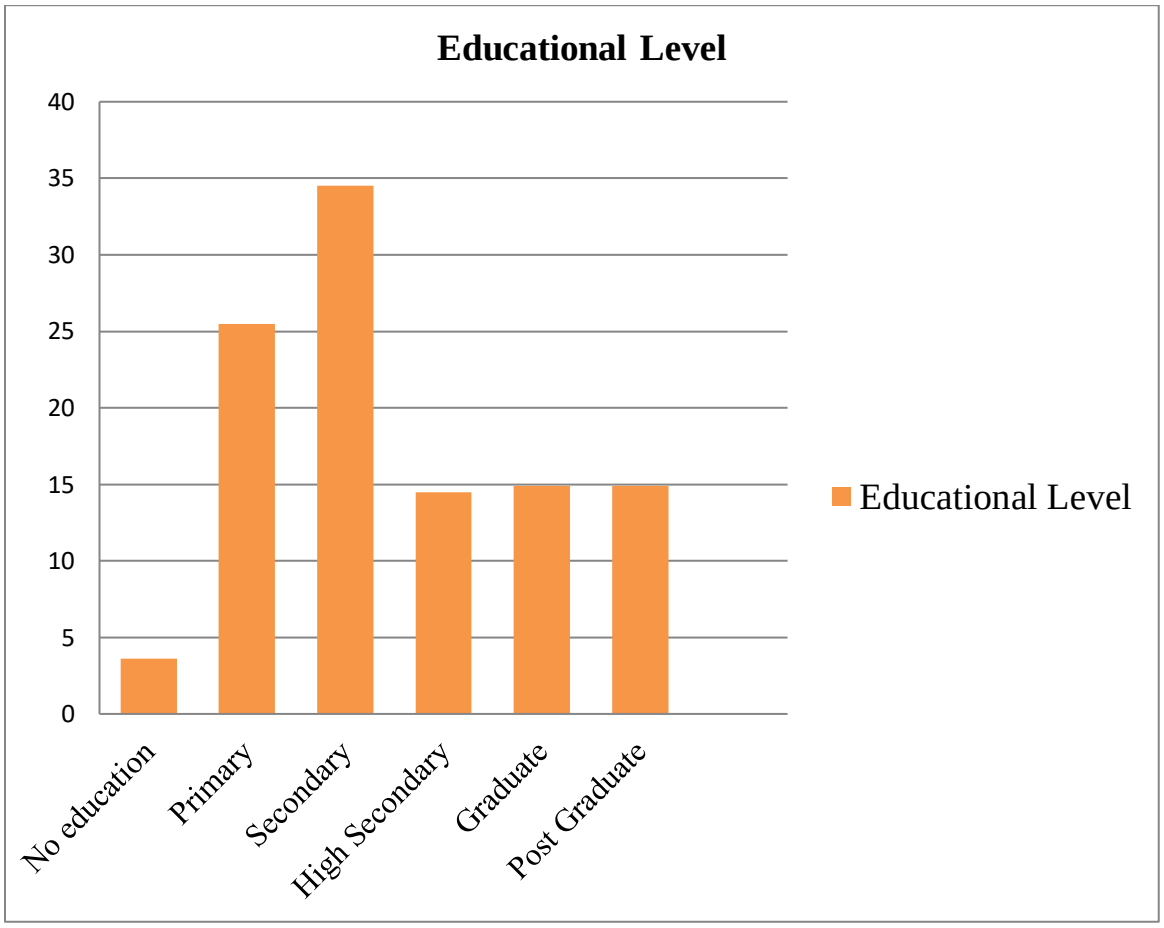


Fig 3: Educational Level

4. Occupation:

Among 55 participants 27.3% (n=15) are housewife, 3.6% (n=2) were farmer, 3.6% (n=2) were shopkeeper, 25.5% (n=14) were business, 23.6% (n=13) were service holder and 16.4% (n=9) were others.

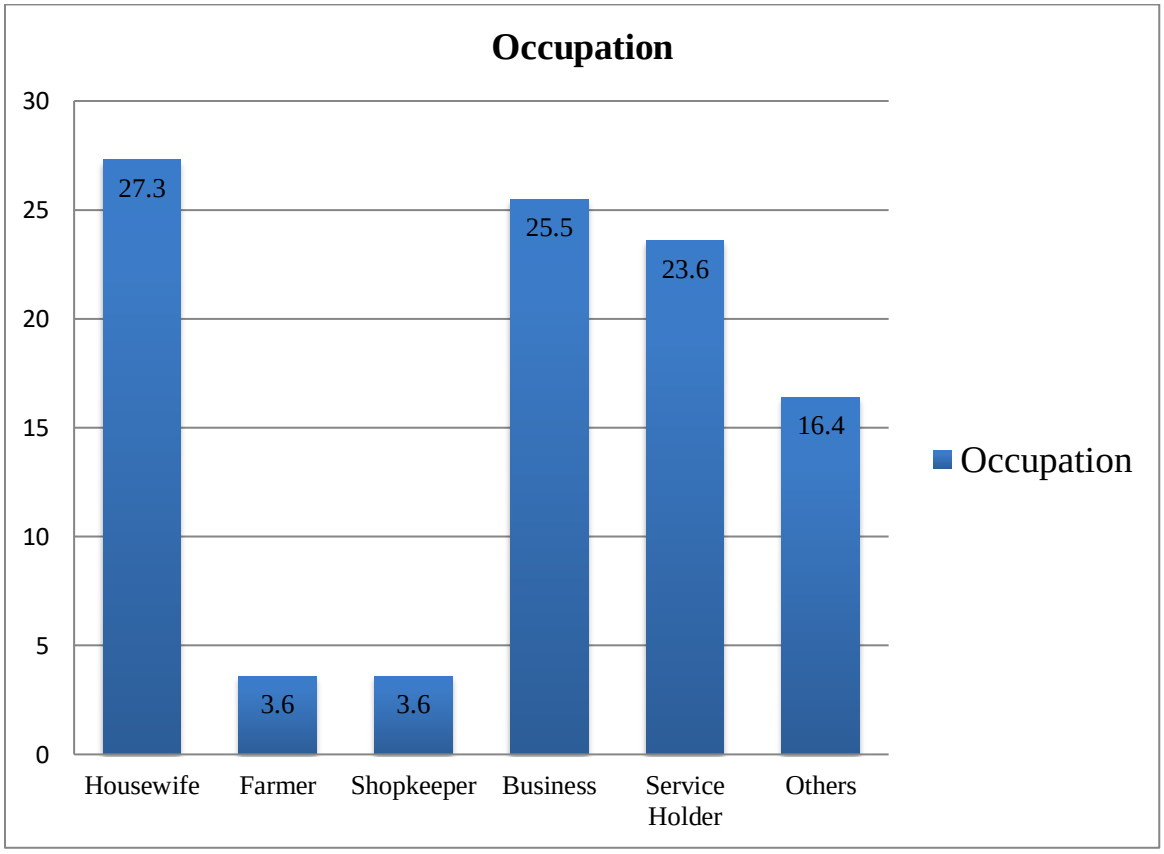


Fig 4: Occupation

5. Marital Status:

Among 55 participants 98.2% (n=54) were married, 1.8% (n=1) were unmarried.

6. Monthly income:

Among 55 participants their median value of the monthly income was 30,000

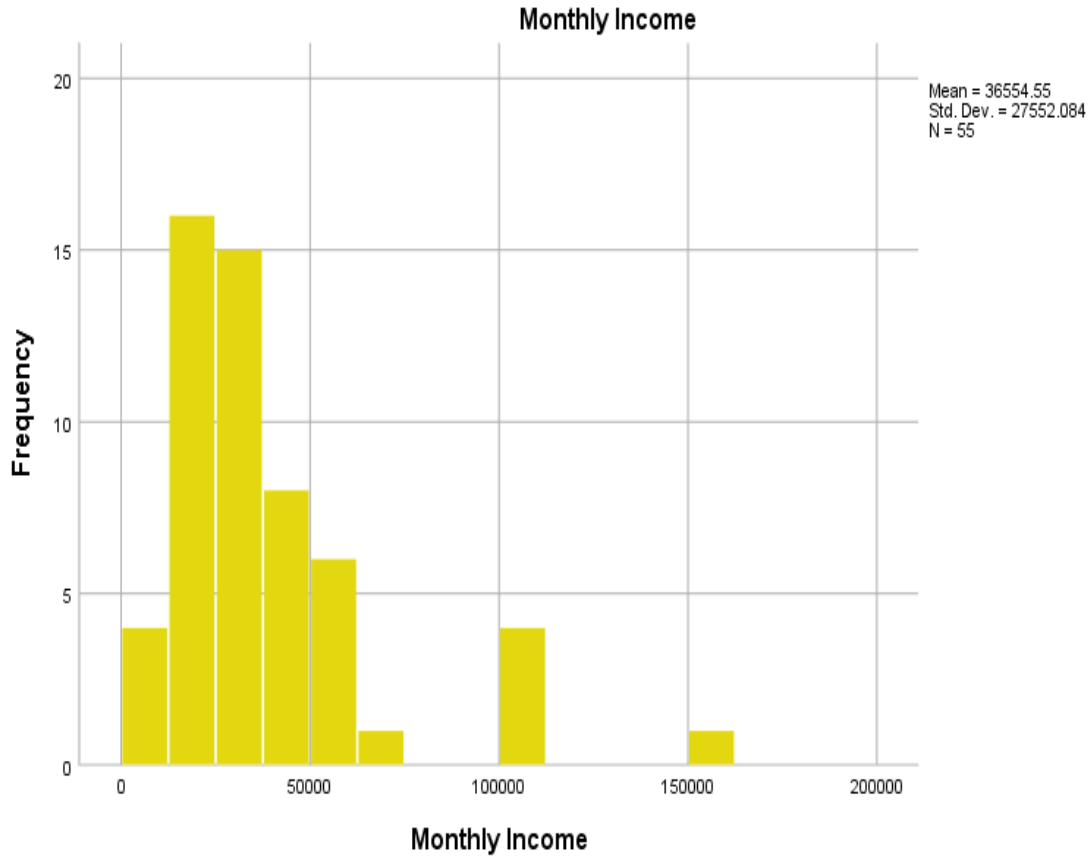


Fig 5: Monthly income

7. Cost monthly current treatment

Among 55 participants their median value of the Cost monthly current treatment was 15,000

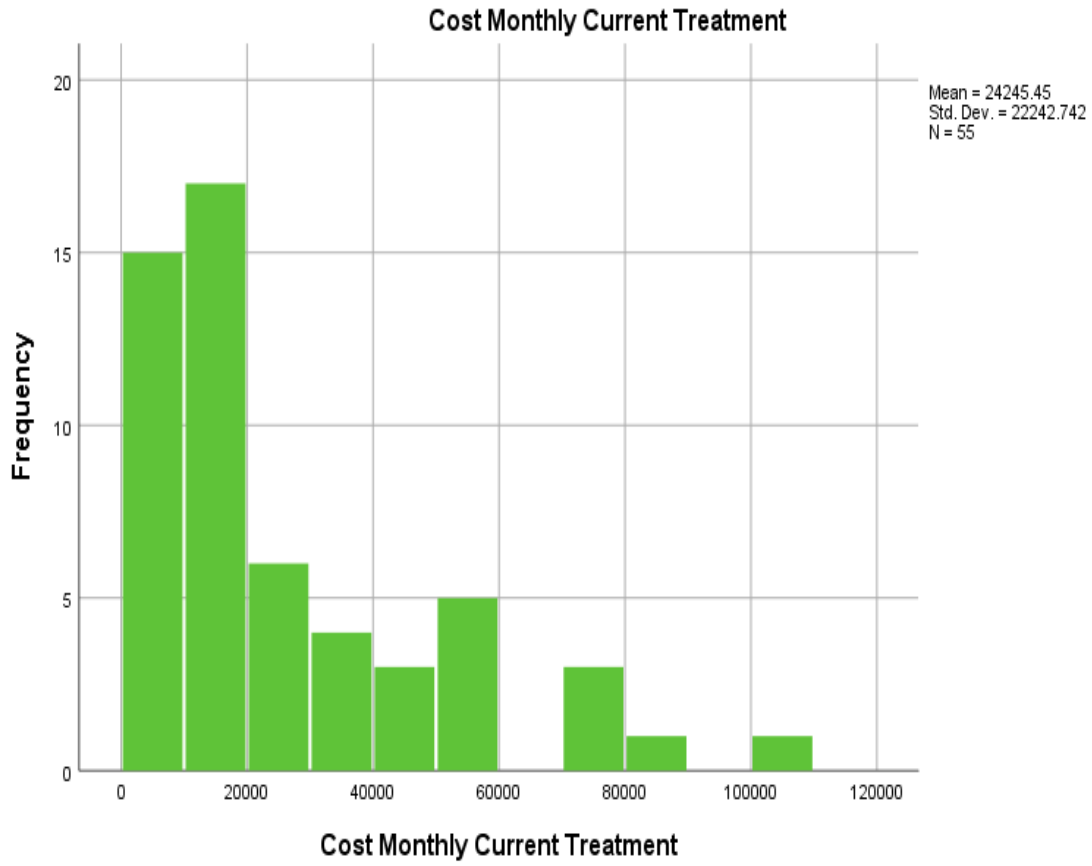


Fig 6: Cost monthly current treatment

8. Residential Area:

Among 55 participants of stroke patients 23.6% (n=13) lived in urban area, 18.2% (n=10) lived in semi-urban area and 58.2% (n=32) lived in rural area.

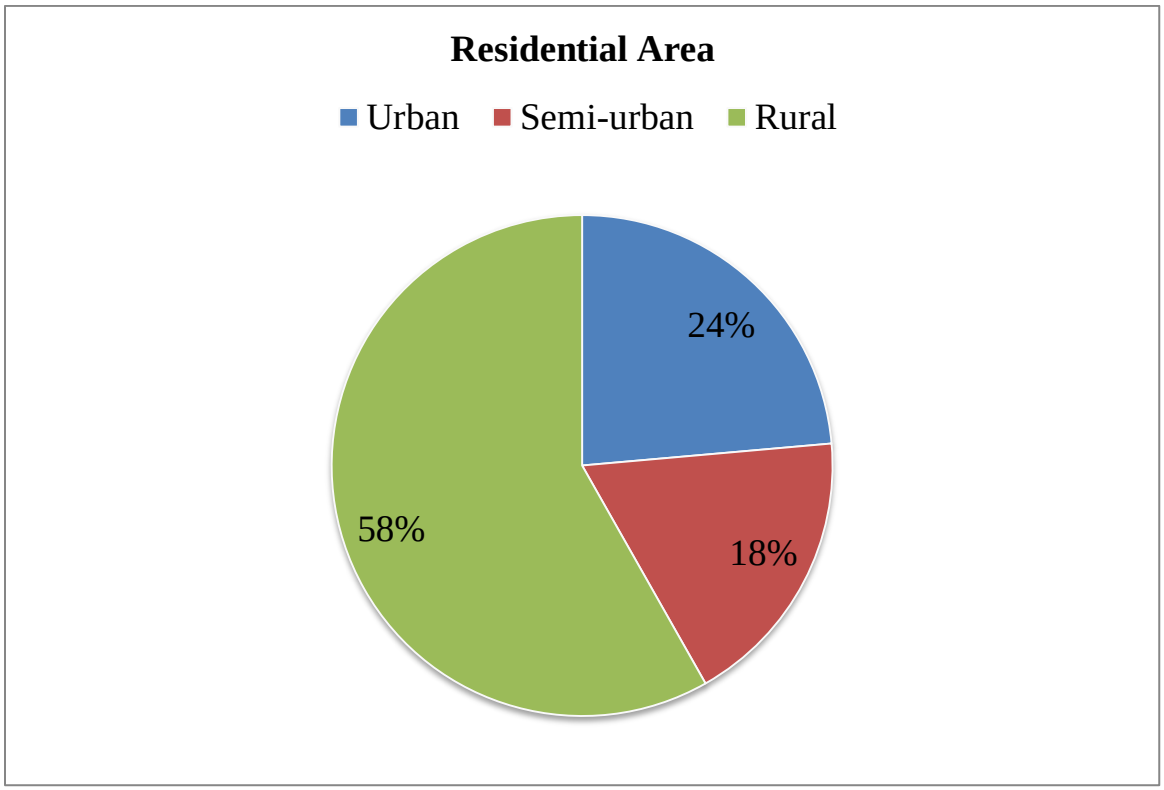


Fig 7: Residential Area

9. Family Types:

Among 55 participants 63.6% (n=35) lived in joint family and 36.4% (n=20) lived in nuclear family.

