"DETERMINANTS AND CONSEQUENCES OF POST-STROKE DISABILITIES- A HOSPITAL-BASED STUDY"

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In

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By

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(Registration No: KLEU/Ph.D./D01218003/2018-2019)

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Dr. Saraswathi. N

ABBREVIATIONS

ACA	-	Anterior Cerebral Artery
ACE	-	Addenbrooke's Cognitive Examination
ACE III	-	Addenbrookes cognitive Examination –Indian version
AD	-	Alzheimer’s Disease
ADL	-	Activities of daily living
AF	-	Atrial fibrillation
AHA	-	American Heart Association
ASA	-	American Stroke Association
BDI	-	Barthel Disability index
CBT	-	Cognitive behavior therapy
CCL	-	Coping Checklist by Rao Subbakrishna and Prabhu
CT	-	Computed Tomography
DALY	-	Disability Adjusted Life Years
DSM	-	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
ECT	-	Electroconvulsive treatment
FNQ	-	Family need questionnaire
HAM-D	-	Hamilton Depression Rating scale
Hcy	-	Homocysteine
HDL	-	High-density lipoprotein cholesterol
ICA	-	Internal Carotid Artery
ICF	-	International Classification of Functioning, Disability and Health
ICIDH	-	International Classification of Impairments, disabilities and Handicaps
LACS	-	Lacunar syndrome

LDL	-	Low-density lipoprotein cholesterol
MBI	-	The Modified Barthel Index of activities of daily living.
MCA	-	Middle Cerebral Artery
MCI	-	Mild cognitive impairment
MDD	-	Major depressive disorder
MMSE	-	Mini Mental State Examination
MRI	-	Magnetic resonance imaging
mRS	-	Modified Rankin Scale
NIHSS	-	National Institute of Health Stroke Scale
NOACs	-	New oral anticoagulants
NPI	-	Neuropsychiatric interview
OCSP	-	Oxfordshire Community Stroke Project
PACS	-	Posterior anterior circulation syndrome
PCA	-	Posterior Cerebral Artery
POCS	-	Posterior Circulation syndromes
PSCI	-	Post stroke Cognitive impairment
PSD	-	Post-stroke depression
PSWD	-	Post-stroke without depression
QoL	-	Quality of Life
RCT	-	Randomized controlled trial
rTMS	-	Repetitive transcranial magnetic stimulation
SAH	-	Subarachnoid Haemorrhage
SIS	-	Stroke Impact scale
SNRI	-	Serotonin and norepinephrine reuptake inhibitor
TACS	-	Total anterior circulation syndrome

TC	-	Total cholesterol
TG	-	Triglycerides
TOAST	-	The Trial of Org 101792 in Acute Stroke treatment
VaD	-	Vascular dementia
VaMCI	-	Vascular mild cognitive impairment
VCI	-	Vascular cognitive impairment
WHO Qol BREF	-	WHO Quality of life BREF questionnaire
WHO	-	World Health Organization
ZBI	-	Zarit Burden Interview Schedule

ABSTRACT

Background: Stroke is a major public health problem in India with an increase in the prevalence of post-stroke disabilities. There is a lack of studies on the determinants and consequences of stroke in India.

Objective: To study the determinants of post-stroke disabilities and their consequences in terms of caregiver burden, family needs, coping strategies and quality of life.

Methodology: This is a prospective cross-sectional study. After following the inclusion and exclusion criteria, 250 stroke survivors were included in the study. Determinants of post-stroke disabilities and consequences were evaluated separately with standard instruments.

Results: The mean age of the study population is 58.7± 13.537, with male predominance (male: female ratio is 2.9:1) and from a rural background. The majority of the subjects had ischaemic type of stroke. Right-sided lesions were more common. Risk factors for stroke, like preexisting hypertension, diabetes mellitus, dyslipidemia, tobacco and alcohol use were found among the stroke survivors. Post-stroke disability was noted in 2/3 of the stroke survivors, Cognitive impairment in 34% and post-stroke depression was observed in 27.2% of the individuals. The determinants of disability are age, education, length of stay, complications during admission and stroke severity. Functional independence is affected by physical disability. Consequences of post stroke disability include financial burden, health information as the most important need. Distraction positive coping was the most important coping strategy and physical, social domains of quality of life were affected. The determinants of PSCI

are age, length of stay, complications, vitamin B12 deficiency and increased homocysteine levels, stroke severity, type of stroke. Religion appears to be the most important coping strategy, emotional support, instrumental support and professional support were the important needs and psychological, social domains of quality of life were found to be the consequences of post stroke cognitive impairment. The determinants of PSD are age, gender, occupation, stroke severity, length of stay, physical disability and cognitive impairment. The consequences of PSD include burden in relationships, distraction negative coping strategy, Instrumental support, Professional support, Community support network and involvement in care were the important family needs and physical, psychological, social domains of quality of life were affected in the current study**.**

Conclusion: The study emphasizes the complexity of post-stroke disabilities and the need for a comprehensive approach to stroke care and rehabilitation**.** Caregivers face a huge burden caring for stroke survivors with long-term disabilities. Their needs vary with the phase of the illness. Addressing needs and caregiver training for better coping would reduce caregiver burden and improve quality of life. Future research with larger and more diverse stroke populations, longitudinal designs, and advanced neuroimaging techniques may provide further insights about post stroke disabilities.

Keywords: Post-stroke disabilities, post-stroke cognitive impairment, post-stroke depression, caregiver burden, coping strategies, family needs, quality of life.

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INTRODUCTION

World Health Organization (WHO) defines Stroke as "**A focal (or at times global) neurological impairment of sudden onset, and lasting more than 24 hours (or leading to death), and of presumed vascular origin."**[1]A stroke is a sudden vascular insult to the brain tissue leading to a variety of neurological deficits. This occurs as a result of either the blockage of cerebral blood vessels (ischemia) or injury to the blood vessels of the brain with blood leaking inside the brain (haemorrhage). A stroke is always a medical emergency. The loss of blood and oxygen supply to the brain damages brain tissues within minutes resulting in a permanent neurological deficit in the affected area. These deficits may result in permanent physical and mental disability limiting the activities of daily living of the survivors.[2]

Global Burden of Stroke

In 2019, there were 12·2 million incident cases of stroke, 101 million prevalent cases of stroke, 143 million Disability Adjusted Life Years (DALYs) due to stroke, and 6·55 million deaths from stroke. Globally, stroke remained the second-leading cause of death (11·6% of total deaths) and the third-leading cause of death and disability combined (5·7% of total) in 2019.[3]

From 1990 to 2019, the absolute number of incident strokes increased by 70%, prevalent strokes increased by 85%, deaths from stroke increased by 43%, and DALYs due to stroke increased by 32%. Among people younger than 70 years, prevalence rates increased by 22% and incidence rates increased by 15%.[3] The ischemic stroke made up 62.4 % of all stroke incidents in 2019, while intracerebral haemorrhage made up 27.9 % and subarachnoid haemorrhage made up 9.7%.[3]

In 2019, the five leading risk factors for stroke were high systolic blood pressure 55·5% (of total stroke DALYs), high body mass index 24·3%, high fasting plasma glucose 20·2%, ambient particulate matter pollution 20·1%, and smoking 17·6%.[3]

Burden of stroke in India

In a systematic review done in India which included studies from 1997 to 2020, it was found that the crude incidence rate of stroke ranged from 108 to 172 per lakh population, crude prevalence rate ranged from 26 to 757per lakh population and case fatality rates ranged from 18-42%.[4]

There is a demographic and epidemiological transition leading to stroke becoming the third leading cause of death in India. High morbidity, mortality and disability are a grave concern for considerable costs for the health care system, for the individual and their family.[5]

BACK GROUND

Post-stroke disability

The central nervous system controls many of the body functions and these areas when affected by stroke result in multiple impairments of varying severity. Stroke is associated with a variety of sensorimotor, cognitive and psychological impairments with activity limitations.[6]These impairments commonly affect activities like self-care, walking, stair climbing and speech, which in turn negatively impact employment, household activities, leisure and sport.[7]

Prevalence of Post-stroke disability

A study by the American Heart Association (AHA) found that functional impairment was found in 75% of stroke survivors and severe disability was up to 30%[8]. A study done in China found a prevalence of post-stroke sequelae in ischemic stroke patients at 66.56% and 25% had varying degrees of disability.[9] In a study in Taiwan, the prevalence of disability was about 44%.[10]In Mexico, Rhiz Sandoval et al reported that 59% had persisting disabilities at the end of 1 year.[11]

In previous Indian Studies, the prevalence of various impairments varied from 24-65%.[6]A multi-centre study done in India has reported disability in nearly 52% of post-stroke survivors. The prevalence of post-stroke cognitive impairment was noted to be 67% and 31.6% at 3 and 6 months.[12]

Stroke lesions are associated with neuropsychiatric complications such as depression, anxiety, apathy, mania, and psychosis.[13]The prevalence of psychiatric complications is depression 35%, anxiety 25%, apathy 20%, catastrophic reactions 20%, pseudo bulbar effects like laughing and crying 20% bipolar disorder < 0.1% and mania <1% and psychosis rare.[14] The prevalence of post-stroke depression in the studies varied from 24-90%. Such wide variation has been attributed to the assessment tools used.[15]

Many Western studies have described determinants of post-stroke disabilities. According to a study from China, the rate of disability among stroke survivors was 63.8% (mild 30%, Moderate-18% severe -10.7% and total disability-5%) the factors associated with Post-Stroke Disability were age, neurological deficits, cognitive function, depression and social support.[16] In a study on determinants of handicap after

stroke in Melbourne, independent determinants were found to be age, recurrent initial stroke severity, female, socioeconomic status, alcohol intake and stroke subtypes.[17]

In another study from China, the correlates of post-stroke disability were older age, lower education level, previous history of stroke, stroke severity at admission, depression, and cognitive impairment.[18]

India being a developing country, has limited resources to cater to post-stroke survivors with disabilities. There are very few studies from India focusing on the determinants of disabilities in stroke survivors. The clinical determinants of Post-stroke disabilities remain incompletely understood. The identification of risk factors, clinical determinants, sociocultural factors and early screening for post-stroke disabilities will help stroke survivors.

Stroke presents with both physical and psychological challenges resulting in detrimental consequences for stroke survivors and their caregivers. The experience of caregiving can be stressful and burdensome in stroke survivors with disabilities.[19]

There is a high risk of social isolation, emotional, and financial burden and reduced quality of life of caregivers. Caregiver burden especially for family members like spouses, parents, and adult children is an important mental health outcome measure requiring assessment.[20] These assessments help in planning out strategies to reduce it for the well-being of both the survivors and caregivers. Hence there is a need to measure the caregiver burden.

Caregivers assume multiple responsibilities that can result in stress, particularly when their own needs are inadequately addressed during the patient's recovery.[21] Family caregivers will have different needs at different stages of the stroke

in stroke survivors. Studies have demonstrated that health information and professional and social support were the leading needs of caregivers at different stages of the stroke illness. Family caregivers need to obtain continued assistance and related care information from health professionals during the illness.[22]

The caregivers need information related to behavioural and emotional management early in the course of illness to improve the quality of home care and reduce their stress. They also need information on future care options, respite care, community activities and support groups.[23]

The burden of caring the persons with stroke is high and the caregivers develop different coping mechanisms. Taylor emphasized that though all the coping strategies are used in all stressful situations, the attempt to solve the problems are useful to control the stressors while the attempts to regulate the emotions are useful in managing the impact of stressors.[24] Studies have highlighted the role of effective coping among caregivers in reinforcing cohesion and improving relationships.[25] It is of utmost importance to understand the extent of the burden and the usual coping strategies adopted by caregivers of stroke survivors for strategic home rehabilitation and to smoothen the day-to-day functioning of caregivers. Thus, the present study aims to look at the needs, burdens and coping strategies among caregivers.

Studies have shown that disabilities among stroke survivors have a detrimental effect on both short and long-term health-related Quality of Life (QoL) and that disability is a strong determinant of health-related QoL.[26] The impact of stroke on health-related quality of life is disastrous as it affects multiple domains of life.[27] How changes over time in physical, emotional, cognitive and community participation

influence QoL is necessary to delineate areas. There is a need to establish a basis for developing future care models for stroke survivors by improving their QoL.[28]

The identification of risk factors, clinical determinants, sociocultural factors and early identification of post-stroke disabilities will help the patient and their caregivers. The disabilities are assessed using the Modified Rankin scale, Addenbrooks Cognitive examination and Hamilton Depression Rating scale. The consequences are assessed using coping strategies, family needs questionnaire, and quality of life so that early identification of risk factors & impairment will influence further management and prognosis.

OBJECTIVES

1. To study the determinants of physical, cognitive and psychological disabilities in stroke survivors.
2. To study the consequences of post-stroke disabilities on families in terms of quality of life, needs, burden and coping strategies.

NEED FOR STUDY/JUSTIFICATION

Stroke is a preventable disease. Global burden of stroke is high in developing country like India. India is a country of cultural and economic diversity and risk factors profile in one region may not be important in the other. There is paucity of studies focusing on determinants and consequences of post-stroke disabilities from North karnataka. The current study will add information to the existing knowledge of risk factor profile from the study region. Assessment of Post Stroke disabilities is important in planning and providing rehabilitation services.

Stroke is associated with greater care needs with substantial caregiver burden. It is important to understand caregiver's coping strategies for tackling burden, because it affects not only caregiver's day-to-day functioning but also is a constant source of stress.

The magnitude of post stroke disabilities helps us in planning for health education activities. There is a need to create awareness about the risk factors, information about stroke to the public so that help seeking behaviour is improved and early treatment is provided thus reducing disabilities.

The study helps in planning caregiver training to better address their concerns, reduce burden, to learn effective coping and improve quality of life. This also improves rehabilitation process thus better stroke outcome.

REVIEW OF LITERATURE

For the present study, the literature review was done focusing on stroke, determinants of post stroke physical disability, post stroke cognitive impairment, post-stroke depression and their consequences in terms of caregiver burden, needs, coping strategies and quality of life.

STROKE

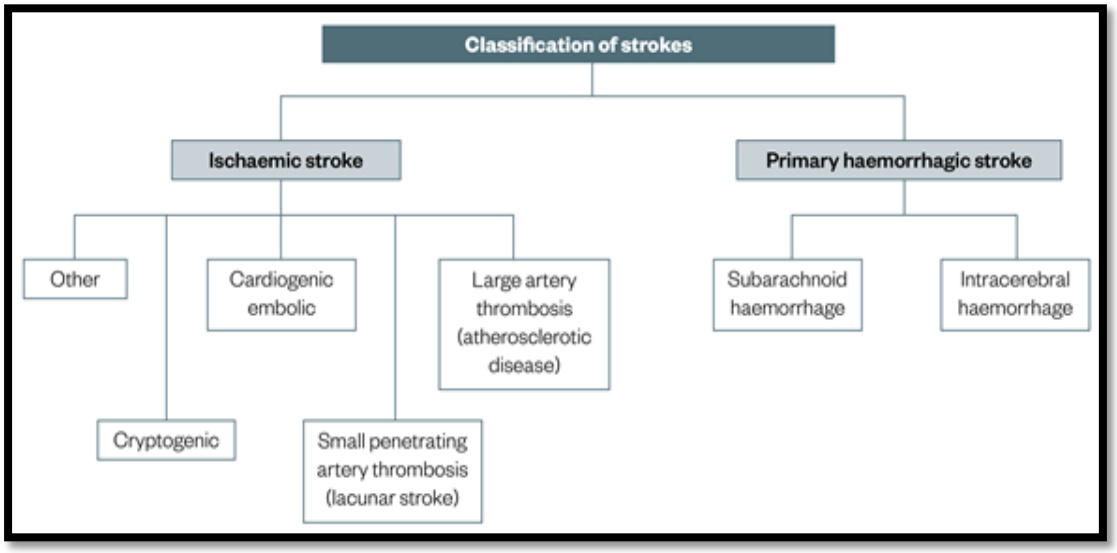
Stroke was first described as apoplexy, or being "struck down by violence," as early as 2400 years ago.[29] Jacob Wepfer was the first to examine apoplexy by postmortem in 1658, and he was also the first to recognize that stroke was caused by either brain bleeding or blockage of the brain's arteries.[30]

Stroke is defined as "A syndrome characterized by rapidly developing clinical symptoms and/or signs of focal, and occasionally global (applied to patients in a deep coma and those with subarachnoid haemorrhage), loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin,"[31]

The traditional classification of stroke is- Ischaemic (thrombotic) strokes

Hemorrhagic(bleeding) strokes

Image 1: Further classification of the subtypes:[32]



Ischaemic strokes are the most prevalent forms, accounting for 80–85% of all strokes worldwide. An ischemic episode is any period of neurological impairment brought on by the blockage of arteries supplying the brain.[33]

Atherosclerosis and cholesterol buildup are the main causes of this occlusion or narrowing of the arteries in the head and neck. It can also be brought on by thrombus formation at the site of the occlusion, which is known as thrombotic ischemic occlusion, as well as by thrombus formation elsewhere in the blood circulation, which can obstruct the arteries in the brain and cause embolic ischemic stroke.[34]

The Trial of Org 101792 in Acute Stroke Treatment (TOAST) developed a system for the categorisation of Ischemic stroke subtypes which is based on the aetiology and mechanism of arterial occlusion.[35]

The TOAST classification is the most widely used and includes:

1. Large-vessel atherothrombosis;
2. Cardioembolism;
3. Small-vessel disease;
4. Other determined causes;
5. Undetermined causes.

The Oxfordshire Community Stroke Project (OCSP)- OSCP Classification or Bamford Classification is based on clinical findings and classifies stroke as per the brain area involved and can be useful in emergency room.[36]

Table 1: Oxfordshire community stroke project classification

Type of infarct	Diagnosis
Cerebral infarction	If a CT scan performed within 28 days of symptom onset shows an area of low attenuation, no relevant abnormality, or an area of irregular high attenuation within a larger area of low attenuation (i.e. an area of hemorrhagic infarction) or: If a necropsy examination shows an area of cerebral infarction (pale or hemorrhagic) in a region compatible with the clinical signs and symptoms.
Lacunar infarct (LACI)	One of the 4 classic clinical lacunar syndromes. Patients with faciobrachial or brachiocrural deficits are included, but more restricted deficits are not.
Total anterior circulation infarct (TACI)	Combination of new higher cerebral dysfunction (e.g. dysphasia, dyscalculia, visuospatial disorders), homonymous visual field defect, and ipsilateral motor and/or sensory deficit of at least 2 areas of the face, arm, and leg. If the conscious level is impaired and formal testing of higher cerebral function or the visual fields is not possible, a deficit is assumed.
Partial anterior circulation infarct (PACI)	Only 2 of the 3 components of the TACI syndrome, with higher dysfunction alone, or with a motor/sensory deficit more restricted than those classified as LACI (e.g. confined to 1 limb, or to the face and hand but not the whole arm).
Posterior circulation infarcts (POCI)	Any of the following: ipsilateral cranial nerve palsy with contralateral motor and/or sensory deficit, bilateral motor and/or sensory deficit, disorder of conjugate eye movement, cerebellar dysfunction without ipsilateral long-tract deficit (i.e. ataxic hemiparesis), or isolated homonymous visual field defect.

OCSP = Oxfordshire Community Stroke Project.