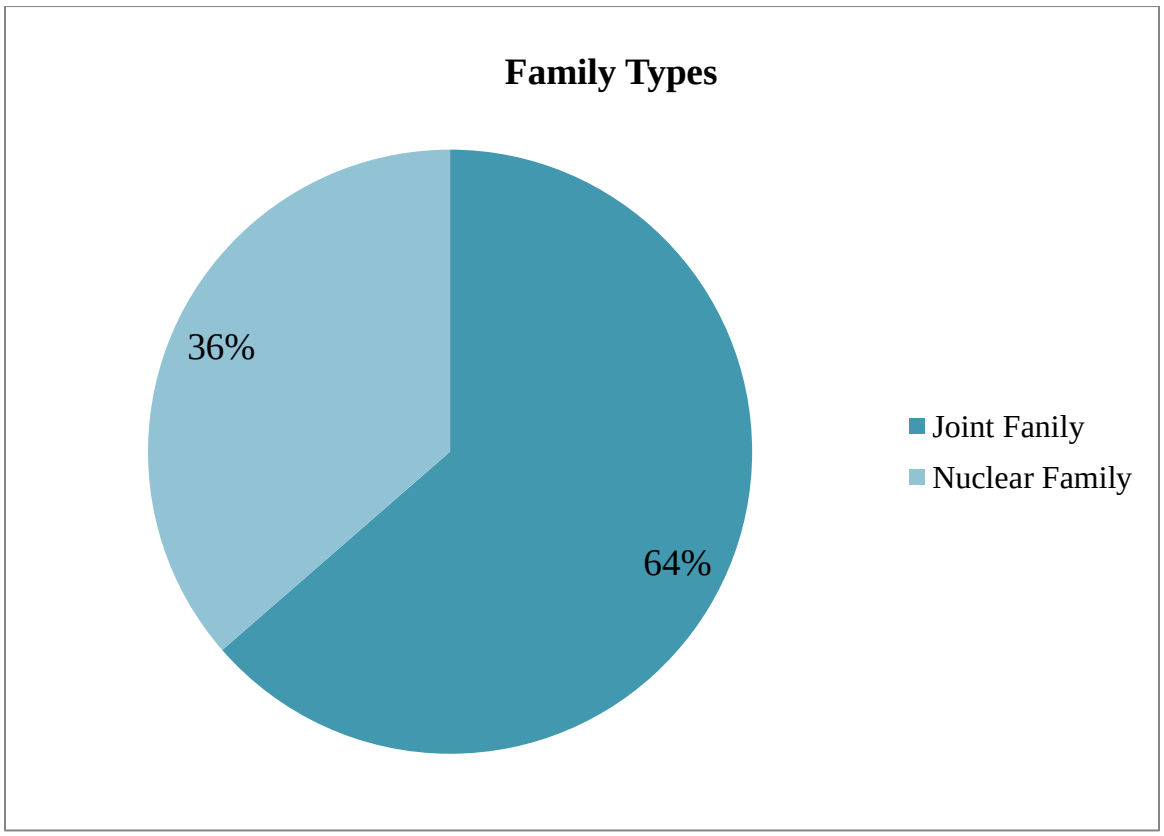


Fig 8 : Family Types

Table 2: Physical Parameter:

SL No.	Variable	Types of variable	Mean/SD	Median	Frequency(n)/ Percentage
1	BMI	Continuous		22.1256	
2	Body types	Nominal			Thin=9 (16.4%) Fat= 12 (21.8% Fat=12 (21.8%))
3	Types of Stroke	Nominal			Ischemic=32 (58.2%) Haemorrage= 23 (41.8%)
4	Affected side	Nominal			Right= 23 (41.8%) Left=30 (54.5%) Both= 2 (3.6%)
5	Intervention Time of Month	Continuous			Early= 8 (14.5%) Late=47 (85.5%)
6	History of Previous	Nominal			Yes= 23 (41.8%) No=32 (58.2%)
7	Family History of Stroke	Nominal			Yes= 25 (45.5%) No=30 (54.5%)
8	Complication After Stroke	Nominal			Yes= 51 (92.7%) No=4 (7.3%)
9	Treatment	Nominal			Medication= 16 (29.1%) Medication and Physiotherapy=39(70.9%)
10	Comorbidity	Nominal			Single=15 (27.3%) Multiple=40 (72.7%)
11	Usual food Habit	Nominal			Carbohydrate=48 (87.3%) Fat= 5 (9.1%) Junk food= 2 (3.6%)
12	Level of Activity	Nominal			Active= 2 (3.6%) Sedentary= 53 (96.4%)
13	Hours Sleeping	Continuous	Mean=6.92; SD=1.5379		
14	Taking Sleeping Pill	Nominal			Yes= 27 (49.1%) No= 28 (50.9%)

15	Smoking	Nominal	Yes= 15 (27.3%) No= 40 (72.7%)
16	Mental Condition	Nominal	Schizophrenia= 3 (5.5%) Bipolar disorder=1(1.8%) Depression= 51 (92.7%)
17	Level of Dementia	Nominal	No Dementia=11 (20%) Mild= 21(38.2%) Moderate=15 (27.3%) Severe= 8 (14.5%)

Table 2: Physical Parameter:

**Median value was considered in case of non-normally distributed continuous data.

1. BMI:

Among 55 participants their median value of the BMI was 22.1256

2. Body Types of the participants:

Among 55 participants thin body types are 16.4% (n=9), fat 21.8% (n=12) and medium is 61.8% (n=34).

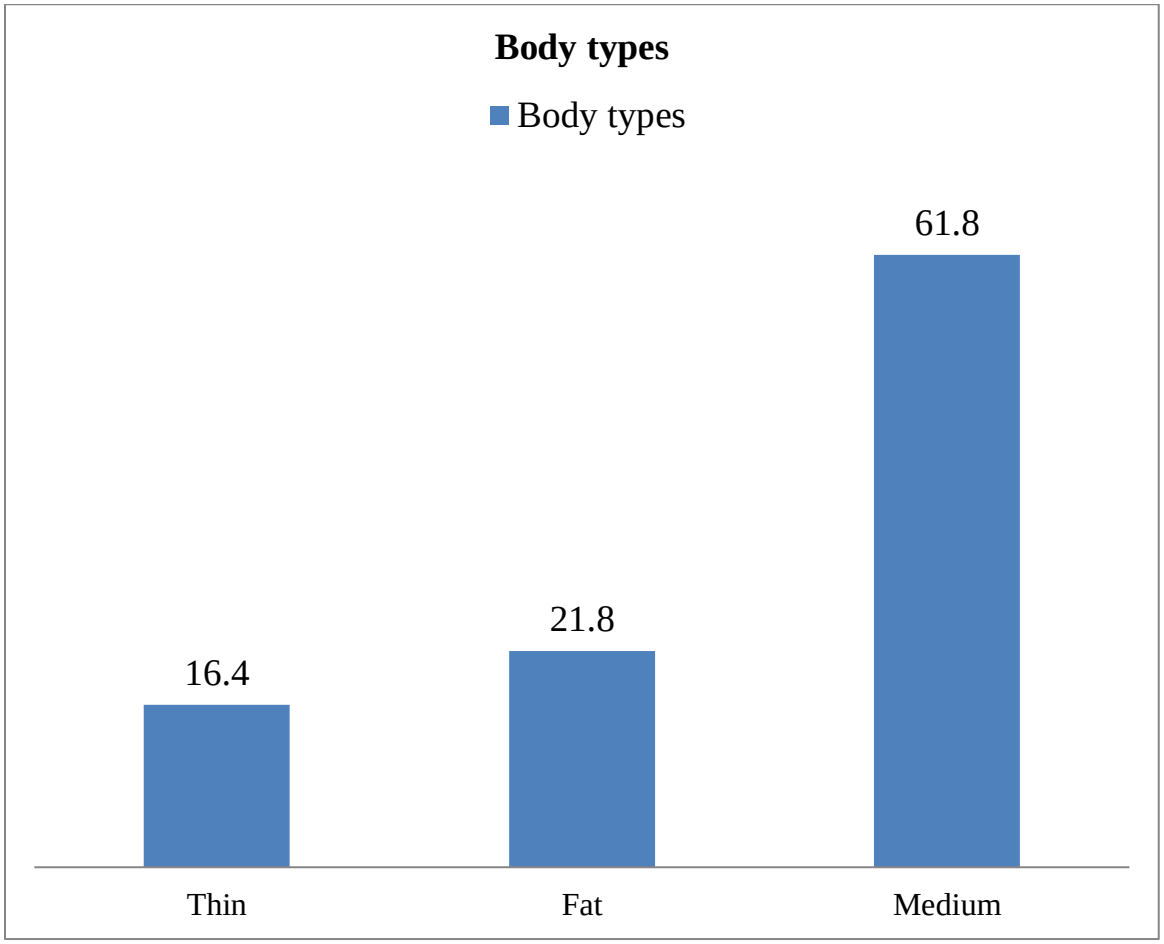


Fig 9: Body types of the participants

3. Types of Stroke:

Among 55 participants ischemic stroke type is 58.2% (n=32) and hemorrhage is 41.8% (n=23).

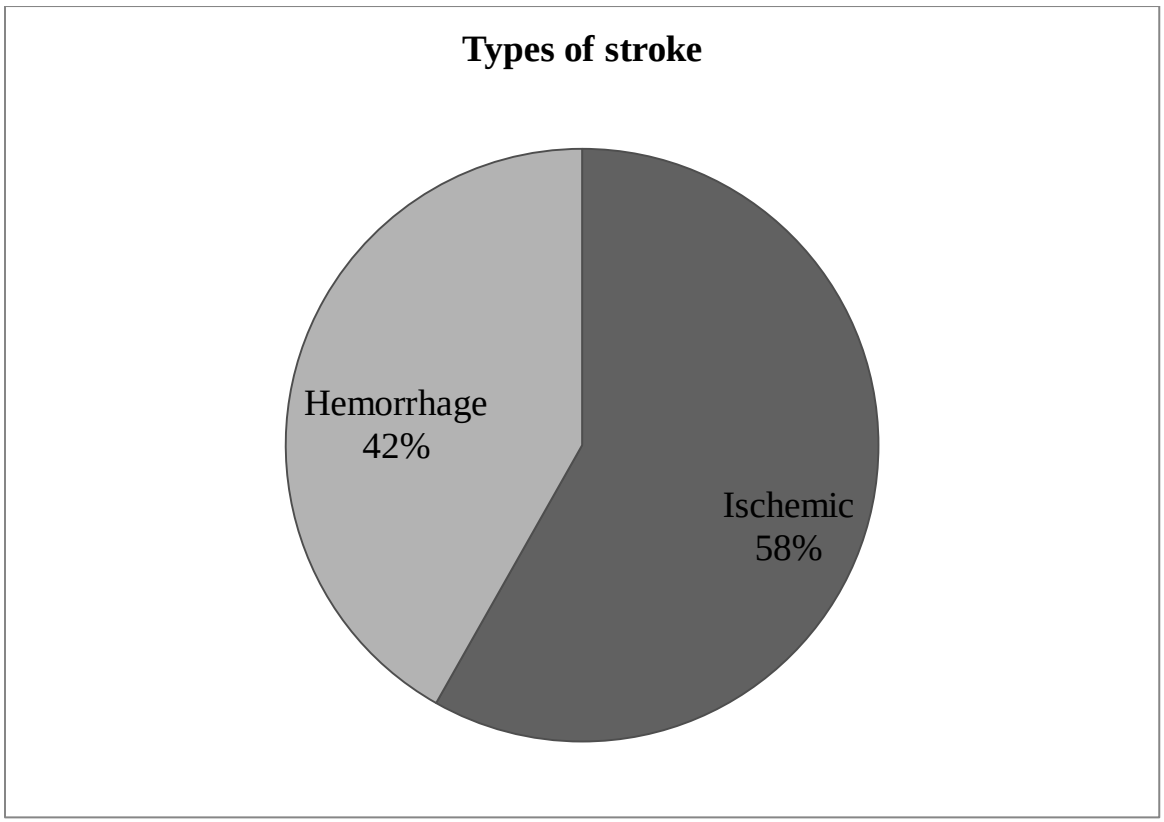


Fig 10: Types of stroke

4. Affected Side of the participants:

Among 55 participants 41.8% (n=23) are right, 54.5% (n=30) were left and 3.6% (n=2) were both.

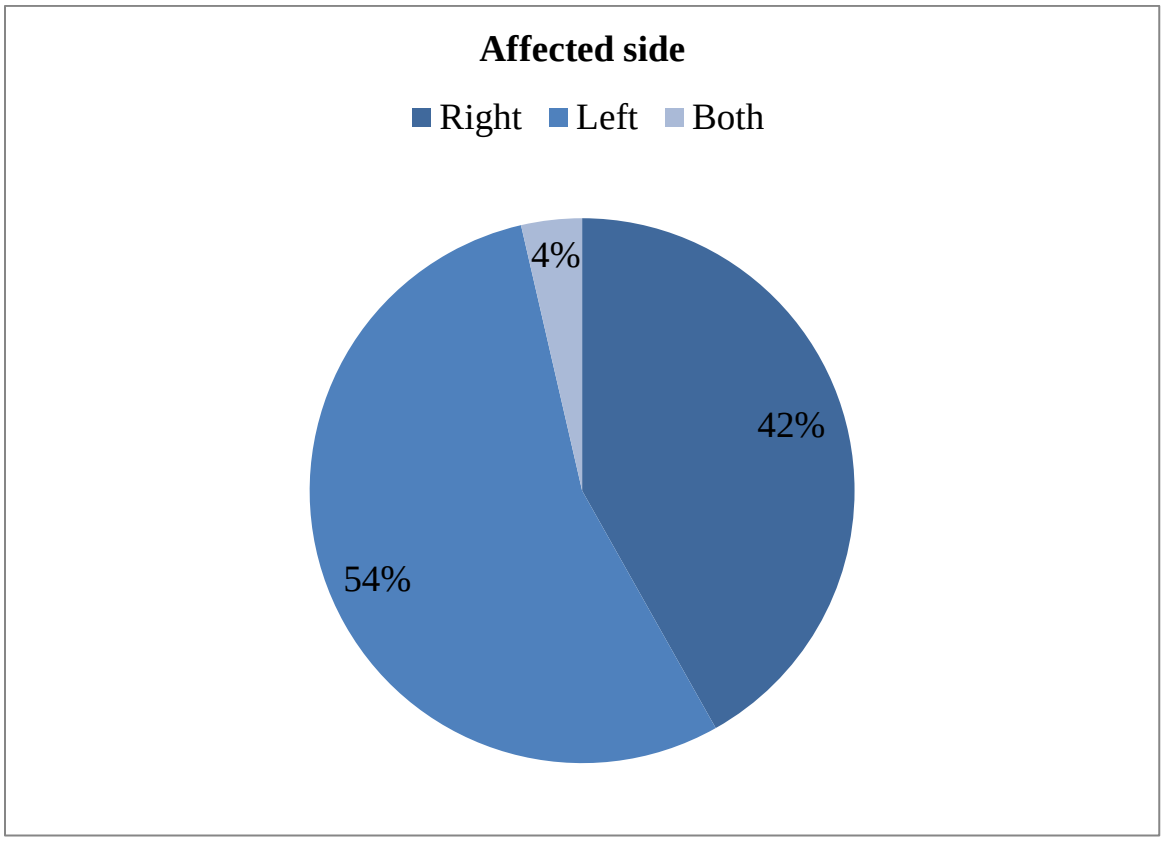


Fig 11: Affected side of the participants

5. Intervention Time of Month:

Among 55 participants, 14.5% (n=8) are early intervation, 85.5% (n=47) were late intervation.