Risk Factors

A Careful understanding of risk factors is of importance in reducing the stroke burden. Risk reduction efforts are important in the community which requires early identification of modifiable risk factors. Though the Risk factors for both ischaemic and hemorrhagic strokes are similar there are some notable differences.[37]

Age, gender, race, ethnicity, and heredity are non-modifiable risk factors. Systemic Hypertension (HTN), smoking, chronic alcoholism, dyslipidemia, obesity, sedentary lifestyle, atrial fibrillation, previous heart disease, and transient ischemic attack are potentially treatable/modifiable factors.[38] In addition, there are risk factors that can be considered as short-term risks or triggers like infectious events, sepsis and stress, intermediate-term risk factors (HTN, hyperlipidemia) and long-term risk factors (sex and race). Risk factors in the young are different from elderly patients.[37]

The Framingham Stroke Risk Profile is a continuously updated, well-known, and widely used risk profile score that combines stroke predictors such as age, systolic blood pressure, anti-hypertensive therapy, diabetes mellitus, cigarette smoking, left ventricular hypertrophy by Electro Cardiogram (ECG), and the presence of cardiovascular disease and used to estimate 10-year stroke risk stratified by sex.[38]

Table 2: Risk factors for both Ischaemic and Haemorrhagic stroke.[39]

	Ishaemic	**Haemorrhagic**
Modifiable factors	Cardiac disease	Anticoagulation
	History of hypertension	Hypertension
	Diabetes	Heavy drinking
	Hypercholesterolaemia	Illegal drug use (especially cocaine and crystal meth)
	Transient ishaemic attack	Thrombolytic therapy
	Cigarette smoking	
	Hyperhomocysteinemia	
	Mitral stenosis	
	Obesity and low physical activity	
Non-modifiable factors	Age	Age
	Gender	Race/ethnicity
	Hereditary/familial factors	Amyloid angiopathy
	Race/ethnicity	
	Geographic location	

POST-STROKE DISABILITY

Evolving concept of disability

In the 1960s initially, there were three different approaches to disability models.

1. Medical model
2. Social model
3. Bio- psycho- social model

The World Health Organization Impairments- Disabilities- and Handicaps Framework (1980) introduced the International Classification of Impairments,

disabilities and Handicaps (ICIDH) a tool for classification of the consequences of disease framework. Disease- impairment- disability- handicap.

ICIDH was widely adopted around the world and many researches were undertaken across the countries. Around 1995, ICIDH underwent an exhaustive revision which resulted in the publication of the International Classification Functioning, Disability and Health (ICF) in 2001. ICF emphasized more on health and functioning rather than disability. ICF is based on the bio-psycho-social model that integrates both medical and social frameworks of disability. It also focused on the capacity performance gap.

A Disability is defined by the WHO as any restriction or lack of ability to perform an activity in a manner or within a range considered normal for human beings and reflects the consequences of impairment in terms of functional performance and activity by the individual.[40] A handicap is a disadvantage, resulting from an impairment or a disability, that limits or prevents the fulfilment of a role that is normal for that individual and reflects interaction with and adaptation to the individual's surroundings. Impairment- Any loss or an abnormality of psychological, physiological, or anatomical structure or function.

Stroke is a cerebrovascular disorder affecting various areas of the brain and leading to multiple impairments. The type and degree of impairment depend on which area of the brain is affected. Paralysis and sensory, perceptual, cognitive, and psychological impairments have been noted after stroke.

The various impairments after Stroke due to brain artery infarction. [41]

Table 3: Stroke outcome due to vessel infarction.

Brain artery infarction	**Brain artery infarction**
Left middle cerebral artery	Aphasia Mutism Buccofacial apraxia Agraphia Acalculia Ideational apraxia Right/left confusion
Right middle cerebral artery	Neglect (personal, extrapersonal, and representational) Visuospatial failures and visuoconstructive disorders Aprosodia Language usage (pragmatic language) Disorders Anosognosia Anosodiaphoria
Posterior cerebral artery	Color agnosia Associative visual agnosia Alexia (hemianopic and pure) Facial agnosia Bálint's syndrome Amnesia

Anterior cerebral artery	Deficits in planning, initiation, monitoring, concentration, and flexibility Contralateral leg weakness Sensory loss
Subcortical infarcts (include thalamic infarcts)	Impaired arousal, attention, motivation, initiation, and executive function Memory (verbal, visual, episodic declarative, anterograde, and retrograde)
Caudate infarcts	Impaired problem solving and attention Memory
Subcortical (infarcts of the inferior genu of the internal capsule)	Confusion Memory disturbance
Limbic and paralimbic lesion	Implicated in a failure to learn and retain new information Affective changes

Prevalence of post-stroke disability

The American Heart Association reported that nearly 75% of post-stroke survivors suffer from dysfunction and 15-30% of them have severe disability.[42] A Chinese study reported a prevalence of post-stroke disability as 45% at 5-year follow-up. Various studies have reported that 25-74% of the 50 million stroke survivors across the globe have some physical, cognitive, or emotional deficiency and also require partial or complete assistance to carry out activities of daily living.[43] The variation in disability rates can be attributed to the assessment method like either the Barthel Disability index (BDI) or Modified Rankin Scale (mRS) and also to follow-up, post-stroke illness comorbidities, and sample size.[44]

Determinants of Post-stroke disability

Study (2004) done on 226 first-ever stroke survivors, who were followed up for 2 years demonstrated that significant determinants of disability on univariable analysis were age, female sex, socioeconomic status, alcohol intake, stroke subtype, initial stroke severity; 2-year physical impairment, disability, depression and anxiety scores; institutionalization; and recurrent stroke.[45]

One study from India (2013) focusing on factors influencing disability and functional status reported that factors like age, rural residence, increased spasticity and imbalance contributed significantly. [46]

According to a Chinese study (2016) with a five-year follow-up of 893 stroke survivors, disability was measured with mRS. The factors contributing to disability were older age, lower education level, previous history of stroke, stroke severity at admission, depression, cognitive impairment at 3 months, and stroke recurrence were significantly associated.[44]

Secondary data analysis of 2439 stroke survivors was included in a study from Indonesia (2020). The risk factors associated with disability among stroke survivors were older age, having a low education level, living in rural areas, not being obese, having a mental-emotional disorder, having no smoking history, and less physical activity.[47]

Another Chinese study (2021) with a 3-year, follow-up of 522 patients, found that disability decreased from 63.8% to 46.7%. the factors significantly associated with post-stroke disability were age, neurological deficits, cognitive function, depression, and social support.[48] In the GRECogVASC study (2022), 256 stroke

survivors were assessed with NIHSS and mRS. The prevalence of disability was 59% in this study. mRS scores were significantly associated with the severity of neurological impairment, cognitive and behavioural disorders (anxiety, depression, epilepsy, and headache).[49]

Assessment of Post-stroke disability

There are various assessment instruments for physical disability, functional impairments, cognitive impairments and psychological impairments. For the Indian population, the Indian Council of Medical Research- neuro cognitive Toolbox was developed for the comprehensive evaluation of cognitive tests which is culturally appropriate and it is available in many regional languages.[50]

Stroke rehabilitation

Howard Rusk (1901-1989) is considered as the father of comprehensive rehabilitation medicine. During his service in the army in World War II, he felt the need for rehabilitation of patients who were disabled secondary to stroke. During that time there were limited rehabilitation programs. He emphasized on the remaining abilities, utilizing simple techniques and equipment to minimize contractures, and other secondary impairments and to maximize function. Since then various programs have been developed for stroke rehabilitation.[51]

In India, to minimize the burden of stroke a National Programme on Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke (NPDCS) was launched by the Ministry of Health and Family Welfare Department. Govt of India. The objective is to prevent and control the NCDs including risk assessment and management and to minimize further complications.[52]

POST-STROKE COGNITIVE IMPAIRMENT

Definition of cognition

The Latin word cognoscere, which is composed of "co-" and "gnoscere" and means "to come to know," is where the idea of cognition originates. Cognition is described as the process of knowing, or more specifically, the process of being aware, knowing, thinking, learning, and judging, in the third edition of Webster's New World Medical Dictionary.

Attention, learning, memory, language, visuospatial/constructional, executive, and sensorimotor capabilities are among the cognitive processes that are commonly evaluated. The cognitive symptoms exhibited in stroke are rarely pure and typically involve a variety of cognitive skills since the brain's vascular regions are only partially consistent with its division into functional neural networks and circuitries.

Post-stroke cognitive impairment.

The term "post-stroke cognitive impairment" (PSCI) refers to a cognitive deficiency that appears up to three months after a stroke, lasts for no less than six months, and is unrelated to any other disease or condition, such as metabolic and endocrine problems, vasculitis, or depression.[53]

PSCI is associated with all cognitive impairment domains that occur after stroke irrespective of the (stroke) aetiology. However, poststroke dementia is defined as irreversible immediate and/or delayed cognitive decline that begins within 6 months after a stroke. which includes vascular dementia, Alzheimer’s dementia or other degenerative dementia, and mixed dementia.[54]

Diagnostic and Statistical Manual of Mental Disorders-5 uses terms like mild and major Neurocognitive disorder.[55] Vascular dementia or significant vascular cognitive disorder are terms used in the VICCS (Vascular Impairment of Cognition Classification Consensus Study) recommendations.[56]

Table 4. Diagnostic Criteria for Vascular Cognitive Impairment (VCI)

VCI refers to all forms of cognitive deficits of vascular origin ranging from MCI to dementia. Diagnosis must be based on cognitive testing involving a minimum of 4 cognitive domains, including executive/attention, memory, language, and visuospatial functions.
Vascular dementia (VaD) requires a decline in cognitive function and a deficit in performance in ≥2 cognitive domains that are of sufficient severity to affect activities of daily living
Vascular mild cognitive impairment (VaMCI) includes 4 subtypes: amnestic, amnestic plus other domains, nonamnestic single domain, and nonamnestic multiple domain; VaMCI should be based on the assumption of a decline in cognitive function. Activities of daily living may be normal or mildly impaired
Probable: A diagnosis of probable VaD or VaMCI requires the following:
(1) Imaging evidence of cerebrovascular disease and (a) a clear temporal relationship between a vascular event (eg, stroke) and onset of cognitive deficits or (b) a clear relationship between the severity and pattern of cognitive impairment and the presence of diffuse subcortical vascular pathology;
(2) Absence of a history of gradually progressive cognitive deficits, suggesting the presence of neurodegenerative disease.
Possible: A diagnosis of possible VaD or VaMCI requires imaging evidence of cerebrovascular disease and should be made if there is no clear relationship between vascular disease and cognitive impairment, if the criteria for probable VaD or VaMCI are not fulfilled, if aphasia precludes proper cognitive assessment, or if there is a history of active cancer or psychiatric or metabolic disorders that may affect cognitive function
Unstable VaMCI: subjects with probable of possible VaMCI whose symptoms revert to normal

MCI indicates mild cognitive impairment. The severity of the functional deficiency is the primary difference between VaD and VaMCI. Subjects with delirium or a current substance misuse diagnosis cannot use the criteria. Criteria were derived from Gorelick et al.[57]

Global Prevalence

Studies have used different screening measures to assess for cognitive deficits, hence there are variations in the prevalence from the studies. Pohjasvaara et al. (1997) evaluated 486 consecutively hospitalized ischemic stroke patients between the ages of 55 and 85 (mean 71.2 years), and discovered that 61.7% of the individuals had some form of cognitive impairment 3 months after their stroke. However, roughly 27% of the participants had cognitive impairment in three or more areas. Constructional and visuospatial abilities (37%), memory functions (23%-34%), executive functions (25%), orientation (23%), attention (22%), and aphasia (14%), were the functions most often impaired. In interviews conducted between three and nine months after a stroke, at least 50% of patients and their next of kin verified the cognitive changes identified by neuropsychological tests.[58]

In individuals with their first stroke who were free of pre-stroke dementia, hospital-based studies that used neuropsychological testing within the first three months after a stroke report a prevalence rate of cognitive impairment ranging from 33% to 82% [59,60] The most common cognitive complaints in the Hochstenbach et al. (2005) study were forgetfulness (60%), mental slowness (56%), poor concentration (55%), and inability to accomplish two things at once (53%).[61]

A thorough neuropsychological evaluation was carried out 3 months after the index stroke in the 55–85year-old among 32 cohort of patients in the Helsinki Stroke

Aging Memory. Eighty- three per cent of the patients had cognitive impairment in at least one domain, and 50 percent had impairment in three or more domains three months after their stroke.[62] The prevalence of post-stroke cognitive impairment varies depending on the nation, race, and diagnostic criteria, falling between 20% and 80%.[63]

A recent systematic review and meta-analysis of the prevalence of cognitive impairment (2010) without dementia in the first year following stroke found that the pooled prevalence of Cognitive Impairment No dementia was 38% and that 4 in 10 individuals experience Cognitive impairment. [64] In China, a community-based study to assess the prevalence of Post-stroke cognitive impairment in 599 stroke survivors, the overall prevalence of non-dementia PSCI was 80.97%, and poststroke vascular dementia was 48.91%.[65] In a recent study from European nations like Britain and Sweden (2019), three months after stroke, PSCI was assessed using a Mini-mental status examination, and the prevalence was found to vary between 24% and 39% in.[66]

This muddled picture is exacerbated by differences in terminology, study sample characteristics, test selection, applied cut-off score for cognitive impairment, and the interval between stroke onset and cognitive testing, which makes comparisons between studies challenging.[67]

Prevalence in India.

In a study conducted in India (2015), the PGI Battery of Brain Dysfunction was used to test 50 post-stroke survivors for cognitive impairment (CI). Dementia and CIND were discovered in 30% and 42% of the participants, respectively. Age, limited education, haemorrhages, and repeated or severe stroke are all risk factors for CI.[68]

In India, the prevalence of post-stroke cognitive impairment might reach 40%, indicating a significant vascular contribution to dementia and cognitive impairment.[69]

According to several studies, the prevalence of cognitive impairment varied between 7.5% and 72% among stroke survivors with dementia and cognitive impairment without dementia (CIND).[70]

Determinants of poststroke cognitive impairment

Research on the factors that contribute to cognitive impairment following a stroke is scarce. Clinical determinants of post-stroke cognitive impairment include: stroke characteristics (pathomorphological and neuroradiological); Pre-existing and coexisting vascular risk factors; and Individual (demographic and clinical) data.

In one study from India (2015), 50 post stroke survivors were assessed for cognitive impairment and the factors associated with vascular cognitive impairment included old age, male sex, low education, hemorrhages, recurrent or severe stroke, silent infarcts, severe cortical atrophy, and left hemispheric or subcortical involvement.[68]

In a community-based study on prevalence of PSCI in China (2015), 599 patients were evaluated for presence of Cognitive impairment and on univariate analysis significant associations were found with factors like age, BMI, education, annual income, stroke frequency, time since onset, number of lesions, complications during the acute phase, hypertension, and exercise. [71]

In a systematic review of risk factors for cognitive impairments in stroke survivors (2016), indicated that age, level of education, history of stroke, diabetes mellitus, hypertension, types of Stroke, affected region, size and location of

infarction, depressive symptoms, and physical function were the potential factors that determine cognitive status of stroke survivors. [72]

One study from Indonesia (2018) on the determinant factors of PSCI, where 110 stroke survivors were assessed Using MoCA and the determining factors of PSCI were stroke onset, time to hospital, multiple lesions, and temporal lesions. [73]

From the REGARDS cohort (Reasons for Geographic and Racial Differences in Stroke) (2018) study, among 22875 participants aged ≥45 years without baseline cognitive impairment, who were followed up for cognitive decline, the factors contributing included increasing age, cardio embolic stroke, race, sex, geography and hypertension. [74]

One recent systematic review and meta-analysis exploring various risk factors associated with cognitive impairment which included 89 studies and 160783 patients concluded that baseline cognitive impairment was a strong risk factor. The other treatable risk factors included diabetes, atrial fibrillation and white matter hyperintensities independent of age and stroke severity. The other risk factors were low education, left hemisphere stroke, multiple stroke lesions. [75]

In a systematic review from STROKOG Consortium (2019), among the 3146 stroke survivors, 44% were impaired in global cognition, and 30-35% were impaired in individual domains 2 to 6 months after stroke. The risk factors strongly associated were diabetes mellitus and past history of stroke. The presence of Hypertension, smoking and atrial fibrillation had weaker domain-specific association.[76]

In a recent large multi-centre study in China in 2019, including 24,055 first-ever stroke survivors, the average age was 70.25±9.88 years. The incidence of PSCI

as measured by NINDS-CSN was 78.7%. Age, lower education and hypertension were associated with increased PSCI risk.[77] Studies conducted in populations typically reveal lower prevalence rates than studies conducted in hospitals, most likely due to a higher percentage of patients with milder strokes.[78]

According to one study from America (2020), 214 stroke survivors were assessed with MoCA at 4-8 weeks and found that 66.8% had PSCI and the predictors included pre stroke unemployment, admission NIHSS>6 and left sided infarction and infarction volume of >17cc. [79]

In the Nor-COAST study (2021), 635 stroke survivors were assessed for cognitive impairment at 3 and 18 months. Regardless of the vascular risk factors, cognitive impairment was observed. The prognosis of the PSCI was noted to be poor in stroke survivors with vascular risk factors. [80]

In a recent study from Indonesia (2023), 236 ischaemic stroke survivors were measured with MMSE for cognitive impairment. The frequency was 67.4% and the risk factors > 80 yrs of age, lower education, temporal and multiple site lesions. [81]

Table 5: Risk Factors for Vascular Dementia by Category (Gorelick (1997, 2004)[57,82]

Demographic	Atherosclerotic	Genetic	Stroke Related
Age Male sex Lower education level	Hypertension Smoking Myocardial infarction Diabetes mellitus Hyperlipidemia	Cerebral autosomal dominant arteriopathy with subcortical infarct Leukoencephalopathy Apolipoprotein	Volume of cerebral tissue loss Evidence of bilateral cerebral infarction Strategic infarction White matter disease

Table 6: Stroke-Related Determinants of Post-Stroke Cognitive impairment[57]

Stroke Characteristics	From Neuro-imaging
Severe deficit at onset	Silent infarcts
Recurrent stroke	Global central atrophy
Supratentorial lesions	Medial-temporal-lobe atrophy
Left hemisphere lesions	White matter changes
Anterior & posterior cerebral artery territory lesions	
Strategic infarcts	
Multiple lesions	

Modes of assessment of PSCI.

There is currently disagreement over the best way to quantify cognitive impairment following a stroke. Wechsler Adult Intelligence Scale, Wechsler Memory Scale, and Halstead-Reitan Battery are among the time-consuming, sensitive neuropsychological test batteries that are expensive to administer and poorly tolerated in this patient group because many of the patients have severe capacity limitations (e.g., fluctuating consciousness level, dementia, aphasia, fatigue, lack of initiative/motivation). However, it has been demonstrated that quick cognitive screening tests, such as the Mini Mental State Examination (MMSE) and Clock Drawing Test, are insensitive to many cognitive symptoms that commonly manifest.[83]

The majority of stroke patients can tolerate "intermediate" cognitive test batteries, such as the Montreal Cognitive Assessment, Addenbrooke's Cognitive Examination (ACE), Cambridge Cognitive Examination (CAMCOG) and The Neurobehavioral Cognitive Status Examination. These could be worthwhile substitutes.[84,85]

The criteria used to determine cognitive impairment, including the cut-off score and norms, will affect the stated prevalence rates. When defining impairment on a cognitive test, cut-off scores between the second and the tenth percentile are

employed. The Mayo Clinic recommends a cut-off score of the 10th percentile for mild cognitive impairment (MCI),[86] whereas a cut-off score of the 2nd percentile is typically seen to be suggestive of a severe cognitive disorder.[87]

Treatment for cognitive impairment

Currently, there is no unequivocally efficacious treatment to post-stroke cognitive impairment. Although studies have shown that some drugs can make significant improvements in some cognitive domains like executive function, the uncertainty on global and daily function makes it difficult.