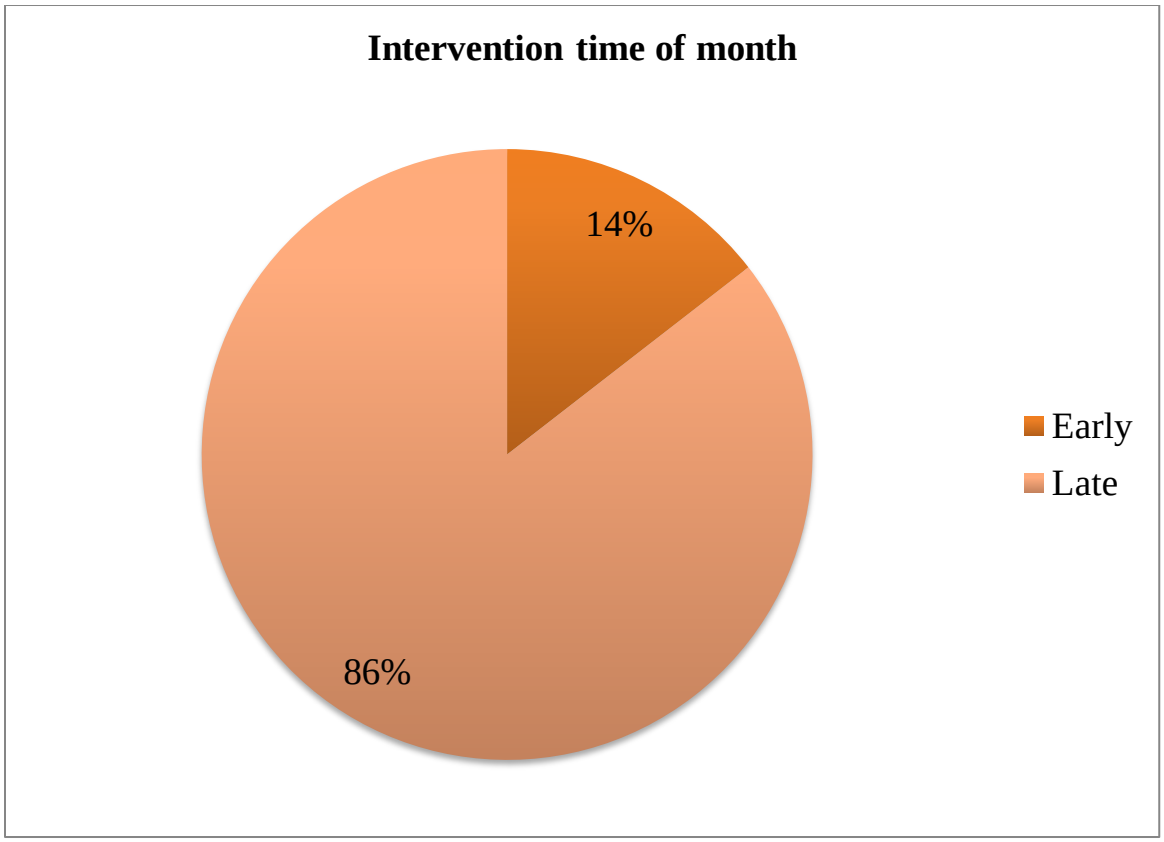


Fig 12: Intervention time of month

6. History of Previous Stroke:

Previous stroke was yes in 41.8% (n=23) and no in 58.2% (n=32) of 55 participants.

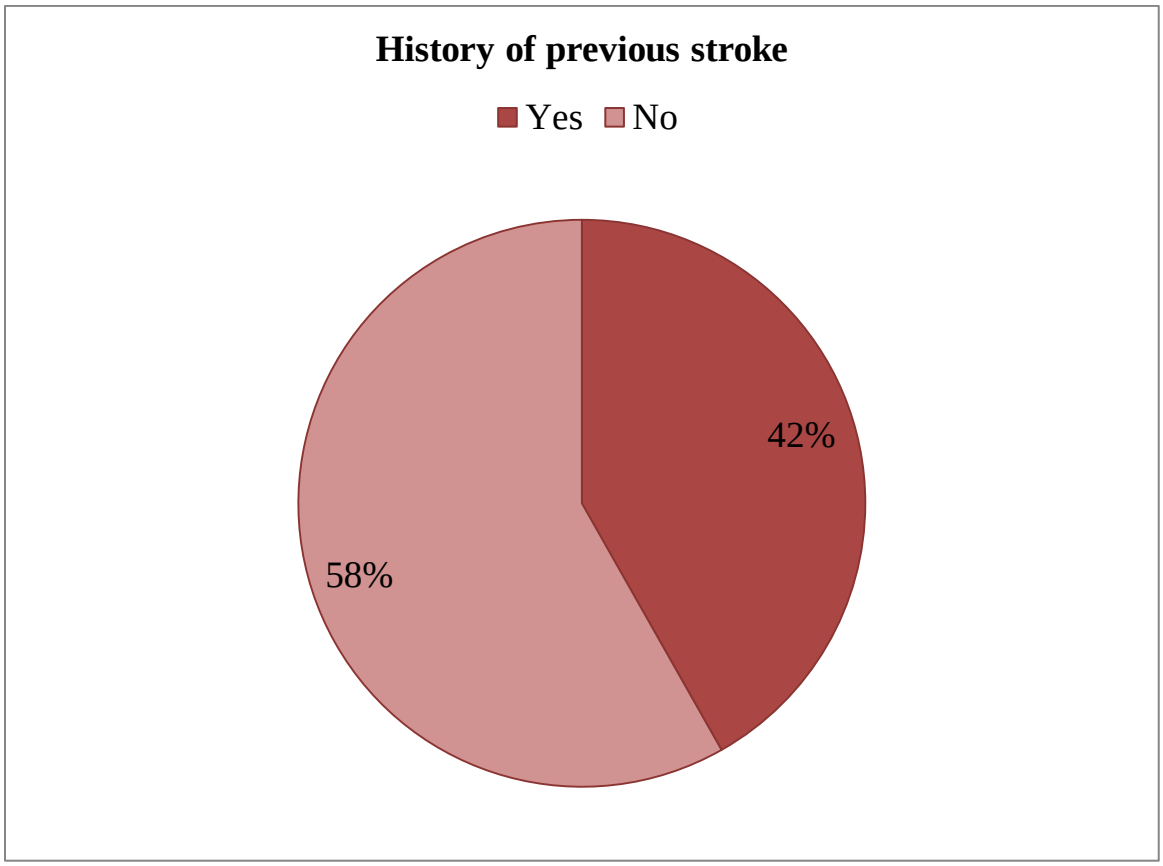


Fig 13: History of Previous Stroke

7. Family History of Stroke:

Family History of Stroke was yes in 45.5% (n=25) and no in 54.5% (n=30) of 55 participants.

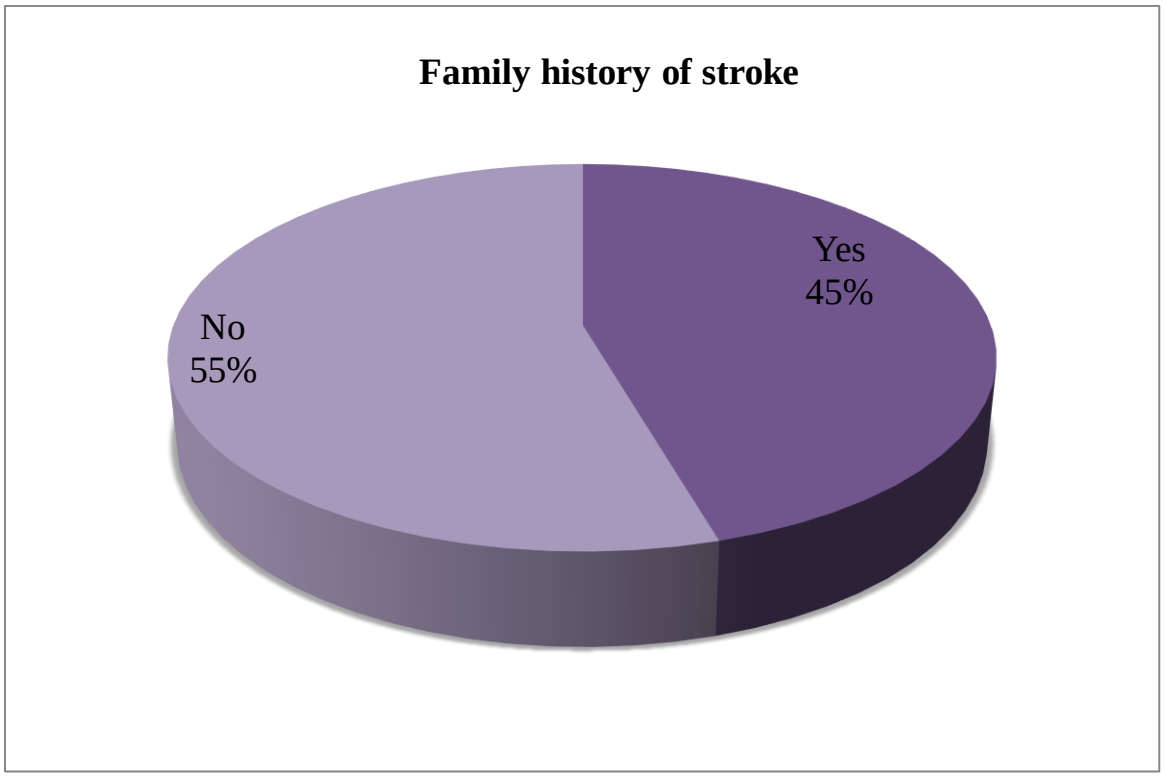


Fig 14: Family History of Stroke

8. Complication After Stroke:

Among 55 participants complication after stroke yes is 92.7% (n=51) and no is 7.3% (n=4).

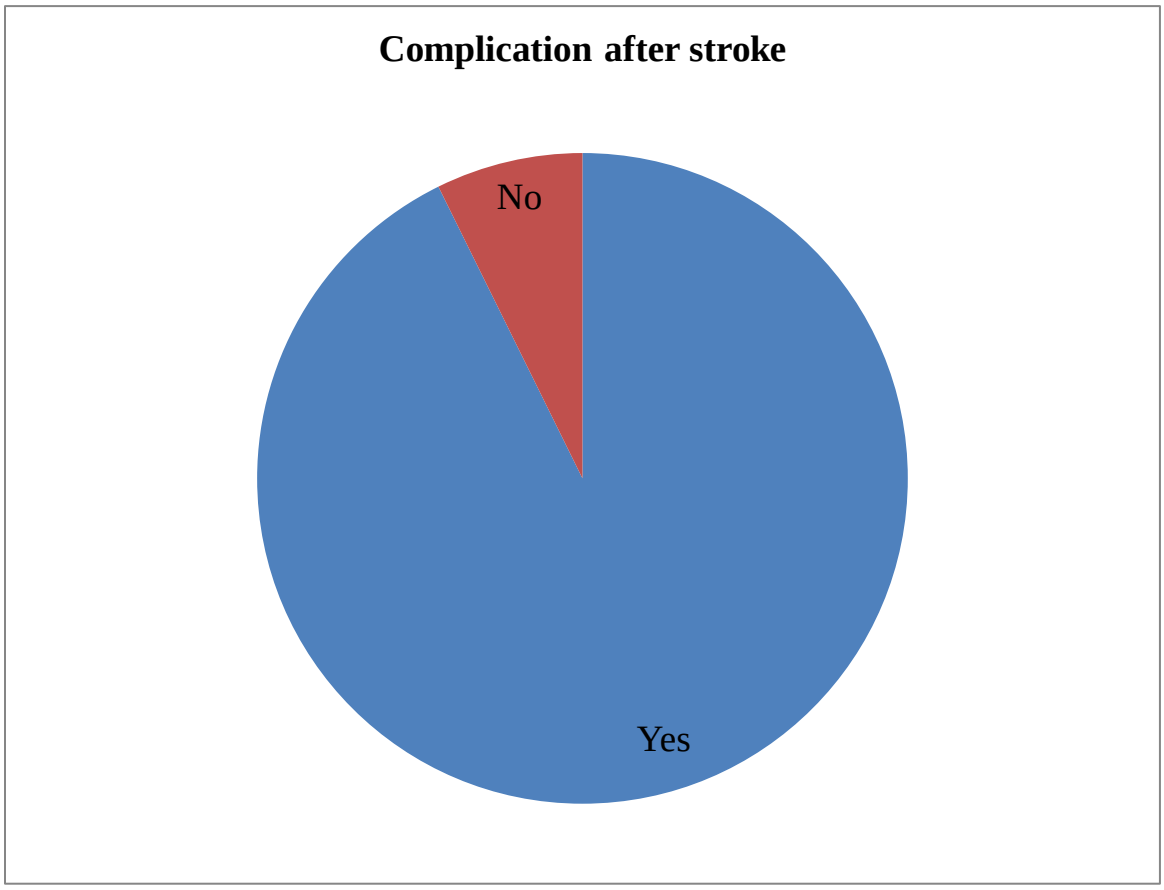


Fig 15: Complication After Stroke

9. Treatment:

Among 55 participants, 29.1% (n=16) took medication and 70.9% (n=39) took medication with physiotherapy.

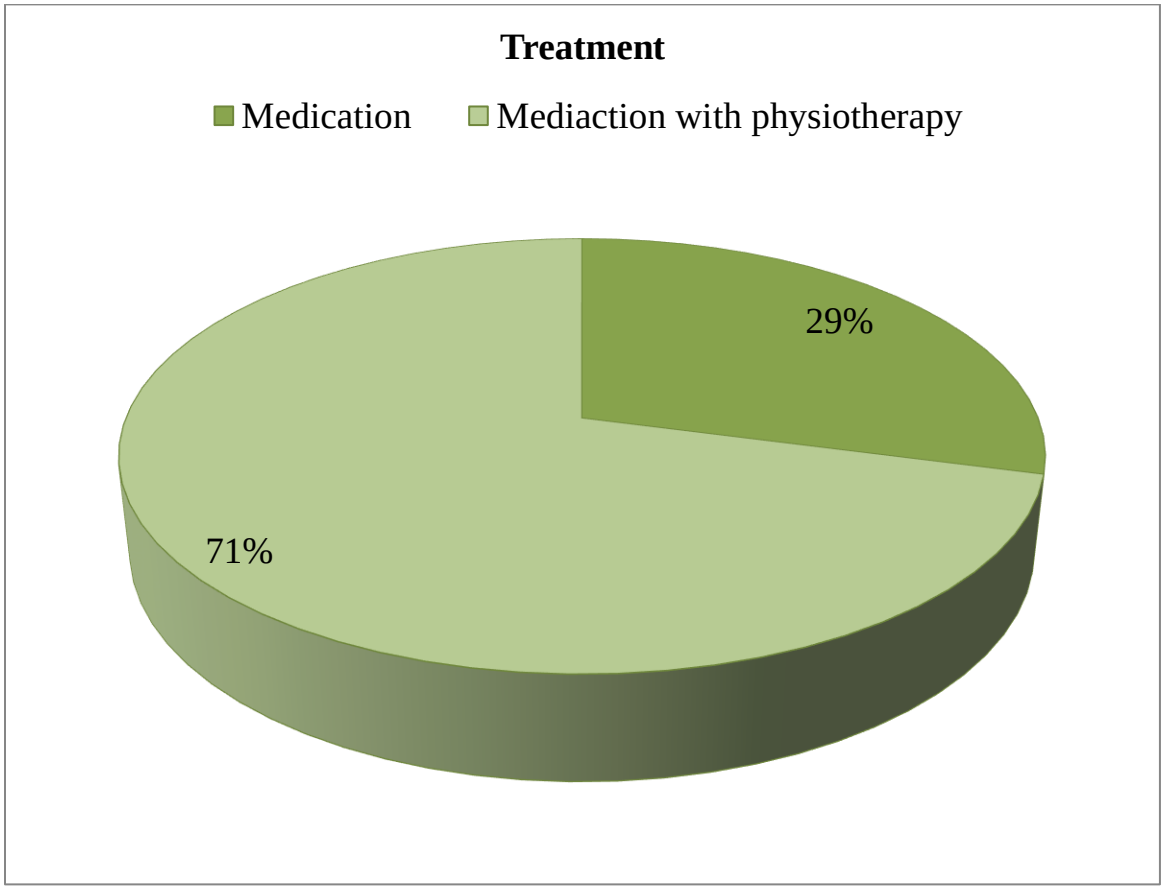


Fig 16: Treatment

10. Comorbidity:

Single comorbidities are present about 27.3% (n=15), multiple comorbidities were present about 72.7% (n=40%).