Anti-cholinesterase drugs like Galantamine, rivastigmine, donepezil, and cholinesterase inhibitors have been licensed for clinical use in AD.[224] Donepezil may be useful for improving cognitive function in VCI patients, according to the American Heart Association/American Stroke Association's (AHA/ASA) recommendations for medication therapies. These recommendations are based on Class II a, Level A data.[57]

Both AD and VCI may be affected by memantine, a noncompetitive N-methyl-D-aspartate receptor antagonist that reduces excitotoxicity to produce a neuroprotective effect. Memantine improves disturbed behaviour and cognition as measured by ADAS-cog, but not global functioning in people with mild to moderate vascular dementia, according to two randomized therapeutic studies.[88,89]

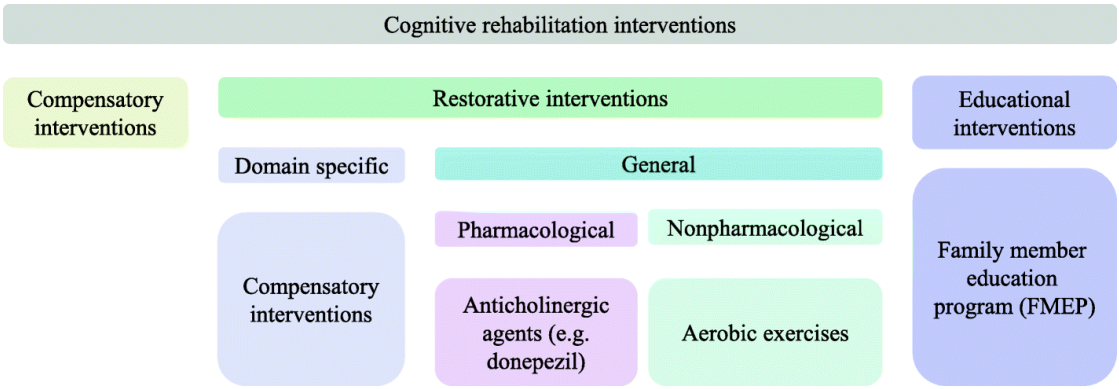
Bilobalide, an extract from ginkgo biloba, has been proven in a study using a rat model of vascular dementia to protect learning and memory function by lowering free radical damage and preventing neuronal apoptosis in the brain cortex and hippocampus CA1 region.[90]

After receiving EGb 761, an extract from Ginkgo biloba, for 24 weeks, both the AD and vascular dementia groups' cognitive functioning and activities of daily living appeared to improve, according to a clinical experiment conducted on 333 patients with AD and 71 patients with vascular dementia from the GOTADAY study. More recently, research on patients with VCI who did not have dementia revealed that Ginkgo Biloba medication for three months could enhance cerebral blood flow and MoCA scores.[91,92]

Cognitive rehabilitation.

Computer-assisted cognitive rehabilitation (CACR), Noninvasive brain stimulation (NIBS), including transcranial current stimulation and transcranial magnetic stimulation, can modulate the excitability of specific brain regions and their participated networks noninvasively, influencing sensorimotor and cognitive abilities.[93]

Image 2: Cognitive rehabilitation interventions [93]



POST-STROKE DEPRESSION (PSD)

The first person to investigate the link between depression and stroke was Martin Roth.[94] Folstein et al. originally documented PSD later in 1977, and at that time, its incidence rate was as high as 45%.[95]

Post-stroke depression (PSD) is the most common mood disorder seen in stroke survivors. The DSM-5 defines post-stroke mood disorders as mood disorders with depressive features, major depressive-like episodes, or mixed mood features.

PSD is defined using the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), criteria of depressive disorder due to another medical condition (stroke) (APA, 2013).[96]

The diagnosis relies on five criteria:

A. presence of depressed mood or anhedonia;
B. symptoms are patho physiologically related to the stroke;
C. symptoms are not better explained by other psychiatric disorders;
D. disturbance does not occur exclusively in the presence of delirium; and
E. symptoms cause significant distress or impairment.

It can be further specified as a depressive disorder due to stroke with

a) With depressive features (when the patient has depressed mood and/or anhedonia but does not meet full criteria for major depressive disorder (MDD);
b) With major depressive-like episode (when full criteria for MDD are met, i.e. five of nine MDD criteria for at least 2 weeks); and

c) With mixed features (when symptoms of hypomania or mania are also present but do not predominate the clinical picture).[96]

Prevalence of PSD

A meta-analysis of 61 studies and 25488 patients revealed that in 32 stroke cohorts, the pooled prevalence of PSD was 34%.[97]A recent systematic review and meta-analysis from India found that post-stroke depression was present in studies with a prevalence of anywhere between 24% and 90%.[98] Different PSD identification criteria, the length of time during follow-up assessments, and the clinical situation all contribute to the heterogeneity in the proportional prevalence of PSD reported by different research, which ranges from 5% to 84%.[99] According to a systematic assessment of 14 studies on the prevalence of PSD, depression peaked 3-6 months after stroke and the prevalence was 9–34%.[100]

In one study from India, 47 per cent of the participants in the trial had serious depression. In 53% of the individuals, a milder form of depression was discovered. Among the entire population under investigation, patients with left hemisphere lesions were linked to statistically significant severe depression. Patients with diabetes who had a stroke were 1.4 times more likely to experience post-stroke depression, compared to patients with IHD, who were 1.2 times more likely.[101]

Determinants of PSD

In a study in Jordan on post-stroke depression involving 153 individuals, it was found that 74.5% of the subjects had depression, 52.9% had anxiety, and 68% experienced stress. The determinants of PSD included Gender, physical disorders, and past mental health issues.[102] In a Nigerian study, 70 stroke survivors' quality of life

and post-stroke depression were assessed. The participants' mean age was 57.43± 9.67 and 22.9% of them had PSD. Financial strain and severe post-stroke impairment are important factors linked to PSD in this study.[103]

In a prospective study conducted in Andhra Pradesh, 32 stroke survivors were evaluated for post-stroke depression and lesion laterality, 3 months after their stroke. It was determined that 62.5% of them exhibited signs of depression. PSD was substantially linked to lesions on the right side. There was a strong association between female gender and left-sided lesions.[104]

Another cross-sectional descriptive study from the same area investigated PSD in 170 post-stroke patients with a mean age of 54.84 ± 10.9 years. Of these, 32.9% (56) had very severe depression. The relationship between demographic factors and depression level revealed that, educational status, occupational status, family income, and caregiver health status were all adversely connected with depression level. Place of residence and family income source both had positive correlations.[105]

The HAM-D scale was utilized in another study from Gujarat with 52 stroke survivors to measure their levels of depression. A prevalence of 73% was discovered. In this study, there were no sociodemographic factors that were significantly related to PSD. The WHO DAS 2.0 was used to assess disability, and it found a nearly significant correlation between PSD and disability.[106]

In the study by Nishat et al. from Bangladesh, 102 post-stroke survivors were included. Seventy three percent of all strokes were of the ischemic type. Forty three percent of people with ischemic type had mild depression, while 12% were found to have moderate anxiety. Patients who had haemorrhagic type of stroke were moderately nervous in 36% and the prevalence of depression was 50%.[107]

Yu Shi et al. included 36 studies in a meta-analysis from 1998 to 2016 on risk variables for PSD. The most frequent modifiable risk factor, it was discovered, was h/o mental disease. Other risk factors included female gender, age 70 years, neuroticism, family history, stroke severity, and degree of disability. A protective element was social support.[108] In an Indian study conducted in Surat, Gujarat, 78% of the sample of 50 stroke survivors were found to be depressed. Females were among the most affected. Nuclear family, ischemic stroke, and left side lesions were determinants of PSD.[109]

A total of 240 stroke survivors (80 cases and 160 controls) participated in the Ethiopian study. The distribution of the sexes was equal, and the mean age was 60.8± 14.3. Male gender, subcortical location of the biggest lesion, the severity of the stroke, physical impairment, prior history of stroke or transient ischemic attack, and ischemic heart disease were factors statistically linked to PSD.[110] In research from Maharashtra, India, out of 107 stroke survivors 57% reported having depression. Age, gender, educational attainment, and stroke comorbidities all have a negative link with one another. PSD was substantially correlated with socioeconomic level and left-sided lesions.[111]

Caregiver burden

In the dictionary, burden is defined as "a duty, responsibility, etc., that causes worry, difficulty or hard work". Due to its complex structure, the literature to date has supported the idea that caregiver burden is a challenging issue.[112] Hoenig and Hamilton first proposed the concept of burden and believed that burden could be divided into subjective and objective burdens. Subjective burden primarily involves the personal feelings of carers generated while performing the caring function, while

objective burden is defined as events or activities related to negative caring experiences.[113]

Zarit, Reever, and Bach-Peterson delineated burden as "the extent to which caregivers perceived their emotional, physical health, social life, and financial status as a result of caring for their relative"[114] Collins et al. proposed that caregiver burden refers to psychological pain, physical health issues, financial and social strains, impaired family relationships, a sense of hopelessness and other negative outcomes of care tasks.[115]

In 1999, Nijboer et al. argued that caregiver burden was a multidimensional concept that included both optimistic and pessimistic aspects of providing care.[116]The stress a person experience while caring for elderly, disabled, or chronically ill family member is known as a caregiver burden.[117] The term "caregiver burden" also describes the negative emotions and subsequent stress associated with providing for a chronically ill individual.[118]

Caregiver burden can be defined as "the level of multifaceted strain perceived by the caregiver from caring for a family member and/or loved one over time".[119] There is a lack of clarity around the concept of caregiver burden and the alternate usage of terms such as stress, distress, tension, and burnout instead of burden.[120] Stress is the most common synonym used by researchers to represent caregiver burden in the literature.

Caregiver stress: Caregiver stress is considered both subjective and objective. Subjective stress refers to the emotional or cognitive responses of the caregiver, such as fatigue, inequality, or the perception of the current state of caregiving. Objective

stress mainly reflects the care responsibility assumed by the caregiver, which is a measurement based on the needs of care recipients.[121]

Unpaid, continuing support with activities of daily living or instrumental activities of daily living for those with a chronic disease or handicap is what is referred to as informal caregiving.[122] Long-term care requires informal, or home, carers, who are frequently made up of family, friends, and relations.[123] Stroke patients and their families may experience a variety of problems, including physical, psychological, social and economic problems.

Multiple disabilities (physical and psychological) are major complications of a stroke that cause various degrees of dependence in patients. These complications may make it difficult or even impossible for a person to perform daily activities of life. Caregivers of stroke patients experience a high level of caregiver burden because they need to provide care for long hours, and the patients are usually dependent on them for their activities of daily life (ADL).[121]After the acute phase, patients are usually discharged from the hospital, and the care will continue by family members. Taking care of a patient with a stroke causes great physical and mental stress for the caregiver, as well as the family. More than half of patients need permanent or temporary assistance from the people they live with for their ADL.[124]

Health care, medication administration, personal care (bathing, feeding, toilet care, dressing), planning social services, grocery shopping, housework, financial management, financial assistance, and living in the same home are all examples of the care given by the patient's family members. This care is not limited to any one type of assistance.

A multifaceted notion, informal caregiver load or strain includes aspects from the physical to the social to the psychological to the economical. The load differed between the objective (financial and the standard of support provided for daily living activities) and the subjective (feelings and perceptions related to caregiving).[125]

The workload that results from the adjustments needed to care for the patient is referred to as the burden. The two categories of caregiver load are distinguished. The physical effort needed to help patients is an example of objective load, whereas the impact on the caregivers' mental, emotional, and social burden is an example of subjective burden.[126]

Prevalence of caregiver burden

According to research by Bugge et al., 25% of caregivers experienced severe hardship after one month, 28% after three months, and 37% after six months.[127] At 2, 4, and 6 months, respectively, Isle et al. reported rates of care giver burden to be of 28%, 31%, and 29%.[128] More than half (56.67%) of stroke caregivers reported feeling weary (high/extreme load), according to Rawat et al. The degree of the patients' dependence on them for activities of daily life may be the cause of these various findings in the care burden of caregivers of stroke patients.[129] In this context, Baumann et al. discovered that an increase in the care burden of stroke patients' carers was substantially correlated with a decline in patients' capacity to carry out daily tasks.[130]

Poststroke determinants of caregiver burden

It was found that in a study from Varanasi, the factors contributing to increased caregiver burden included, females, moderate to severe score on NIHSS,

mRS scores at 30 days post stroke and functional dependence. Caregiver factors contributing included young age, female gender and long time spent on caregiving.[131]

In a study from Vietnam, the burden among caregivers of stroke survivors was mild-to-moderate. Caregiver burden correlated significantly with their anxiety and depression symptoms, the functional dependence of the patient, and caregivers' demographic characteristics, specifically, age, caring hours per day, relationship to patient, and self-perceived health status.[132] In one study from Singapore, the informal caregiver burden has remained high for upto 12 months post-stroke and the major factor associated was functional dependence.[133] Caregiver burden is related to the well-being of both the individual and caregiver; therefore, understanding the attributes associated with caregiver burden is important.

FAMILY NEEDS

A need can be defined as a "physiological or psychological requirement for the well-being of an organism" (Merriam- Webster, n.d). when people refer to NEEDS there is a range of meanings but generally is a requirement which is essential. Needs differ depending on the situation.

Stroke is a family disease that affects both the patient and the family caregivers. After being released, the majority of stroke survivors live with their families, and more than 75% rely on them for care.[134] In India, stroke victims with ongoing disability will return home after being discharged and would require support from their families. Family members are expected to look after their elderly and disabled relatives as part of India's traditional family system.

When caring for stroke survivors, the caregiver takes on a variety of duties, and the stroke survivors either temporarily or permanently stop performing significant tasks and obligations.[135] The first two years of caregiving are the most challenging for carers because after being hospitalized for an acute episode of stroke, stroke survivors are released with a range of problems that require long-term care.[136]

The primary caregiving position of a stroke survivor with impairments has a significant mental, physical, and social impact on the caregivers' personal and professional lives. The way of life, family dynamics, and daily activities have all drastically changed. There will be more work for caregivers when they assume the obligations of stroke survivors. The caretakers are typically ill-equipped, overburdened, and troubled by this unexpected change in the family's circumstances and their lack of past experience.

Most carers had to forego their own needs in order to fulfil their obligation to others. To devote themselves totally to providing care and assistance to stroke victims, many caregivers were forced to resign from their jobs. The fact that some caregivers had to take time off from work to care for stroke survivors affected their ability to do their jobs well.[137]

Stroke being a sudden event, the carers will not be ready for the altered situation. Poor post-stroke rehabilitation will come from the family caregivers' lack of information, practical skills, and proper support from medical specialists.[138] When certain criteria were met, family caregivers reported positive experiences and impacts, according to prior studies.[139,140] Although there have been numerous studies on the difficulty of caregiving, Mauss-Clum and Ryan were the first to concentrate on family requirements after the beginning of neurological disease.[141] It is crucial to create and

promote suitable interventions and evidence-based policies to lessen burden and enhance quality of life for both stroke survivors and caregivers in order to lessen caregiver burden.[142] Understanding the unique demands or requirements of the caregivers and stroke survivors is necessary when planning interventions. This necessitates precise needs evaluations.[143]

At various stages of the stroke condition, different caregiver demands arise. The five stages of caregiver support needs across the care continuum have been outlined by Cameron and Gignac as follows: during acute care—Event, Diagnosis, and Stabilization. The stage of preparation occurs during inpatient therapy, while the stages of implementation and adaptation occur following release.[144]

The caregivers require knowledge on the course of the illness and available treatments when the patient is hospitalized and experiencing an acute episode of stroke. In general, the family should be informed as soon as the patient's health changes. The caregiver wants truthful responses to their questions from the medical professionals.[145]

The carers require information on the fresh problems resulting from stroke rehabilitation as well as the lingering deficits and disabilities during discharge. Additionally, they require details on the security, vital care practices, and emotional behaviour of stroke survivors. Medication administration, any home medical devices needed for stroke prevention, accessibility to community services, and medication management.[146,147]

In a Taiwanese study on the needs of caregivers, information on health topics like medication management, patient respect, providing information on disease progression, and handling emergencies took the lead. Even though the acute stage of

the illness (hospitalization) was when the carers needed the most information, they do need different information and support at other times.[148]

Caregivers anticipate support from healthcare professionals as well as information about their care. Although the details change depending on the condition. For instance, when a patient has a stroke episode that is acute, the caregivers need to be open with the patient's progress with the disease, the patient's therapy, and any changes in the patient's condition. When a patient is hospitalized, nurses are fully responsible for their care, particularly in the intensive care unit, and if the family caregivers are not given accurate information about the patient, this can cause anxiety and uncertainty.[149] Regardless of the period of assessment, the top three need areas for carers are health knowledge, professional assistance, and community networks.[150]

Following the patient's discharge, the caregivers will need specific knowledge, abilities, social support, and emotional assistance. Disability-related cognitive, behavioural, and emotional alterations are common in stroke survivors. Information on navigating these changes is required for caregivers.[151] If relevant care information and emotional support are given on a regular basis, caregiver stress can be minimized and their quality of life can be enhanced.[152]

After discharge, it's also critical to give carers tools for managing their own shifting responsibilities and healthcare requirements. Additionally, they require details about available community resources, financial aid, and social welfare programs that could enhance home care and lessen caregiver stress. It's also crucial to have information about support groups, community activities, future care possibilities, and respite care.[144]

Finding information and preparing for life after discharge were the top concerns for family caregivers of stroke victims, according to studies from the U.S. and Australia.[153,154] while a study from Canada revealed that interacting with the healthcare team was the need that was most frequently reported.[155] The limited growth of the primary healthcare system and the social care system for the elderly in China, which is influenced by traditional culture, may cause other needs to take precedence.[156]

The ecological resilience framework created by Windle and Bennett shows that the causes of the many requirements include variables at the individual, community, and societal levels.[157] which might also be seen as a shortcut to addressing their needs. In this study, elements including one's personal health issues and work position at the individual level, community-level health resource accessibility, and social-level medical costs appear to be significant factors that need to be generated. Additionally, family caregivers frequently have a range of demands of various kinds and intensities.[158]

In a recent study conducted in China (2022) by Lu et al., it was discovered that family carers had demands related to adjusting to a new position, delivering care in accordance with the needs of the care recipient, managing one's own emotional needs, evaluating supportive resources, and juggling caring and one's own needs.[159]

Norsima Sidek et al.'s study on caretakers in Malaysia, there were two main needs for caregivers. the need for self-psychological support as well as information regarding complete stroke care at home. The level of motivation of the stroke survivor was shown to be the primary internal driver for care, while social support with regard to access to comprehensive stroke care was found to be the primary external driver.[160]