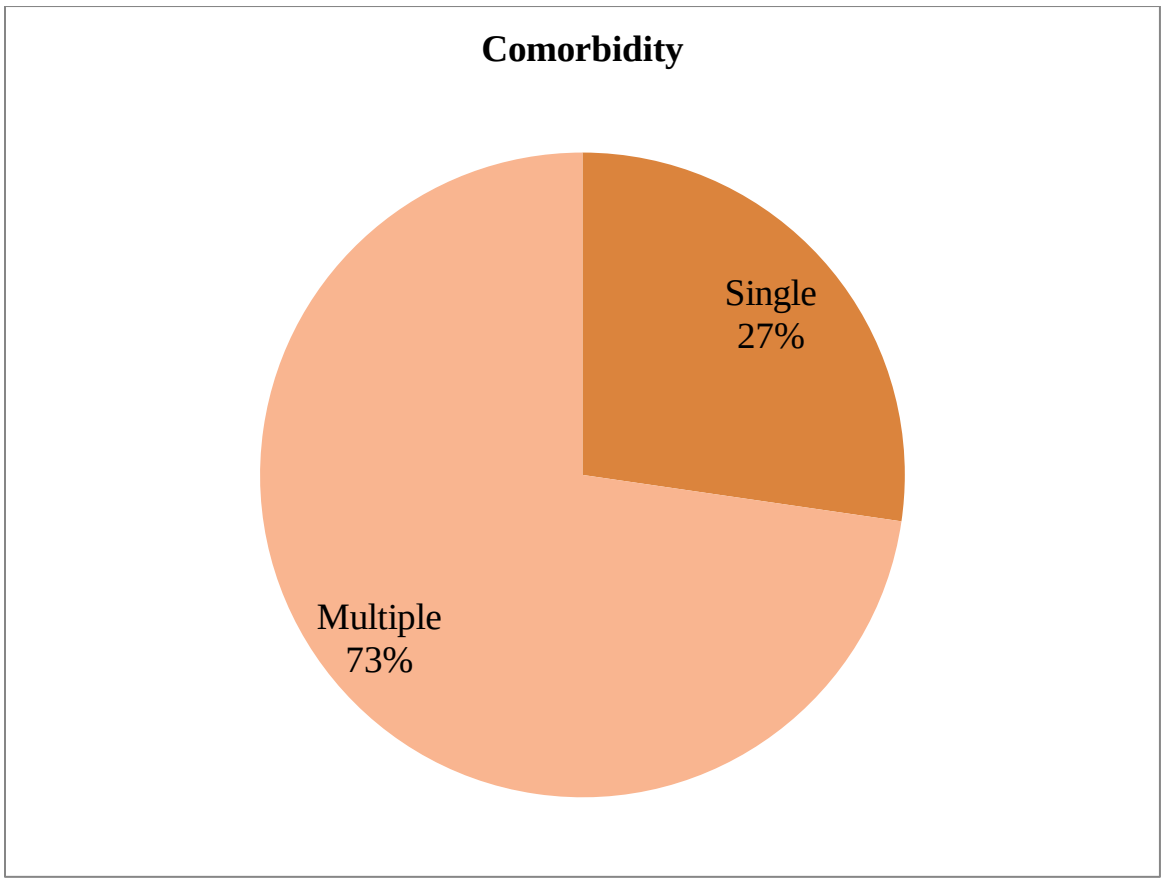


Fig 17: Comorbidity

11. Usual food Habit:

Among 55 participants 87.3% (n=48) was habitual in carbohydrate, 9.1% (n=5) was habitual in fat and 3.6% (n=2) was habitual in junk food.

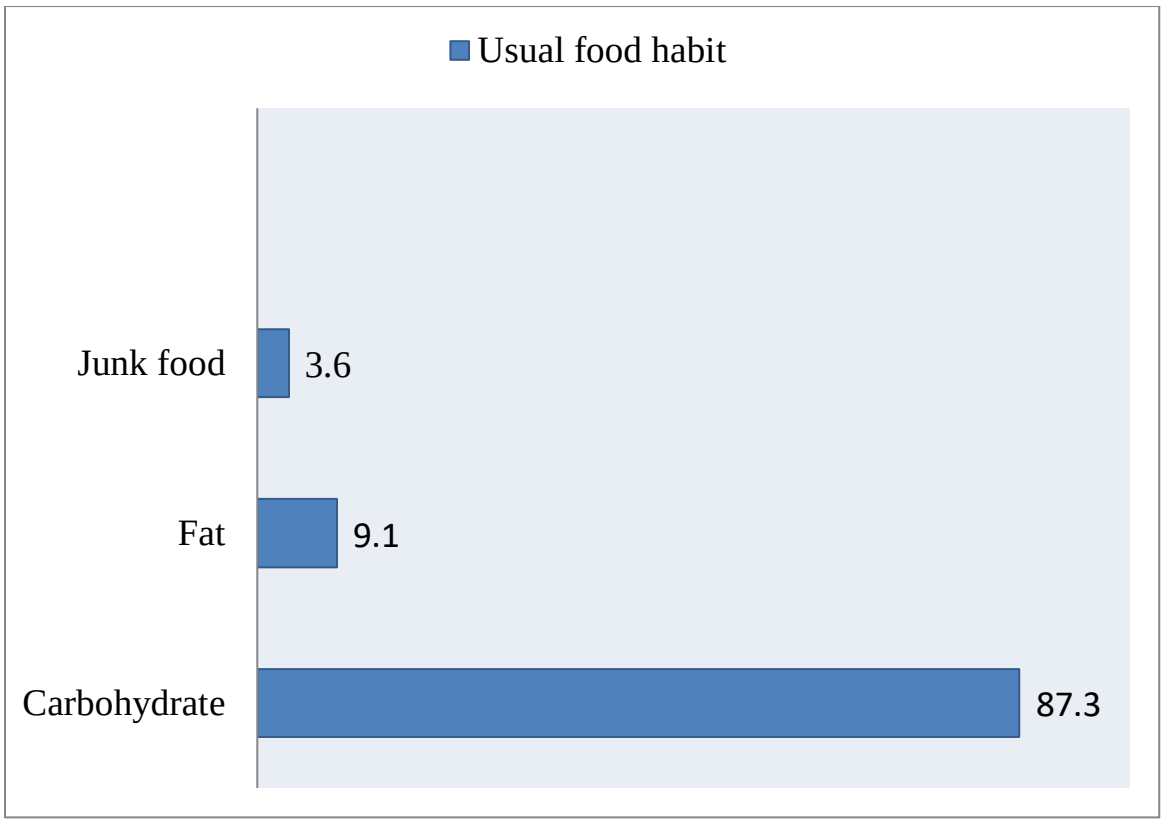


Fig 18: Usual food habit

12. Level of Activity:

Among 55 participants active life leads about 3.6% (n=2) and sedentary life leads about 96.4% (n=53).

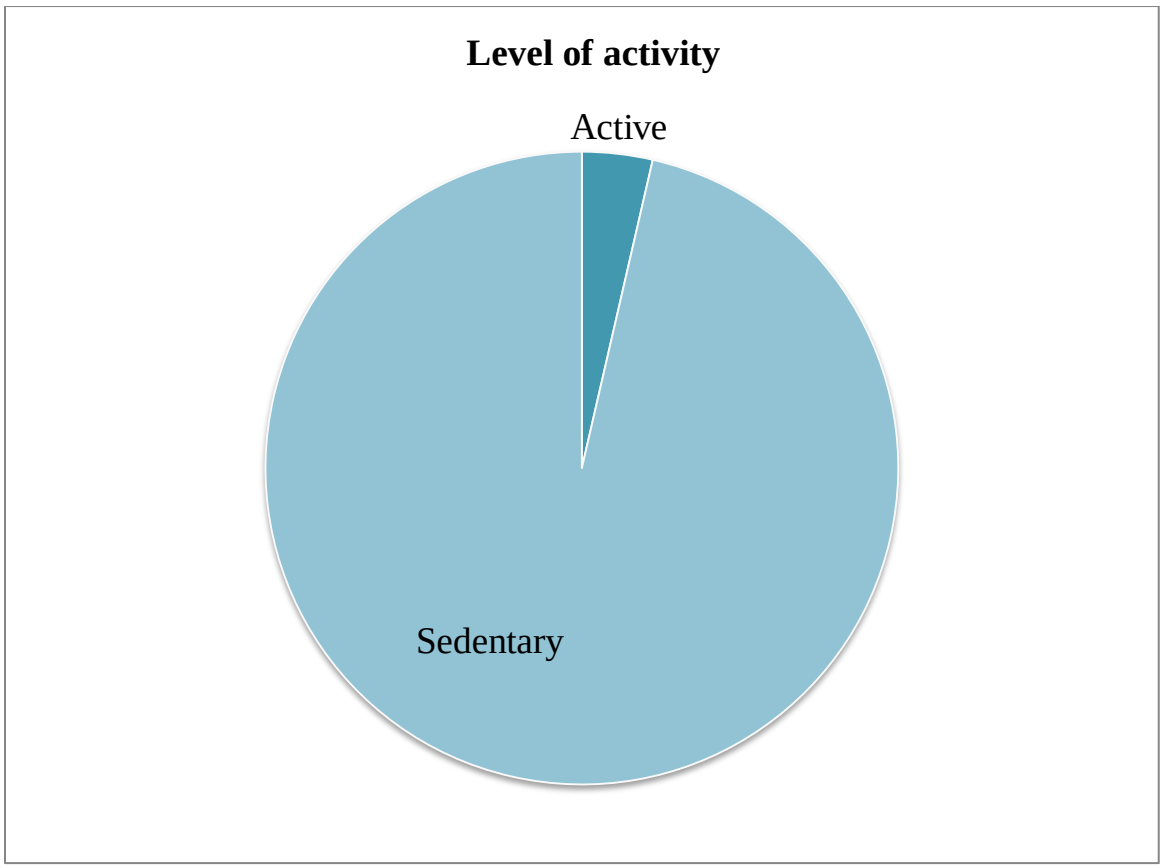


Fig 19: Level of activity

13. Hours sleeping

Mean value of sleeping hours 6.927 and standard deviation 1.5379.

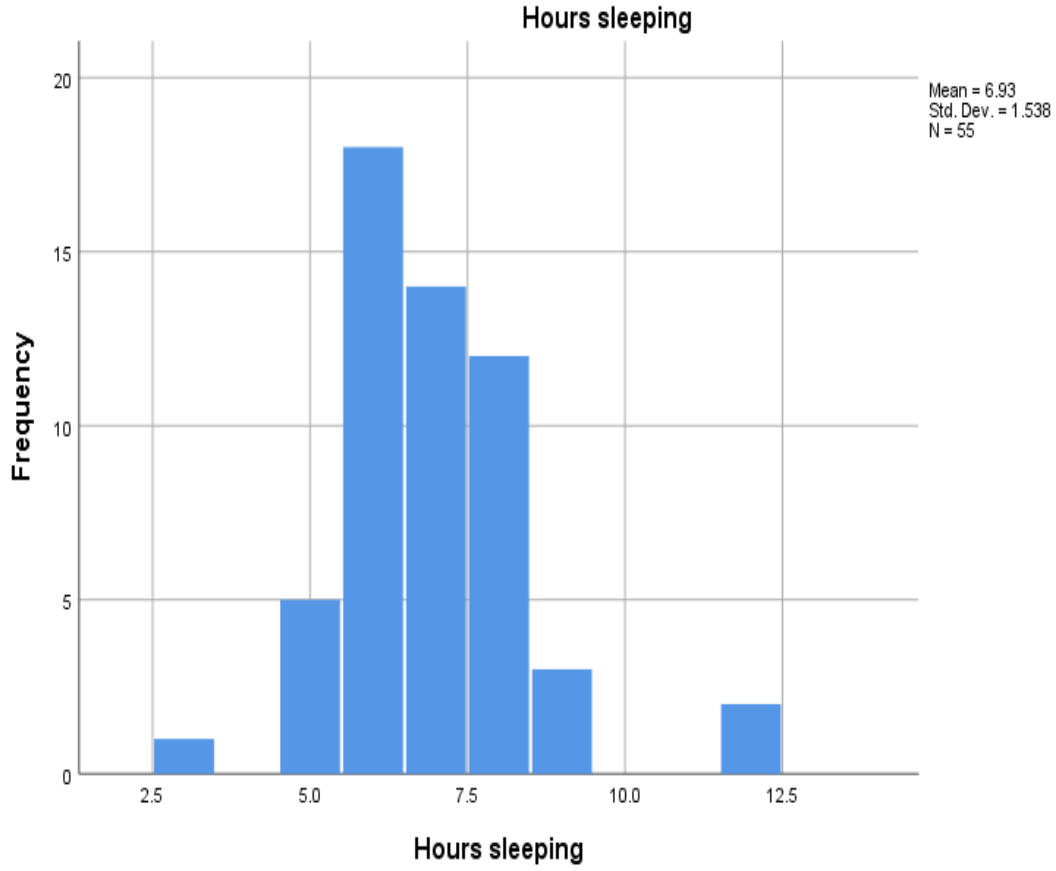


Fig 20: Hours sleeping

14. Taking Sleeping Pill:

49.1% (n=27) took sleeping medication and 50.9% (n=28) did not consummate any sleeping medication.

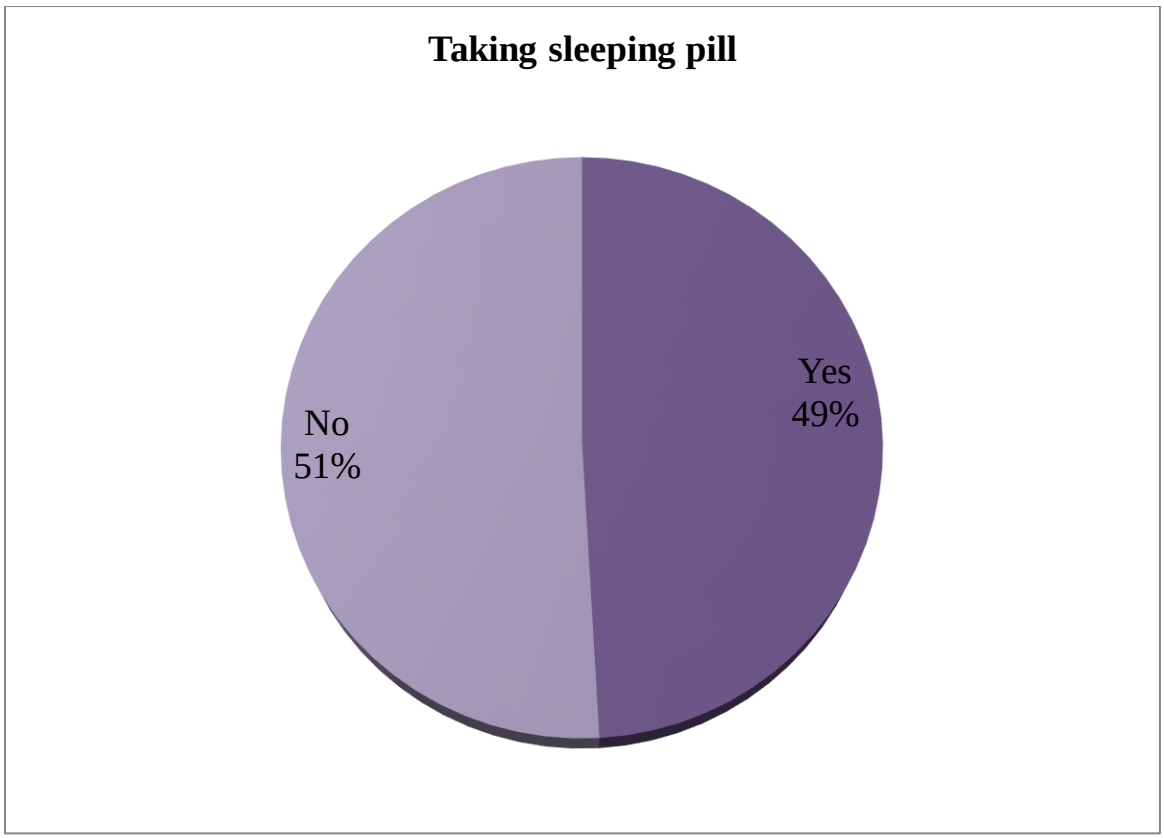


Fig 21: Taking sleeping pill

15. Smoking:

27.3% (n=15) took smooking and 72.7% (n=40) did not consummate smoking.