In an Indian study by Kumar et al, the most important needs were within the 'Health information', 'Instrumental support' and 'Professional support' sub-scale and the least important needs fell within 'Emotional support', and 'Community support areas in the caregivers. The most essential needs areas for carers, according to an Indian study on family needs, were professional support and involvement in care. Emotional support and social support were the least significant needs.[161]

In the Brazilian study (2020) by Jaine Kareny da Silva et al, three areas emerged: 1) the early need for family caregiver health education; 2) the need to reorganize family caregiver needs; and 3) the requirement for family carers to have free time for social activities and (self)care.[162]

In the recent Indonesian study, the necessary information related to the need of physical education (managing patients' ADLs, patient transport, and medical rehabilitation training at home training) emerged as important. However, the necessity of psychological education has to do with the psychological changes that stroke survivors experience and also handle these changes.[163]

COPING STRATEGIES

The definition of coping by Folkman and Lazarus, two of the key thinkers in the study of coping, is "the constantly changing cognitive and behavioural efforts to manage the specific external or internal demands that are appraised as taxing or exceeding the resources of the person." [164]

Coping mechanisms are the unique behavioural and cognitive methods that humans employ to control, tolerate, lessen, or minimize stressful situations.[165] There are two main types of coping techniques that are commonly accepted: problem-

solving techniques (efforts to take action to lessen stressful situations) and emotion-focused techniques (efforts to control the emotional effects of stressful or potentially stressful events).[166]And third aspect is avoidance-oriented coping (efforts to avoid a difficult situation by looking for others to be with you or by doing something else instead).[167] Active approach-oriented coping is at the other end of the spectrum from avoidance-oriented coping. Additionally, a distinction is drawn between dispositional and situational coping strategies. The situational approach refers to coping as a dynamic process, demonstrating minimal consistency both across and within stressful events, while the dispositional approach focuses on generally stable coping mechanisms utilized by people throughout different stressful situations.[168]

The most popular framework for analyzing coping mechanisms is the Transactional Theory of Stress and Coping, which was created by Lazarus and Folkman. In accordance with this idea, the resources available to deal with the stressor are first assessed in terms of their personal relevance to the individual.[169] Based on the Folkman and Lazarus' Ways of Coping (WOC) Questionnaire, eight coping mechanisms are found. These consist of Confrontational Coping and Intentional Issues Problem-focused coping strategies include distance, self-control, acceptance of responsibility, positive reappraisals, and escape. Avoidance is seen as an emotion-focused coping strategy. Seeking social support serves as a problem- and emotion-focused coping technique.[169]

Planful issue solving involves taking an analytical approach to find answers to difficulties, whereas confrontational coping refers to the aggressive endeavour to change unpleasant situations.[170] Distancing oneself from stressful events is referred to be a coping mechanism (detachment), and caregivers who feel they lack the coping skills to deal with a particular situation they find upsetting may frequently employ this

tactic. Distancing has to do with denying, diverting attention, or detaching. When a family member is diagnosed with a stroke, this may occur, and the caretaker may use diversions to avoid confronting the issue.[171]

The act of controlling one's own emotions and behaviour is referred to as self-control. Recognizing one's role in the issue and taking the appropriate action are both parts of accepting responsibility.[172,173]This might be viewed as a flexible and effective coping mechanism for carers. Managing the news of a stroke can involve accepting the situation and realizing they have influence over how they will react and manage. This could help in preventing negative psychological effects like melancholy or anxiety associated to mortality as well as anticipatory grief and loss.[174,175,176]

Positive reappraisal is another coping technique that focuses on viewing things positively. In this technique, stressful events are thought of as benign, desirable, or advantageous.[177] It frequently has elements of religious significance and personal development.[178] Positive evaluation for caregivers may entail accepting that stroke is inescapable or inevitable. They can view the fact that there were no fatalities as lucky. unlike optimism and hope.[179]

Cognitive behaviour therapy frequently employs reappraisal-type tactics.[180] This can be viewed as a sensible and effective coping mechanism. Escape avoidance is defined as the mental and behavioural attempts to remove oneself from difficult circumstances or issues.[181] This may entail intentionally avoiding the issue, retreating from people, or avoiding the stressful environment. Furthermore, wishful thinking may be involved. A person who is receiving care may suffer from escape avoidance and distance.

People with a chronic illness or injury are at tremendous risk when a caregiver withholds assistance and care, either physically or psychologically. An adaptive coping technique that is frequently employed is called "seeking social support," which involves talking about your feelings and thoughts with others or asking them for help, resources, or emotional support.[182,183]

Families and friends can provide social support, and caregivers can also get advice from experts, which can also be a kind of social support.[184] It has been discovered that social support and intergenerational interaction are crucial for older individuals' health outcomes, ageing, and ageism.[185] After being released from the hospital, stroke patients frequently rely on their families for all of their physical and emotional requirements.[180] Because patients frequently require long-term care, the job of in-home carers is crucial.[186]

Essential caregiving for stroke survivors is crucial to their recovery, as well as to preventing future strokes and enhancing their general health.[187] There is a wealth of studies on coping in the setting of many different illnesses. The topic of coping has received some relatively recent attention in the context of stroke. The number of persons learning to deal with stroke-related disability each year is growing as a result of the ageing population's size and the fraction of acute stroke survivorship.[188]

Recent years have seen a rise in the importance of health psychology's contributions to the field of cardiovascular diseases. These contributions take into account how patients are adapting to their disease process and neurorehabilitation treatment, as well as how they are adjusting to new derived lifestyles and, in particular, how they are paying attention to the psychological needs brought on by the disease status.[189]

In this regard, ongoing research on psychological aspects that affect a patient's health state will present opportunities for particular preventive treatments, the development of disease-preventive strategies, and the reinforcement of healthy lifestyles.[190] Coping skills may be crucial since neurorehabilitation involves maximizing recovery and disability adaption. According to certain data, coping skills are likely to predict rehabilitative success.[191]

Rehabilitation following a stroke entails more than just functional recovery because, in addition to physical impairment, people frequently experience a range of psychological sequelae like depression, anxiety, and emotional lability that can hinder the healing process and have an impact on long-term adjustment.[192]

Understanding the recovery process requires a focus on adjusting to the emotional and cognitive changes that result from a stroke.[193] The majority of studies on stroke survivors' family carers have found detrimental effects of caregiving on the health and well-being of the caregivers.[194]

Caregiving for a stroke survivor has been reported to have a negative influence on the physical, emotional, and psychological health of caregivers because of the sudden onset of impairment and the chronic nature of stroke rehabilitation.[195,196]

Compared to the general population, primary caregivers of stroke patients frequently report higher levels of somatic and depressive symptoms, sleep difficulties, stress, and social isolation.[197] It has been hypothesized that men and women deal with pressures in different ways. Previous research on the usage of coping mechanisms by gender revealed disparities in preferred coping mechanisms.[198]

According to a study from North India that evaluated the load and coping mechanisms of carers, acceptance, receiving social support, problem-solving, and seeking religious guidance were the most often employed coping mechanisms. Denial or placing blame as coping mechanisms were positively and significantly linked with the burden.[8]

A study from Iran that included 110 carers indicated that the strain of being a caretaker was mild to moderate. Positive reappraisal and looking for social support were the two most often employed coping mechanisms. Positive reappraisal and taking ownership were substantially more frequently utilized by male carers than by female caregivers. A positive association was observed between emotional coping methods and caregiver load.[199]

Motivating patients and their caregivers to use coping mechanisms is a challenging process because it requires the patient to adopt self-management behaviours, exercise self-control over their processes and outcomes, and actively engage in their health education. However, there is only weak evidence to support the effectiveness of psychosocial interventions in improving the quality of life for stroke patients.[200]

QUALITY OF LIFE

A person's assessment of their place in life in relation to their objectives, expectations, standards, and worries, as well as the culture and value systems in which they live, is described by the WHO as their quality of life.[201] The notion of a person's sense of wellbeing, purpose in life, autonomy, capacity to take on meaningful responsibilities, and capacity to participate actively in relationships can all be considered as aspects of quality of life.[202]

The term "quality of life" has been defined in a variety of ways, but its primary meaning is "subjective wellness," which incorporates aspects of the physical, psychological, social, and mental selves.[203] The quality of life (QoL), which is sometimes mistaken for the standard of living determined by income, encompasses not only wealth and work but also physical and mental health, education, the environment, leisure activities, and social connection.[204]

All facets of a person's life are frequently impacted by consequences of stroke. Stroke can result in a variety of impairments, including loss of motor function. Functional independence is also impacted by a variety of sensory, cognitive, and behavioural restrictions. There are limitations on one's personal, social, and professional roles after an episode of stroke, which lowers one's self-esteem increases sadness and lowers quality of life.[205]

Patients who have made a full recovery and are functionally independent still experience significant disabilities, functional restrictions, cognitive function alterations, and behavioural changes.[206] According to the social model of stroke, quality of life (QoL) is a complicated interaction between the severity of the stroke, social support, and health-promoting behaviours including secondary stroke prevention. A multi-dimensional assessment of the quality of life of stroke survivors should be conducted, including evaluations from them directly. These evaluations should cover the following domains: physical (motor deficit, spasticity, ataxia, dysarthria, dysphagia, pain, sleep disturbances, and fatigue), functional (mobility, care), psychological (mood, cognition, satisfaction, and self-perception), and social (work, social network, and social role).[206]

The Auckland Stroke Study (2000) is the largest study on post-stroke survivors' quality of life. Here, 639 stroke survivors' disability and quality of life data were available. 42% of the participants in this study required assistance with at least one essential daily care task. However, the overall QoL scores for the aspects of physical health, general health, vitality, and social function are lower than those of the general population.[207] The Brazilian study (2009) on determinants of QoL found that motor impairment, disability and mood disturbances were the independent predictors.[208]