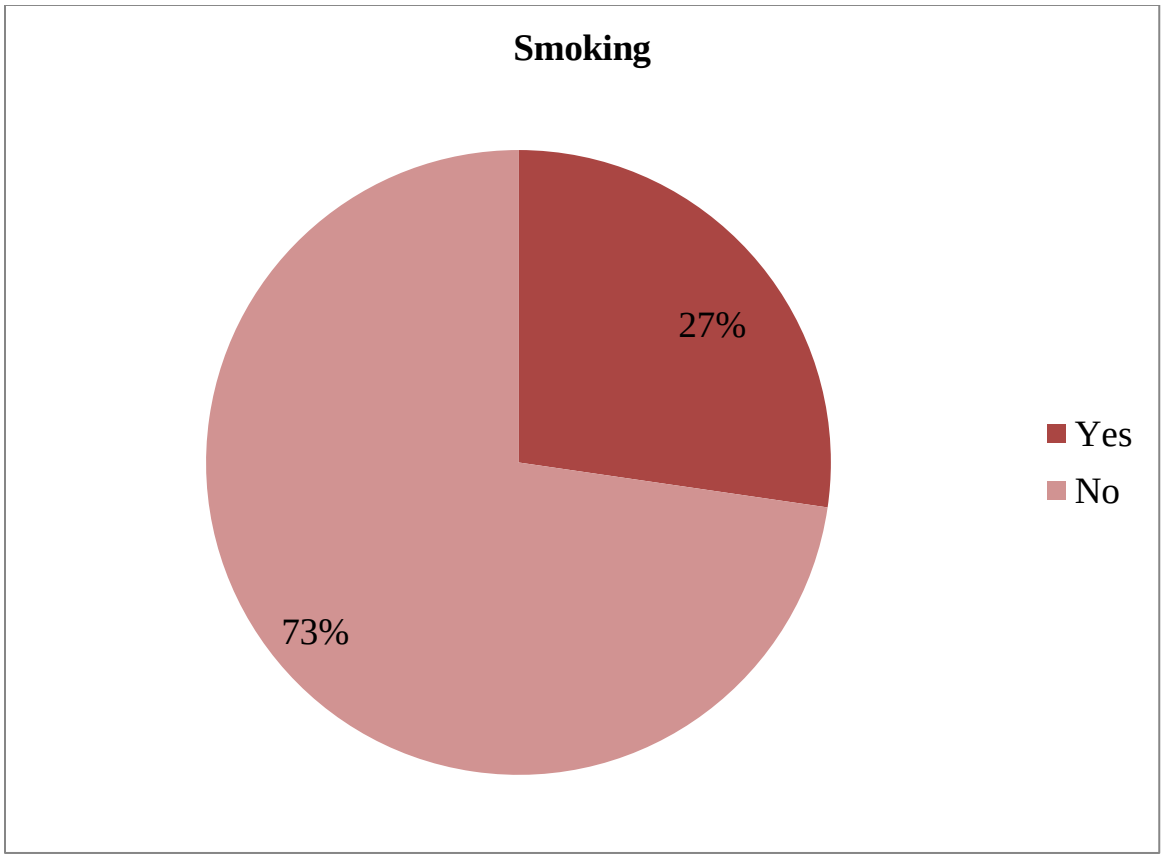


Fig 22: Smoking

16. Mental Condition:

Among 55 participants, schizophrenia was present about 5.5% (n=3), Bipolar disorder was 1.8% (n=1) and depression was 92.7% (n=51).

17. Level of Dementia:

Among 55 participants, normal cognition/no dementia are 20% (n=11), mild dementia are 38.2% (n=21), moderate dementia 27.3% (n=15) and severe dementia 14.5% (n=8).

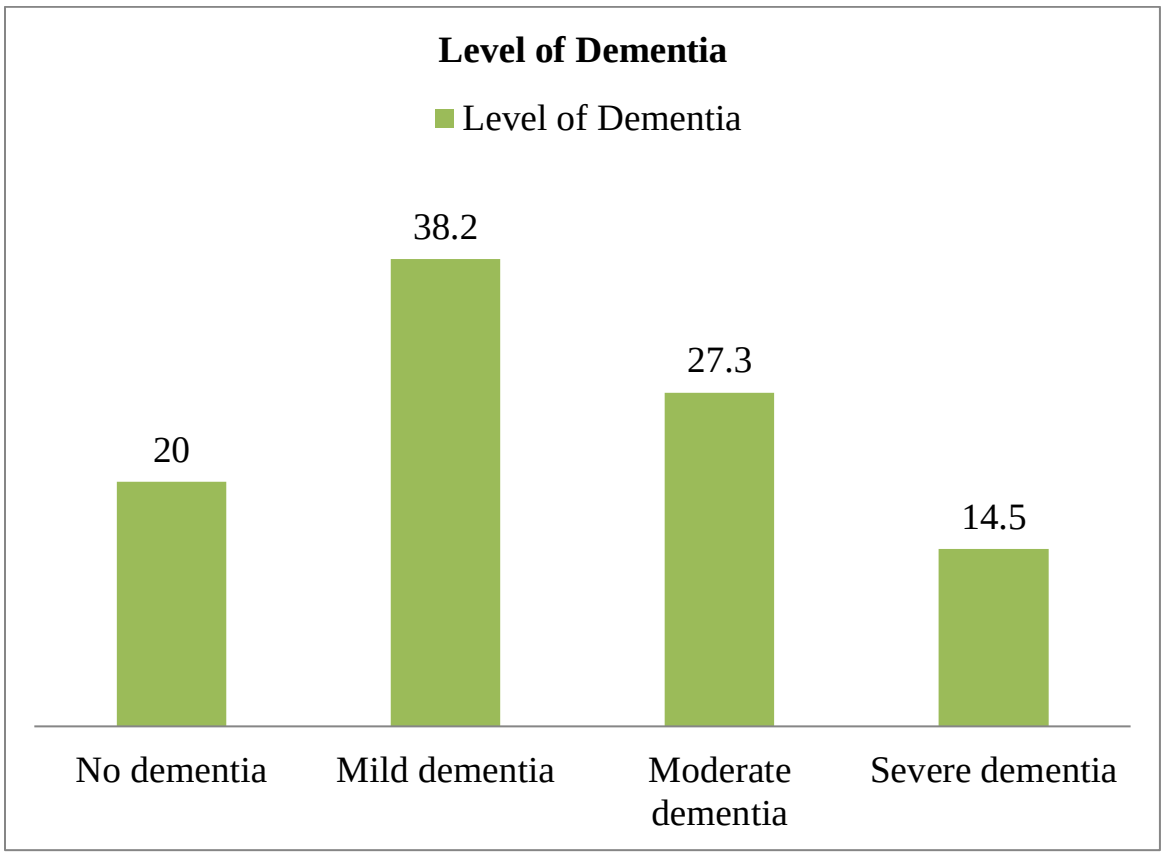


Fig 23: Level of Dementia

Inferential statisical analysis:

Typically, inferential statistical analysis involves drawing inferences about a population based on data describing a sample (Lix et al. 2013, p. 698). In this study associations were analyzed between level of dementia with sociodemographic information (e.g gender) and physical parameter related information (e.g types of stroke, previous history of stroke, comorbidity, level of activity, body types etc). Co-relation was analyzed between age with total score of MMSE scale and sleeping hours with total score of MMSE scale.

Table-3: Association between level of dementia with sociodemographic information (e.g gender) and physical parameter related information (e.g types of stroke, previous history of stroke, comorbidity, taking sleeping pill, level of activity, smoking, food habit, body types etc).

Null (H0): There has no association between level of dementia with gender, types of stroke, previous history of stroke, comorbidity, level of activity, body types etc.

Alternative (HA): There has association between level of dementia with gender, types of stroke, previous history of stroke, comorbidity, level of activity, body types etc.

Test assumption:

In case of Pearson chi square,

1. Two categorical variables including two or more subcategory each
2. 0-1 cells (0%-20%) have expected count less than 5.

In case Fisher's exact test if

1. Expected frequency is <5, cell count is >20%

Level of significance (α value <.05)

Table-3: Association between level of dementia with sociodemographic information and physical parameter related information.

Variable 1	**Variable 2**	**Pearson Chi square co efficient value** (r)	**Fisher's exact co efficient value**	**Significant level**	**Comment/Discussion**
Level of dementia (mild, moderate and severe)	Gender 1. Male 2. Female		3.861	.276	No significant association found/Null hypothesis is failed to be rejected
	Types of stroke 1. Ischemic 2.Haemorrhage		1.698	.655	No significant association found/Null hypothesis is failed to be rejected
	Previous history of stroke 1. Yes 2. No		.460	.980	No significant association found/Null hypothesis is failed to be rejected
	Comorbidity 1. Single 2. Multiple		2.720	.432	No significant association found/Null hypothesis is failed to be rejected

	Level of Activity 1. Active 2. Sedentary		4.909	.056	No significant association found/Null hypothesis is failed to be rejected
	Taking sleeping pill 1. Yes 2. No		2.330	1.000	No significant association found/Null hypothesis is failed to be rejected
	Smoking 1. Yes 2. No		5.975	.104	No significant association found/Null hypothesis is failed to be rejected
	Food habit 1.Carbohydrate 2. Fat 3. Junk food		6.453	.232	No significant association found/Null hypothesis is failed to be rejected
	Body types 1. Thin 2. Fat 3. Medium		8.028	.205	No significant association found/Null hypothesis is failed to be rejected

** α value is 0.05. P value is statistically significant if it is less than α value and alternative hypothesis is accepted. If P value is greater than α value then null hypothesis is accepted.

Result: The table above showing result of no association between level of dementia with gender, types of stroke, previous history of stroke, comorbidity, taking sleeping pill, level of activity, smoking, food habit, body types. The null hypothesis is failed to be rejected (P >.05) therefore it can be concluded that severity of dementia is not related to gender, types of stroke, previous history of stroke, comorbidity, taking sleeping pill, level of activity, smoking, food habit, body types

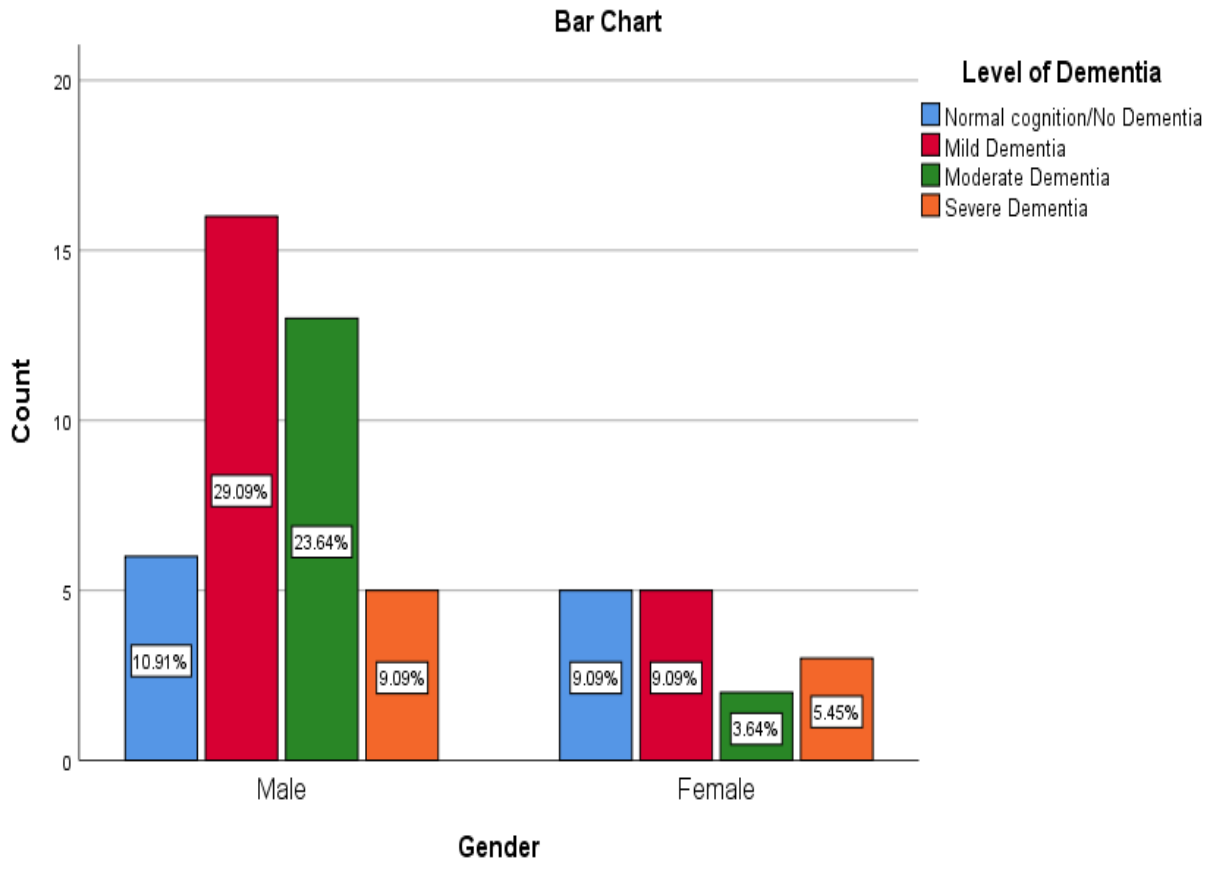


Fig-3(A): Association between level of dementia and gender

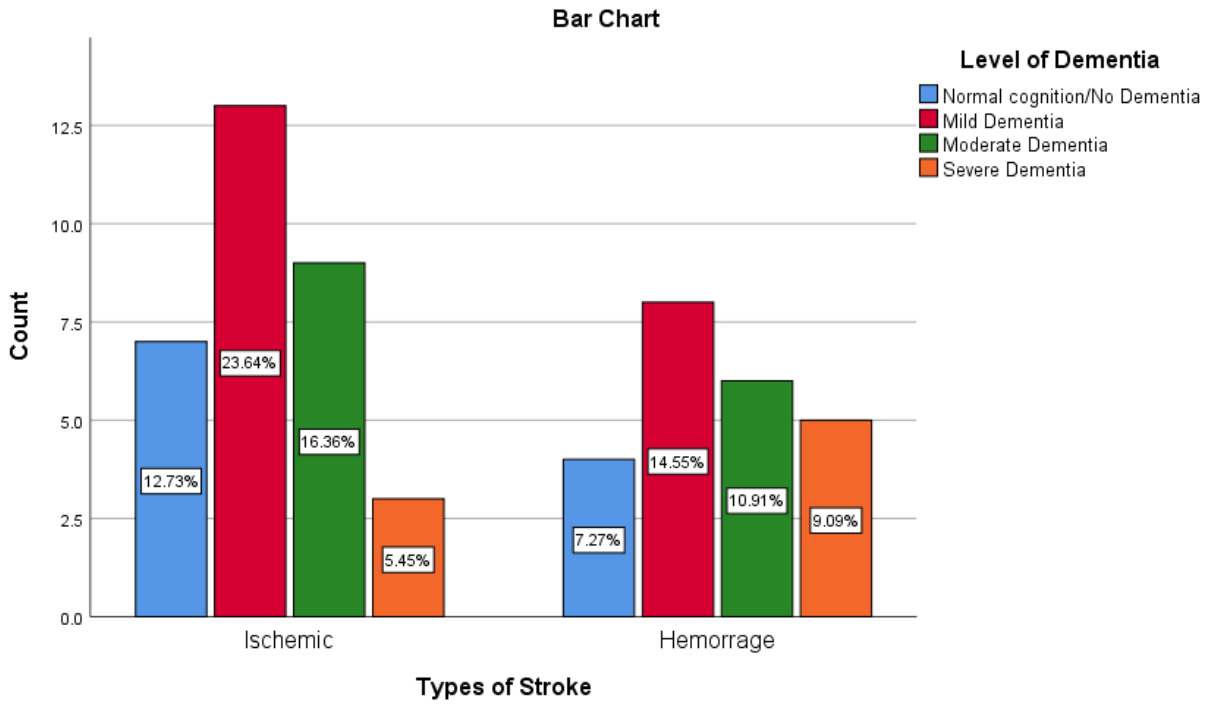


Fig-3(B): Association between level of dementia and types of stroke

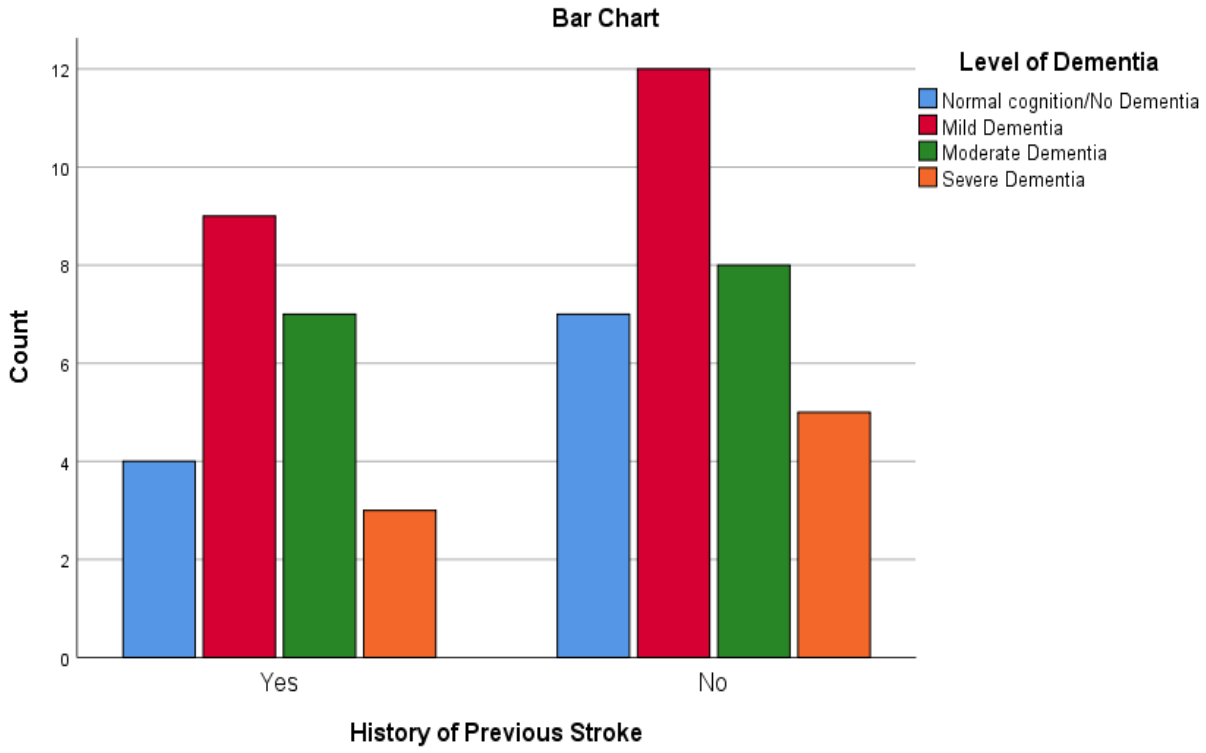


Fig-3(C): Association between level of dementia and history of previous stroke

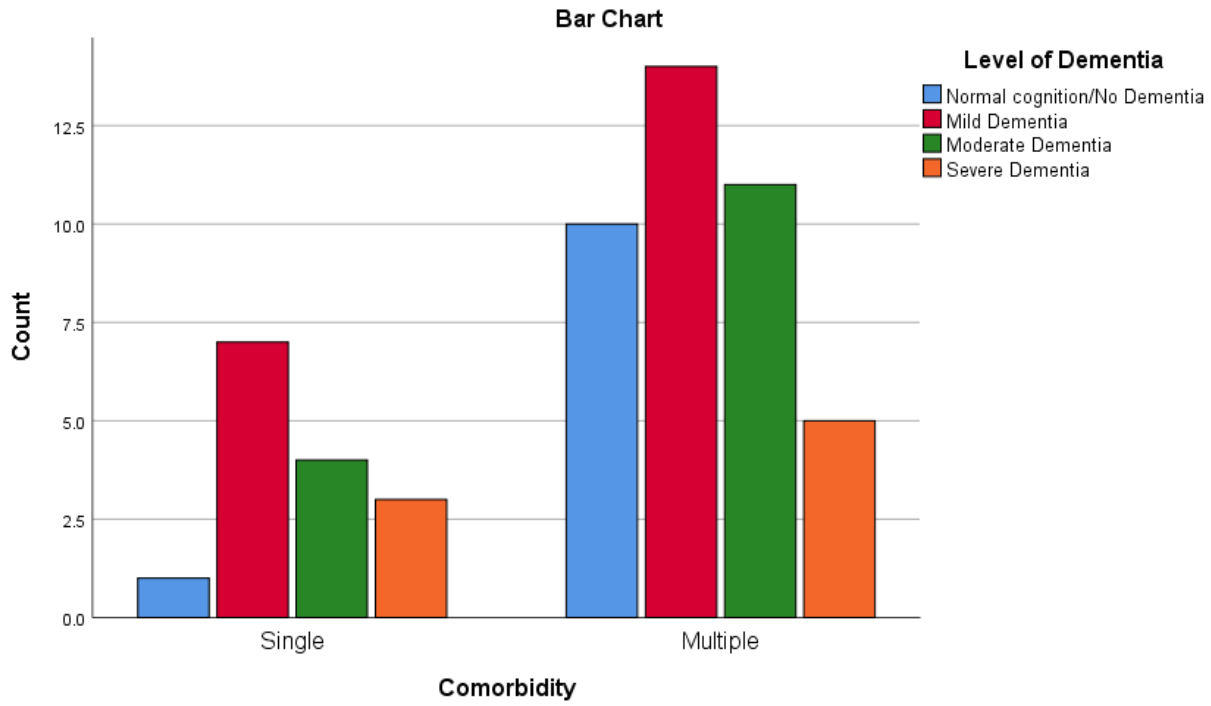


Fig-3(D): Association between level of dementia and comorbidity

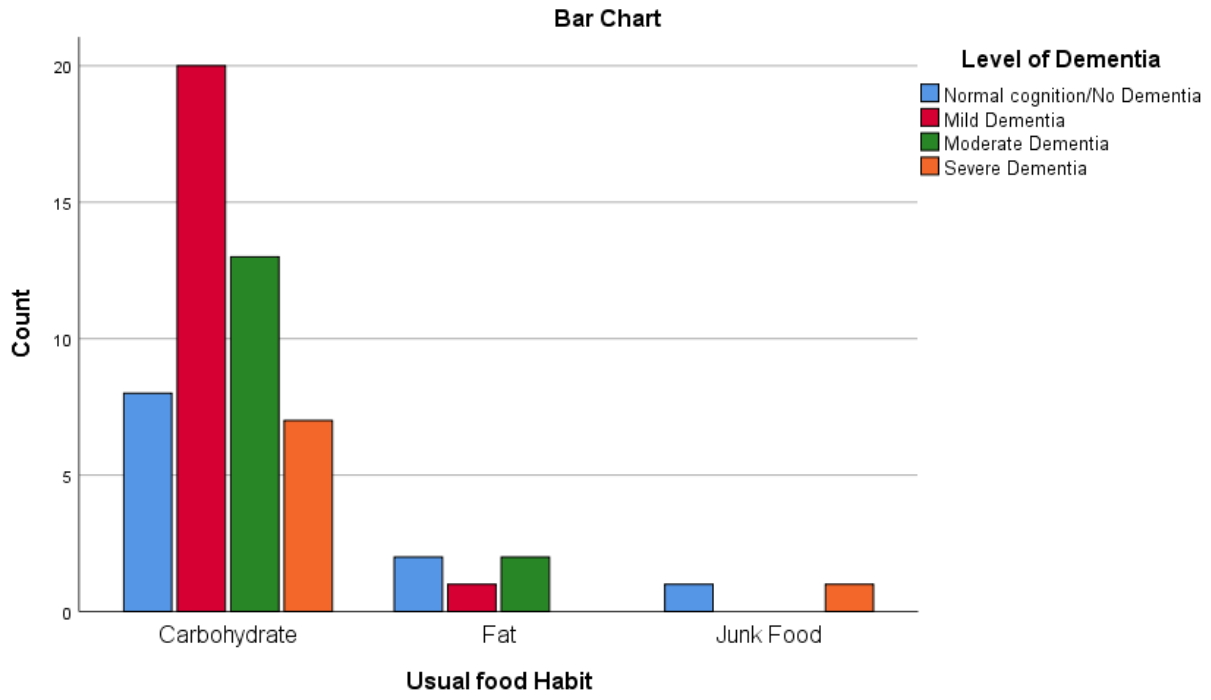


Fig-3(E): Association between level of dementia and usual food habit

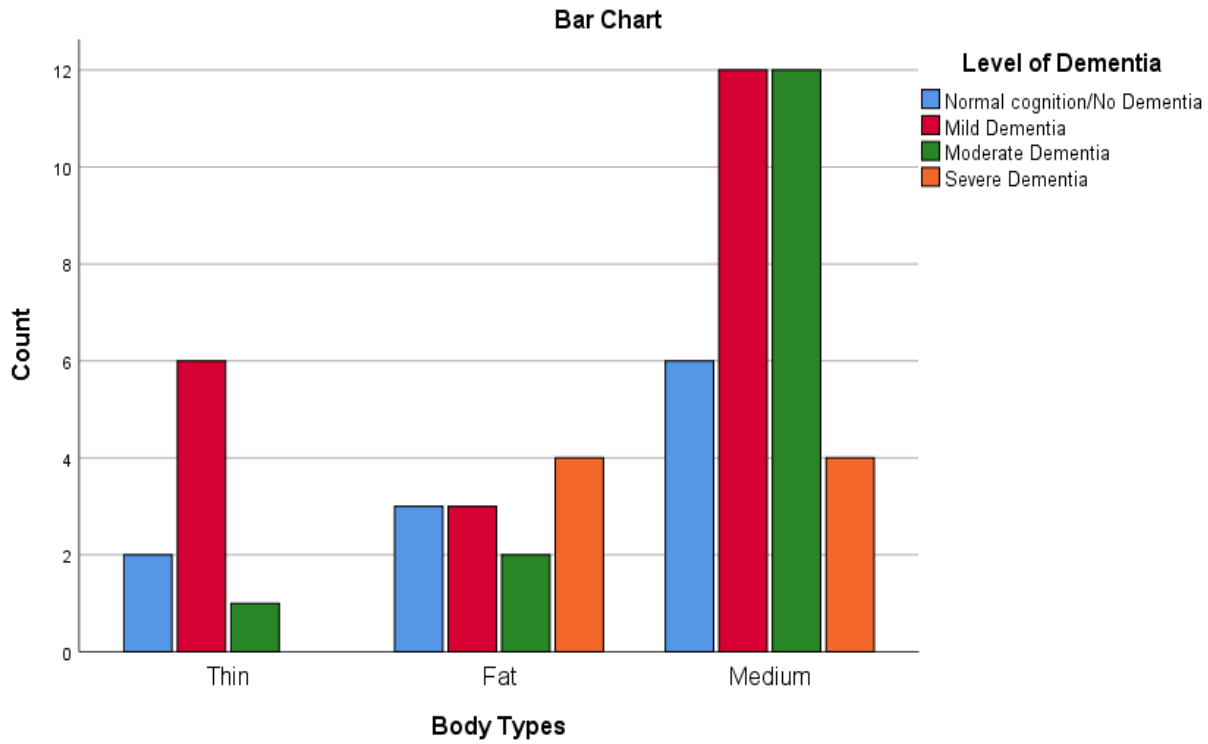


Fig-3(F): Association between level of dementia and usual body types

Table-4: Pearson's co-relation between age with Total score of MMSE scale

Null (H0): There is no relationship between age with Total score of MMSE scale

Alternative (HA): There has relationship between age with Total score of MMSE scale

Test assumption:

1. Two continuous variable

2. Normally distributed

3. Presence of liner association

Level of significance (α value <.05)

Table-4: Pearson's co-relation between age with Total score of MMSE scale

Variable 1	**Variable 2**	**Pearson co-relation co-efficient value (r)**	**Significant value**	**Comment/Discussion**
Age	Total score of MMSE scale	.026	.852	No significant association found/Null hypothesis is failed to be rejected

** α value is 0.05. P value is statistically significant if it is less than α value and alternative hypothesis is accepted. If P value is greater than α value then null hypothesis is accepted.

Result: The table above, showing there was no statistically significant relationhip between age with total score of MMSE scale. The null hypothesis was failed to be rejected (P >.05) therefore it can be concluded that age is not related to dementia.

Fig 4(A): Histogram of age

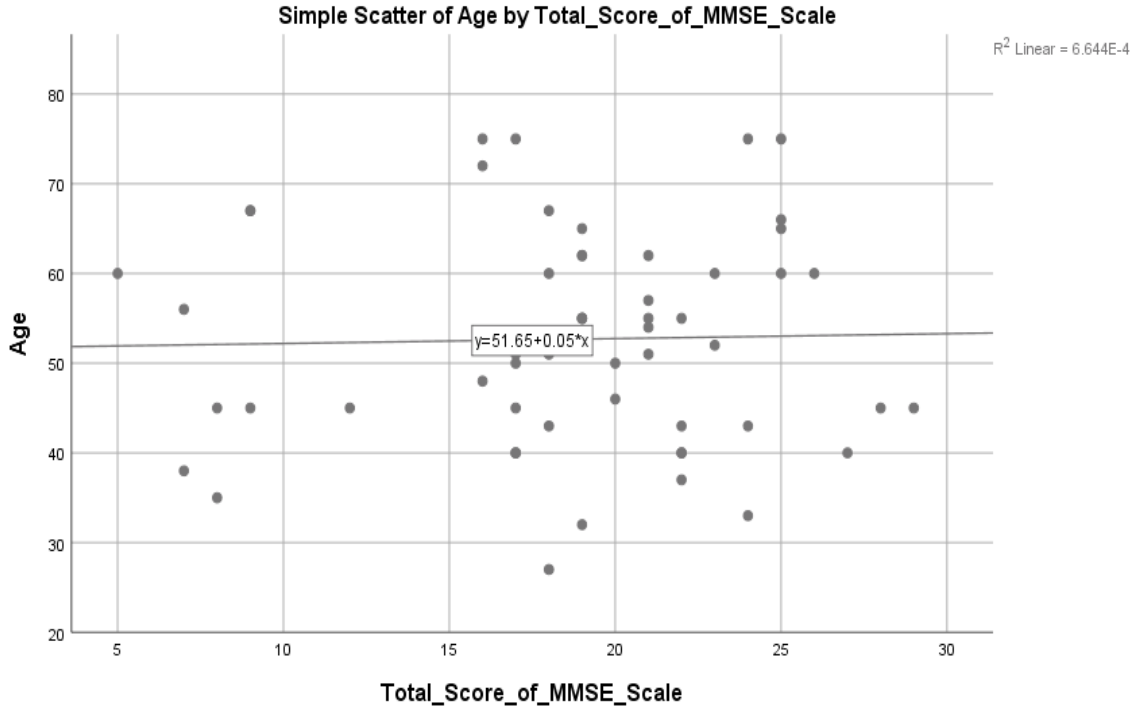


Fig 4(B): Normal Q-Q plot of age

Table-5: Pearson's co-relation between sleeping hours with Total score of MMSE scale

Null (H0): There is no co relation between sleeping hours with Total score of MMSE scale

Alternative (HA): There has co relation between sleeping hours with Total score of MMSE scale

Test assumption:

1. Two continuous variable

2. Normally distributed

3. Presence of liner association

Level of significance (α value <.05)

Table-5: Pearson's co-relation between sleeping hours with Total score of MMSE scale

Variable 1	Variable 2	Pearson co-relation co-efficient value (r)	Significant value	Comment/Discussion
Sleeping hours	Total score of MMSE scale	.123	.371	No significant association found/Null hypothesis is failed to be rejected

Result: The table showing there was no co-relation found sleeping hours with Total score of MMSE scale. The null hypothesis was failed to be rejected (P>0.05) therefore it can be concluded that sleeping hours is not related to dementia.

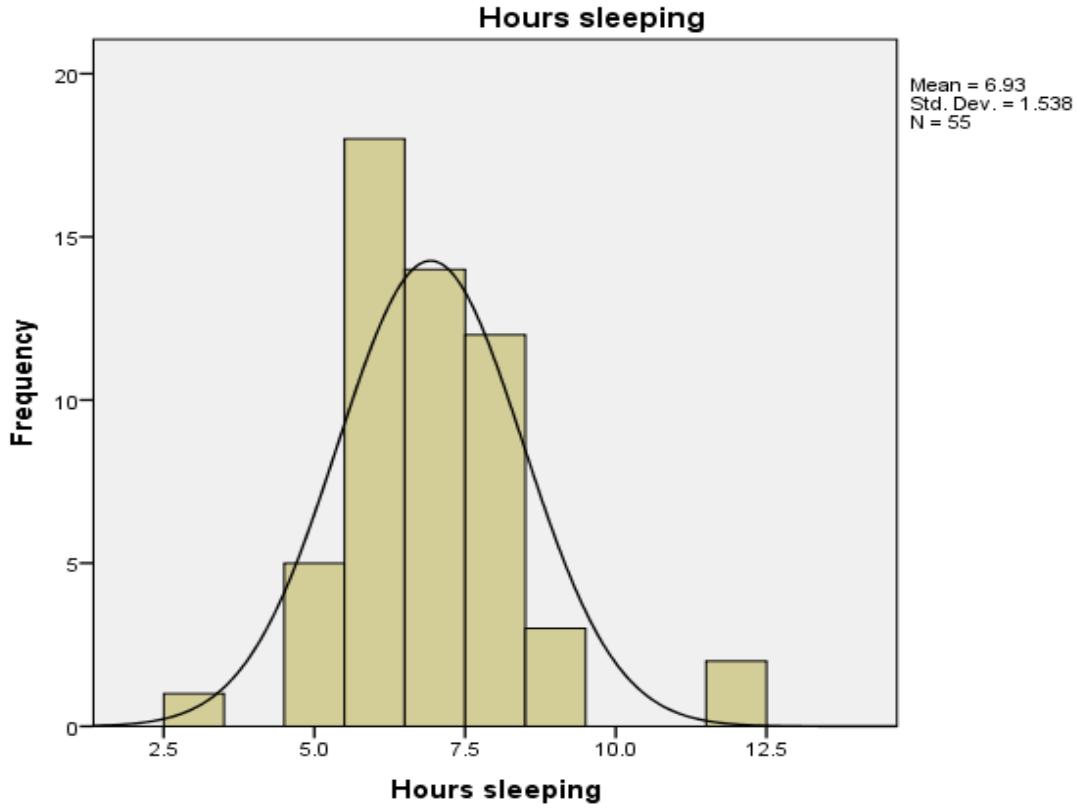


Fig 5(A): Histogram of hours sleeping

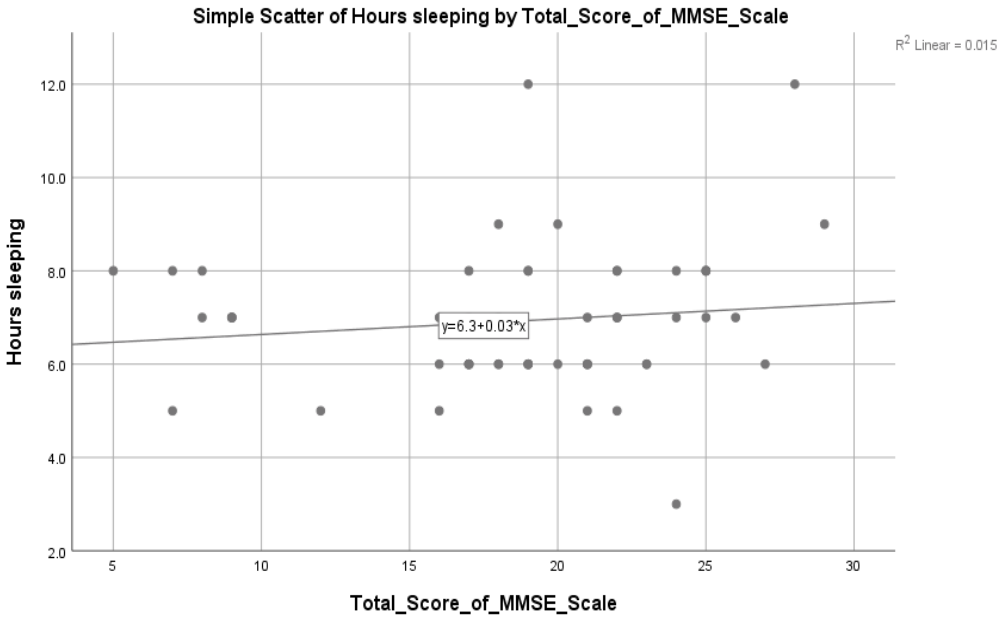


Fig 5(B): Normal Q-Q plot of hours sleeping

CHAPTER-V DISCUSSION

Strokes are the main cause of physical disability in adults and the third most common cause of death in developed countries. They are also the second most common cause of dementia (Krishnamurthi et al. 2015, p.195). Stroke is a specific type of illness that can be identified by a number of extra symptoms, such as pain, memory loss, brain disorder, speech problem, vision problem, balance problem, and other problems that are similar. Along with serious mental and emotional health problems, stroke patients often have serious physical disabilities (Godwin et al. 2013, p. 428). This is bad for people who have had a stroke, their families, and the community as a whole. Today, it's important to do study on how to tell if a stroke patient has dementia..

Based on MMSE scores, the prevalence of dementia was estimated (Woo et al. 1998, p. 984). A descriptive and inferential statistical study was done to find out what happened. In the descriptive part, the categorical variables were shown as percentages and written out in a variety of ways, such as bar graphs, pie charts, and tables. The mean and standard deviation were used to figure out the continuous variable's centre tendency and measure of dispersion (Livingston 2004, p.119). To determine the relationship between various dependent and independent variables in the inferential section, the chi-square of independence and Pearson co-relation test were used.

In this study, the result showed, prevalence of dementia among stroke patients, types of dementia, which type of stroke shows more prevalence and the likelihood of dementia can be distinguished according to MMSE scale. This cross-sectional study's goal is to look into the prevalence of dementia. The cross-sectional design of this study makes it modifiable. Although it is an exploratory study, it does offer some useful details about stroke and dementia or cognitive impairment.

Findings from this study indicate that 80% patient exhibit dementia after stroke among them 38.2% were found mild dementia, 27.3% were found moderate dementia and 14.5% were found severely dementia. This result is consistent with previously reported rates of cognitive impairment high prevalence up to 72.8% and 63%, respectively, which showed

that mild and moderate PSCI account for 60% of all cases in this study. This result is consistent with previously reported rates of cognitive impairment, which, depending on the length of follow-up and the subtype of stroke that occurred, can range from about 30% to 74% (Patel et al. 2003, p.158-166). The prevalence of post-stroke cognitive impairment can range from around 20 % to 80 %, depending on the country, the race of the patient, and the diagnostic criteria (Sun, Tan & Yu 2014). According to the findings of a few earlier prospective studies carried out in India, 20% or fewer stroke survivors overall had cognitive impairment. According to recent research conducted in India on a sample of fifty stroke victims, 72% of the patients showed signs of cognitive decline.

In another study, the prevalence of cognitive decline was found to be 31.7% among 164 patients using the Mini-Mental State Examination (MMSE) score (Sundar and Adwani 2010, p.42). This is in contrast to another study's finding that 43% of participants with PSCI had mild to moderate cognitive impairment, which was represented by 27% and 16% of participants, respectively. In contrast, a different study found that 40% of the 150 stroke survivors had cognitive impairment; of these, 30.67% had severe impairments and 9.33% had mild impairments (Nayan, Miah and Islam 2016, p.7)

Bangladesh has a reported 0.3% stroke prevalence even though data on stroke incidence have not been gathered (Islam et al. 2013, p.212). In community-based studies with adjustment for age, the prevalence of dementia in people with a history of stroke is about 30%. In hospital-based studies, the prevalence of PSD ranges from 5·9 to 32%. Stroke increases the risk of dementia up to 12 times. The overall prevalence of dementia is estimated in India was 3.36% (Salahuddin et al. 2022, p.106616).

According to a previous study that followed stroke patients for three months, the majority of patients have mild disabilities (57.2%), a small number have severe disabilities (18.6%), and a small number have moderate disabilities (9.4%). In addition, a stroke increased the risk of dementia and memory loss by 9.4 times compared to a stroke alone. Memory loss increased by 20 to 80 percent, and dementia incidence increased by 5 to 48 percent (Surawan et al. 2017, p.7216).

Leys et al. (2005, p.759) showed that in community-based studies, the prevalence of PSD was approximately 30%, whereas in hospital-based studies the prevalence ranged from 6% to more than 32%.

One study's findings claim that Mexican Americans are more likely than non-Hispanic whites to experience post-stroke cognitive impairment, and that post-stroke dementia will affect about 31% of Mexican Americans who have had strokes (Lisabeth et al. 2014, p. 1099). The prevalence of post-stroke dementia was recently found to be 13.88% according to a prospective community study conducted in East India (Das et al. 2012, p.61). In 2009, a meta-analysis of 30 studies revealed that more than a third of symptomatic stroke patients who experienced recurrent strokes also had dementia. The prevalence of dementia in these patients increased from 10% prior to the first stroke to 20% shortly afterward (Pendlebury and Rothwell 2009, p.1015).

The mean age of the participants was 52±12.04 among 55 participants, this is almost close to the findings of (Thiengburanathum and Watcharasaksilp 2018, p.22). They found more affected mean age was 69.73±13.33 among 98 stroke survivors. Another study have found mean age of the study group was 57.68±12.34 among 181 stroke patients (Beemreddy, Gade and Neerati 2018). BMI was found in this study was median 22.13. Also the other study found that 27.7±19.2, which is almost similar (Jacquin et al. 2014, p. 1038).

In all participants, 72.7% were male, and 27.3% were female. (Tham et al. 2002, p.49). Another study found almost identical distributions, with males making up 66% and females 34%. Another study showed that does not similar previous research among where male was 35.71% and female were 64.29%.

This study findings shows about 98.2% participants were married and 1.8% participants were unmarried. Another study showed almost similar to previous research among where 78.6% participants were married, 4.29% participants were unmarried and 17.1% participants were divorced.

In this study ischemic stroke was 58.2% and hemorrhagic stroke was 41.8%% which is similar to the study, in which they found that ischemic was 86.5%, hemorrhagic was 10.4%among 599 participants (Qu et al. 2015, p.e0122864).

This study findings shows about 23.6% participants live in urban area, 18.2% participants live in semi-urban area, and 58.2% participants live in rural area reported that 54% of stroke survivors lived in urban areas (Hossain et al. 2011, p.20). Single comorbidities are present about 27.3%, and multiple comorbidities were present about 72.7% . another study found almost similar findings where single and dmultiple rate were 15% and 56.4% (Douiri, Rudd & Wolfe 2013, p.139).

There has no association between level of dementia with gender types of stroke, previous history of stroke, comorbidity, taking sleeping pill, level of activity, smoking, food habit, body types etc. Van der Flier and Scheltens (2005, p. 5) found that association between level of dementia with age and gender. The prevalence of dementia in those aged 30-64 was 54 per 100000. For those aged 45-64, the prevalance was 98 per 100000. Prevalence of dementia was higher in women then in men and nearly doubled with every 5 year increase in age.

The risk and severity of cognitive impairment following a stroke do not appear to be affected by the type of stroke (ischemic or hemorrhagic) (Barba et al. 2000, p. 1501). Contrarily, according to one study Desmond et al. (2002, p.2255) people who have had an ischemic stroke have a higher-than-average incidence of dementia.

No correlation was found between dementia and other physical or stroke-related factors in this study, including body type, type of stroke, level of dementia, family history, privious history of stroke, food habits, and level of physical activity. In contrast to other studies, there has been a correlation between stroke state and cognitive impairments. 20–60% of stroke survivors are said to exhibit PSCI during the subacute phase of hospitalization (Mori, Yoshioka and Tanno 2021, p.4).

According to the findings of a different study, roughly 60% of chronic stroke patients had cognitive impairment (Nakling et al. 2017, p. 283-296) Executive and perceptual

disorders are the most frequent types of cognitive impairment in the first few weeks following a stroke (Montagne et al. 2007, p.280).

A study found a strong correlation between physical activity and cognitive impairment. Physical activity was linked to lower risks of cognitive decline, Alzheimer's disease, and all types of dementia when compared to inactivity (Laurin et al. 2001, p.500). In contrast to the current study, a cross-sectional investigation of an elderly community cohort found a significant relationship between longer sleep duration (9 h) and lower MMSE scores. However, MMSE performance was not significantly impacted by short sleep duration (6 h) (Gutierrez-Fernandez et al. 2013, p.38)

5.1 Limittions:

Every study could have some limits. This study may not be as accurate as it could be because of some problems and limits. Few people were used in the study. Only 55 samples were used in this study. The number of stroke patients with dementia couldn't be found out because not enough samples were taken, which would have been more efficient. If we had enough money, we could have made our data collection area bigger to get the sample number we needed. Time was one of the biggest limits. I only had a short amount of time to do the research, so I couldn't get a lot of samples for the study. CRPs in Rajshahi, Dhaka, and Savar were used to get the sample. If the data came from rehabilitation centres all over the country, they would be more accurate and useful. Since this was the first research project the researcher had ever done, the supervisor and the good teachers should be ready to overlook any mistakes.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

Conclusion

The results of this study showed that even though the sample size was small and the rate of dementia was (80%), it still gave useful information about the level of cognitive impairment/dementia. The study also found no link between the severity of dementia and sociodemographic data, like gender, or physical parameter data, like stroke type, history, comorbidities, use of sleeping aids, level of exercise, smoking, eating habits, body type, etc. Dementia, which is a very common problem, can have a big effect on how a stroke turns out. Before a stroke happens, it is important to find out the risk factors for dementia after a stroke and to test cognitive ability. Along with more knowledge and the right kind of therapy, the important steps that need to be taken to reduce cognitive damage after a stroke and improve the person's quality of life should be taken. Along with more knowledge and the right kind of therapy, the important steps that need to be taken to reduce cognitive damage after a stroke and improve the person's quality of life should be taken.This will help stop dementia from getting worse and improve mental health through the use of useful interventions.

Recommendation

Because dementia can affect not only day-to-day life but also how well someone recovers from a stroke, it is important to pay more attention to this after a stroke. Several studies have been done on this subject, and more should be done to find out how dangerous cognitive damage is and what can be done to stop it. If other authors want to do similar study, I recommend that they look at the whole country and use a larger sample size.

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APPENDIX

CONSENT FORM

(Please read out to the participants)

Assalamualaikum, my name is Md. Selim Raza. I am conducting a study for partial fulfillment of Bachelor of Science in Physiotherapy degree at Bangladesh Health Professions Institute (BHPI) (Under the Faculty of Medicine University of Dhaka). My research title is **"Dementia among stroke patients at CRP: A Cross Sectional Study"**. I need some information to fulfill my research project. So participants consent need for this research and it will take approximately 20-30 minutes. I would like to inform you that this is a purely academic study and will not be used for any other purposes. The researcher is not directly related to neurology unit, so your participation in the research will have no impact on your present or future treatment in neurology unit. Researcher will maintain confidentiality of all procedures. Your data will never be used without your permission. Your participation will be voluntary and any type of remuneration will not be provided. You may withdraw yourself after 1 week of data collection. No additional intervention will be provided.

If you have any query about the study or your right as a participant, you may contact with the researcher.

So, may I have your consent to proceed with the interview?

Yes / No

Signature of the participant.....

Relationship (If not patients).....

Date…….....

Signature of the data collector.....

Date…….....

Personal Information:

SL No.	Questions	Response
1	Name:	Date
2	Patient ID No:	Patients Mobile No:
3	Caregiver:	Caregiver's Mobile No:

Socio-demographic Information

SL No.	Questions	Response
1	Age	
2	Gender	1. Male 2. Female
3	Education Level	1. No formal education 2. Primary 3. Secondary 4. Higher Secondary 5. Graduate 6.Post-graduate
4	Occupation	1. Housewife 2. Farmer 3. Shopkeeper 4. Business 5. Service holder 6. Day-labor 7. Student 8. Unemployed 9.Others_____
5	Address	1. Union_____ 2. Ward No_____ 3. Village_____ 4. House no_____
6	Marital status	1. Married 2. Unmarried 3. Divorced 4. Seperated
7	Number of Family Member	
8	Financial Condition	1. Independent 2. Dependent
9	Monthly income	Tk
10	Cost to continue current treatment	Tk
11	Residential Area	1. Urban 2. Semi urban 3. Rural

12	Family types	1. Joint family 2. Nuclear family

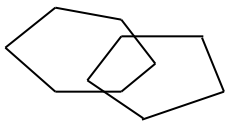
Physical Parameter

SL No.	Questions	Response
13	BMI	Kg/m^2
14	Body types	1. Thin 2. Fat 3. Medium
15	Types of stroke	1. Ischemic 2. Hemorrage 3. Transient ischemic attack
16	Affected Side	1. Right 2. Left 3. Both
17	Onset of stroke	
18	Intervention Time	
19	History of previous stroke	1. Yes 2. No
20	Family history of stroke	1. Yes 2. No
21	Complication after stroke	1. Yes 2. No
22	Treatment Received	1. Yes 2. No
23	Treatment Received	1. Medication 2. Physiotherapy 3. Medication and Physiotherapy 4. Surgery 5. Others
24	Comorbidity (You can choose multiple responses)	1. Heart disease 2. High blood pressure 3. Respiratory disease 4. Diabetes 5. Kidney disease 6. Anaemia 7. Ulcer and stomach disease 8. Pressure sores 9. Depression 10. Urinary tract infection 11. Postural Hypotension 12. Muscle spasm

		13. Circulatory problem(oedema) 14. Others(Write)
25	Usual food habit	1. Carbohydrate 2. Fat 3. Junk food
26	Level of activity	1. Active 2. Sedentary
27	Hours sleeping	Hours/Day
28	Taking sleeping pill	1. Yes 2. No
29	Smoking/Others	1. Yes 2. No
30	Others mental conditions	1. Schizophrenia 2. Bipolar disorder 3. Depression/ Anxiety/Stress

Mini-Mental State Examination:

Patient's Name: **Date:**

Questions	Patients Score	Maximum Score
What is the year? Month? Season? Date? Day of the week?		5
Where are we now? State? Country? Town/City? Hospital? Floor?		5
I will name 3 objects (pen, chair, Book). Now repeat the 3 objects. (Score 1 mark for each correct answer, now repeat the 3 objects name until the patients learns all of them)		3
What is the day before Friday? Day before that? Day before that? Day before that? Day before that?		5
"Earlier I told you the names of 3 things. Can you tell me what those were?		3
(Showing wristwatch) name this object, (Showing Pencil) name this object		2
Listen carefully what I say and then repeat them, "One shallow does not make summer"		1
Follow my instructions "Take the paper in your right hand, then fold it in half and give me it on my hand"		3
Follow my instructions do what I do, "Close your eye for 2 seconds".		1
Say one line about what you see around you		1
Please copy next to the picture below 		1
Total		30

অনুমতি ফর্ম

(অংশগ্রহণকারীদের পড়ে শোনাতে হবে)

আসসালামুআলাইকুম, আমি মোঃ সেলিম রেজা, আমি বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই) (ঢাকা বিশ্ববিদ্যালয়ের মেডিসিন অনুষদের অধীনে) ফিজিওথেরাপি ডিগ্রীতে ব্যাচেলর অফ সায়েন্সের আংশিক পূর্ণতার জন্য একটি অধ্যয়ন পরিচালনা করছি। আমার গবেষনার শিরোনাম হলো "সিআরপিতে স্ট্রোক রোগীদের মধ্যে ডিমেনশিয়া: একটি ক্রস সেকশনাল স্টাডি"।আমার গবেষণা প্রকল্প পূরন করতে আমার কিছু তথ্য দরকার। তাই অংশগ্রহণকারীদের এই গবেষণার জন্য সম্মতি প্রয়োজন এবং এটি প্রায় ২০-৩০ মিনিট সময় নেবে।তাই আপনাকে জানাতে চাই যে এটি একটি সম্পূর্ণরূপে একাডেমিক অধ্যয়ন এবং অন্য কোন উদ্দেশ্য ব্যবহার করা হবে না।গবেষক সরাসরি নিউরোলজি ইউনিটের সাথে সম্পর্কিত নন, তাই গবেষনায় আপনার অংশগ্রহন নিউরোলজি ইউনিটে আপনার বর্তমান বা ভবিষ্যতের চিকিৎসার উপর কোন প্রভাব ফেলবে না।গবেষক সকল তথ্যের গোপনীয়তা বজায় রাখবেন। আপনার অনুমতি ছাড়া আপনার তথ্য ব্যবহার করা হবে না। আপনার অংশগ্রহণ স্বেচ্ছায় হবে এবং কোন প্রকার পারিশ্রমিক প্রদান করা হবে না। আপনি তথ্য সংগ্রহের ১ সপ্তাহের মধ্যে নিজেকে সরিয়ে নিতে পারবেন।

তাহলে, আমি কি আপনার সাক্ষাৎকার শুরু করতে পারি?

হ্যাঁ / না

অংশগ্রহণকারীর স্বাক্ষর.....

সম্পর্ক (রোগী না হলে).....

তারিখ.....

গবেষকের স্বাক্ষর.....

তারিখ.....

ব্যক্তিগত তথ্য

সিরিয়াল নম্বর	প্রশ্নাবলী	উত্তর
১	নামঃ	তারিখঃ
২	রোগীর আইডিঃ	রোগীর মোবাইল নাম্বারঃ
৩	রোগীর সহকারীঃ	রোগীর সহকারীর মোবাইল নাম্বারঃ

আর্থ-সামাজিক তথ্যবলি

সিরিয়াল নম্বর	প্রশ্নাবলী	উত্তর
১	বয়স	বছর
২	লিঙ্গ	১. পুরুষ ২. নারী
৩	শিক্ষাগত যোগ্যতা	১. শিক্ষাগত যোগ্যতা নাই ২. অক্ষর জ্ঞান সম্পূর্ন ৩. মাধ্যমিক পাশ ৪. উচ্চমাধ্যমিক পাশ ৫. স্নাতক পাশ ৬. স্নাতকোত্তর পাশ
৪	পেশা	১. গৃহণী ২. কৃষক ৩. দোকানদার ৪. ব্যবসায়ী ৫. চাকুরিজীবী ৬. দিন মুজুর ৭. ছাত্র ৮.বেকার ৯. ড্রাইভার ১০. রিক্সাচালক ১১. গার্মেন্টস শ্রমিক ১২. অন্যান্য.....

৫	ঠিকানা	১. ইউনিয়ন ..... ২. ওয়ার্ড নং ..... ৩. গ্রাম..... ৪. বাড়ি নং .....
৬	বৈবাহিক অবস্থা	১. বিবাহিত ২. অবিবাহিত ৩. বিধবা ৪. বিবাহ বিচ্ছেদ
৭	পরিবারের সদস্য সংখ্যা	
৮	আর্থিক অবস্থা	১. আত্মনির্ভরশীল ২. নির্ভরশীল
৯	মাসিক আয়	টাকা
১০	বর্তমান চিকিৎসার খরচ	টাকা
১১	বসবাস এলাকা	১. শহর ২. আধা-শহর ৩. গ্রাম
১২	পরিবার প্রকার	১. যৌথ পরিবার ২. একক পরিবার

শারীরিক অবস্থা পরিমাপক

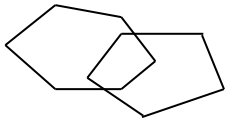
সিরিয়াল নম্বর	প্রশ্নাবলী	উত্তর
১৩	বিএমআই	কেজি/মি^{2}
১৪	শারীরিক গঠন	১. চিকন ২. মোটা ৩. মধ্যম
১৫	স্ট্রোকের প্রকারভেদ	১. রক্তের অভাবে ২. রক্তক্ষরিত ৩. ট্রান্সিয়েন্ট ইসকেমিক অ্যাটার্ক
১৬	ক্ষতিগ্রস্ত অংশ	১. ডান ২. বাম ৩. উভয়ই
১৭	আপনি কতদিন আগে স্ট্রোক করেছেন	
১৮	স্ট্রোকের কতদিন পর চিকিৎসা নিয়েছেন	
১৯	পূর্ববর্তী স্ট্রোকের ইতিহাস	১. হ্যাঁ ২. না
২০	স্ট্রোকের পারিবারিক ইতিহাস	১. হ্যাঁ ২. না

২১	স্ট্রোক পরবর্তী জটিলতা	১. হ্যাঁ ২. না
২২	চিকিৎসা গ্রহন	১. হ্যাঁ ২. না
২৩	যে ধরনের চিকিৎসা নেয়া হয়েছে	১. ঔষধ ২. ফিজিওথেরাপি ৩. ঔষধ এবং ফিজিওথেরাপি ৪. সার্জারি ৫. অন্যান্য
২৪	অন্যান্য রোগব্যাধি (আপনি একাধিক উওর দিতে পারেন)	১. হৃদরোগ ২. উচ্চরক্তচাপ ৩. শ্বাসযন্তের রোগ ৪. ডায়াবেটিস ৫. কিডনি রোগ ৬. রক্তাল্পতা ৭. আলসার এবং পেটের রোগ ৮. শরীলের ক্ষত ৯. বিষন্নতা ১০. মূত্রনালীর সংক্রমণ ১১. পেশীর খিঁচুনি ১২. রক্তসঞ্চালন সমস্যা (ফোলা) ১৩. অন্যান্য (লিখুন)
২৫	সাধারন খাদ্যাভাস	১. কার্বোহাইড্রেট ২. চর্বি ৩.ফাস্ট ফুড
২৬	শারীরিক কাজের অবস্থা	১. সক্রিয়তা ২. অসক্রিয়তা
২৭	ঘুমের সময়কাল	ঘন্টা/দিন
২৮	কোন ঘুমের ঔষধ সেবন করা	১. হ্যাঁ ২. না
২৯	ধুমপান/ অন্যান্য	১. হ্যাঁ ২. না
৩০	অন্যান্য মানসিক সমস্যা	১. সিজোফ্রেনিয়া ২. বাইপোলার ডিসওর্ডার ৩. হতাশা/ আতঙ্ক/ মানসিক চাপ

মিনি মেন্টাল স্টেট পরীক্ষা

রোগীর নামঃ তারিখঃ

প্রশ্ন	প্রাপ্ত নম্বর	সর্বাধিক নম্বর
এখন কোন বছর? মাস? মৌসুম? তারিখ? বার?		৫
আমরা কোথায়ঃ দেশ, জেলা, শহর, এই জায়গার নাম, কোন তলা?		৫
আমরা ৩টি জিনিসের নাম বলব (কলম, চেয়ার, বই); এখন এই ৩টি জিনিসের নাম আপনি বলুন।প্রতিটি উত্তরের জন্য ১ মার্ক দিন। এবার ঐ ৩টি জিনিসের নাম বারবার বলুন যতক্ষণ না রোগীর মুখস্থ হয়।		৩
শুক্রবারের আগের বার কি? তার আগের বার কি? তার আগের বার কি? তার আগের বার কি? তার আগের বার কি?		৫
একটু আগে যে ৩টি জিনিসের নাম বলেছিলাম সেগুলোর নাম আবার বলুন।		৩
(ঘড়ি দেখিয়ে) এটা কি? (কলম দেখিয়ে) এটা কি?		২
আমি এখন যা বলবো তা শুনুন এবং বলুন; শুনুন; "এক মাঘে শীত যায় না"। বলুন		১
এখন আমি যা বলন তা আপনি করে দেখাবেনঃ "একটি কাগজ আপনার ডান হাতে নিন, এবার কাগজটি মাঝখানে ভাঁজ করুন, এবার কাগজটি আমার হাতে দিন।		৩
আমি এখন যা করবো তা আপনি করে দেখানেনঃ ২ সেকেন্ড চোখ বন্ধ রেখে খুলুন।		১
আপনার আশে পাশে যা দেখছেন তা সম্পর্কে এক লাইন বলুন (ইঙ্গিত দেয়া যেতে পারে)		১

নিচের ছবিটির পাশে হুবহু ঐ রকম একটি ছবি আঁকুন. 		১
সর্বমোট প্রাপ্ত নম্বর		৩০

Permission Letter

March 30, 2023

Head

Department of Physiotherapy

Center for the Rehabilitation of the Paralyzed (CRP)

Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI

Subject: Request for seeking permission to collect data for conducting research project.

Requested Sir,

With due to respect and humble submission to state that I am Md. Selim Raza, a student of 4th year B.Sc in Physiotherapy at Bangladesh Health Professions institute (BHPI). In the 4th year course curriculum, I have to conduct a research project. The ethical committee has approved my research project entitled **"Dementia among stroke patients at CRP: A Cross Sectional Study"** under the supervision of Asma Islam, Assistant Professor, Department of Physiotherapy, BHPI. I want to collect data for my research project from the Department of Physiotherapy at CRP. So, I need permission for data collection from the Neurology Unit of Physiotherapy Department at CRP-Savar, Dhaka-1343 and Rajshahi CRP. I would like to assure that anything of the study will not be harmful for the participants and the Department itself.

I hope that you would be kind enough to grant my application and give me permission for data collection and oblige thereby.

Yours faithfully

Md. Selim Raza

Md. Selim Raza

4th year B.Sc in Physiotherapy

Session: 2017-2018, ID: 112170407

Bangladesh Health Professions Institute (BHPI)

(An academic Institution of CRP)

CRP, Chapain, Savar, Dhaka-1343

Fovewarded to HOD(PT)
30/03/23

Recommended
30.03.23

Approved
30/03/23

Dr. Mohammad Anwar Hossain, PhD
Senior Consultant & Head
Physiotherapy Department
Associate Professor, BHPI
CRP, Savar, Dhaka-1343

Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

BANGLADESH HEALTH PROFESSIONS INSTITUTE

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP/BHPI/IRB/03/2023/692

Date: 13/03/2023

To
Md. Selim Raza
B.Sc. in Physiotherapy,
Session: 2017-2018, DU Reg. No: 8630
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the dissertation proposal **"Dementia among Stroke Patients at CRP: A Cross Sectional Study"**-by ethics committee.

Dear
Md. Selim Raza,
Congratulations
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the Principal Investigator Asma Islam, Assistant Professor, Department of Physiotherapy, BHPI, as dissertation supervisor. The following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form

The purpose of the study is to find out dementia among stroke patients at CRP. Should there any interpretation, type, spelling, grammatical mistakes in the title, it is the responsibilities of the investigator. Since the study involves questionnaire that takes maximum 20-30 minutes and have no likelihood of any harm to the participants. The members of the Ethics committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on January 9, 2023 at BHPI, 34th IRB Meeting.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Muhammad Millat Hossain
Associate Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB) BHPI,
CRP, Savar, Dhaka-1343, Bangladesh

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