A study with a sample size of 119 stroke survivors was conducted in Taiwan (2015) to determine the factors predicting quality of life. It was discovered that the different areas of QoL were influenced by the severity of the stroke, cognitive function, functional status, balance, and the side of the stroke.[209] Within three months of a stroke, QoL was evaluated using the WHO BREF in an Indian study (2016), and it was discovered that 40% of participants had poor physical domain, 60% had poor psychological domain, and 50% had poor environmental domain.[210]

In North Kerala (2017), a cross-sectional population-based study was conducted to evaluate stroke survivors' quality of life. SF-36 was used to assess QoL in 40 stroke survivors. In all the domains, QoL scores were low, especially for those with physical disabilities and role restrictions. Poor QoL was influenced by a high reliance rate and the existence of post-stroke sadness.[211]

A Singapore study (2019) assessed 285 post-stroke survivors' health-related QoL at 3 months using the EQ-5D-3L 3Level European Quality of Life Five Dimensions. The QoL was found to be lower than the general population and at 71%

of the pre-stroke level. It was discovered that having diabetes mellitus, HTN, and hyperlipidaemia was linked to low quality of life.[212]

A study was carried out in China (2019) to comprehend the dynamic changes connected to QoL and the indicators of QoL improvement. It was discovered that the scores in the physical dimensions, such as physical functioning, physical issues, and general health, had improved four weeks following the treatment. However, there was no appreciable improvement in psychological health in terms of social functioning or role restrictions brought on by emotional issues.[213]

A community-based longitudinal study from Karnataka (2019) with 150 stroke survivors used a stroke-specific QoL measure for the baseline, three-month, and six-month QoL assessments. Physical, psychological, and social domains were shown to have improved after six months compared to the first three. Age, altered consciousness, and daily activities are important indicators of a higher quality of life. Other factors like educational level, occupation, and patient symptoms had little statistical significance.[214] A study from the sub-Himalayan region (2020) assessing factors contributing to poor quality of life of stroke survivors found that disability and depression were the leading factors.[215]

Within a year of the stroke's onset, 96 stroke survivors were evaluated for QoL using the WHO QoL BREF in a study from Rajasthan (2021). The factors that were linked to lower QoL ratings included age, gender, rural upbringing, and lower educational status. The conclusion that the QoL is lower than the general population was drawn from the findings that 60% of respondents reported poor physical health, 93% of respondents in the psychological area had negative feelings, 52% expressed poor social support, and 84% had little to moderate financial support.[216]

Another recent study from Saudi Arabia, (2022) found a significant association between gender, bilateral lesion location and quality of life.[217] In a large cross-sectional study from China, (2022) 1709 stroke survivors were evaluated for quality of life. In this study, literacy, low income, reduced physical activity, diabetes, anxiety, depression and poor sleep quality were significantly associated with quality-of-life domains.[218]

Based on the above studies, Age, sex, stroke type, stroke side, duration after onset, stroke severity, functional status, upper extremity motor function, balance function, lower extremity motor function, cognitive functions, and depression have all been found to be significant predictors of quality of life in post-stroke survivors. Disability, depression, and a reduced functional level are among the factors linked to a lower quality of life in stroke survivors. The WHOQOL-BREF scores were considerably and continuously poorer one year after stroke in patients with post-stroke depression.

METHODOLOGY

Study population: All the first-ever Stroke patients attending the Dept of Neurology were recruited for the study after obtaining informed consent, and following inclusion and exclusion criteria.

Study design: This is an analytical cross-sectional study.

Study period: July 2019-August 2021

Sample size: The sample size is computed considering 95% confidence limit, 85% accuracy, 14% of tolerable error and prevalence of post-stroke depression taken to be 46.3% at 20% attrition rate.[97] so to get the desired number of subjects to estimate the average change in post-stroke psychological and neurological changes with treatment.

$$\mathbf{n = \frac{[Z(1-\alpha/2)]^2 * (1-p) * 1.2}{d2}}$$

Where, p=prevalence of the event

d=expected absolute error

Z(1-α/2) = standard normal variate (level of confidence). Usually taken at 95% Confidence interval as 1.96. The sample size calculated accordingly is

$\frac{(1.96)^{2*}53.7}{(0.14)^2}$ *1.2= **247** rounded off to **250**

Sample selection criteria:

Inclusion criteria: First ever stroke patients- Ischemic and haemorrhagic strokes (Radiologically proven)

Exclusion criteria:

1. Recurrent strokes
2. Cerebral-venous thromboses
3. Vascular malformations
4. Subarachnoid haemorrhages
5. Serious medical condition
6. Severe psychiatric disorder.
7. Previous history of cognitive decline
8. Post stroke survivors with aphasia
9. NIHSS Score > 21 at the time of admission

Ethical approval: Ethical approval was obtained at the beginning of the study from the Institutional Ethical Committee. Informed consent was taken from all the participants.

Training: Online training to administer NIHSS was undertaken before the study. Permission to use the standard questionnaires was obtained through mail.

Method of Data Collection: The data was collected by the investigator. The sampling technique is a convenient sampling method. All the first-ever stroke patients meeting the inclusion criteria were screened for the study. Out of 2997 cases of stroke admitted in the Department of Neurology in the previous three years, 433 cases of the acute first episode of stroke were screened for inclusion in the study. The treating neurologist did the clinical and neurological examination of the stroke patients during admission and the investigator recorded NIHSS scores during admission. After following the inclusion and exclusion criteria, more cases were screened to arrive at the required sample size of 250 cases.

During admission, the following socio-demographic information like Age, sex, occupation, socioeconomic status and place of residence were recorded. Determinants of post-stroke disabilities consisting of socio-demographic factors, clinical factors like type and side of the lesion, the area involved and the time elapsed between the onset of the symptoms and presentation to the hospital for treatment were collected.

The following information on vascular risk factor were collected.

1) Presence of Hypertension
2) Diabetes mellitus
3) Presence or absence of smoking and Alcohol consumption.
4) Presence of Dyslipidemia
5) Hyperhomocystinemia
6) Presence of heart diseases or atrial fibrillation
7) Vitamin B12 deficiency.
8) Family history of stroke.

Definitions

First-ever stroke event: Defined as occurring in a person who has Never had a stroke before.

Hypertension: As per JNC-7 criteria (stage I hypertension as systolic BP between 140-159 mmHg and diastolic BP between 90-99 mmHg, stage II hypertension as systolic BP >160 mmHg and diastolic BP 100 mmHg or more) patient diagnosed as hypertension and on treatment were considered as hypertensive. [219]

Diabetes mellitus: According to the American diabetes association, a patient is to be considered diabetic when random blood sugar is above 200 or glycosylated haemoglobin is greater than 6.5 or fasting blood sugar is more than 126 and post-prandial blood sugar is more than 200. When patients satisfied the above criteria or were on any oral anti-diabetic drug/ insulin regimen were considered as having diabetes.[220]

Smoking: A person who smoked 100 or more cigarettes during his lifetime was considered as a smoker. A "current smoker" was defined he/ she smoking 2 cigarettes/beedi per day for 3 months or more or consuming tobacco in different forms. "Never smoker," is a person who has not come into the criteria of the current smoking person or ex-smoker.[221]

Alcohol use: A person is considered to be a regular alcohol user when the daily consumption of alcohol is ≥ 2 drinks for men and 1≥ for women. The previous consumer is considered when the alcohol consumption was 1 year previously and currently abstinent.[222]

Dyslipidaemia: Dyslipidemia was diagnosed as per American Heart Association (AHA) guidelines (2011) as serum cholesterol > 200 mg/dl, low-density lipoprotein (LDL) > 130 mg/dl, triglycerides > 150 mg/dl and high-density lipoprotein (HDL) < 40mg/dl for men and HDL < 50 mg/dl for women. Also, if there is history of dyslipidemia and are on lipid-lowering drugs are included.[223]

Cardiovascular causes: Patients with ischemic heart disease, congestive heart failure, rheumatic heart disease, atrial fibrillation, chronic obstructive pulmonary disease, and cardiomyopathy were considered as suffering from heart disease.[224]

Family History: Family is considered significant when his/her sibling/parents/first degree relative had previously suffered from stroke or transient ischemic attack and undergone treatment.[225]

Time to hospital is defined as the duration from the beginning of stroke symptom(s) until arrival at the hospital.[226]

Socioeconomic status: Based on the Modified Kuppuswamy socioeconomic scale updated for the year 2020.[227] The total score is computed by adding the individual scores and based on the total score socio economic class are divided into the following groups.

Table 7: Modified Kuppuswamy socioeconomic scale scores and Socioeconomic status

Sl no	Score	Socioeconomic class
1	26-29	Upper
2	16-25	Upper middle
3	11-15	Lower middle
4	5-10	Upper lower
5	< 5	Lower

Instruments used at the time of acute episode during admission

1. Socio demographic Data Sheet
2. NIHSS scale
3. Modified Rankin Scale (mRS)

At 3 months post-stroke and not later than 6 months, stroke survivors were assessed for impairments and their consequences. Locomotor disability was assessed using the mRS scale in all the patients. For the assessment of the cognitive impairment stroke survivors with severe disability and severe dysarthria (n=68) were excluded. Stroke survivors with mild dysarthria and preserved comprehension were included. ACE-III Indian version, in Kannada language and Hindi version were used in the present study. Cognitive assessment was undertaken in 182 post-stroke survivors.

The Neuropsychiatric inventory questionnaire is an informant-based brief assessment of Neuropsychiatric symptomatology. The screening for post-stroke depression was carried out in all the cases. The investigator collected the information from the informants. Those who scored positive for depression as per NPI-Q (n=68) were administered the Hamilton depression rating scale to assess for severity of depression.

The various impairments are assessed using the following instruments

4. Addenbrookes cognitive Examination –Indian version (ACE III)
5. Neuropsychiatric interview (NPI)
6. The Modified Barthel Index (MBI) of activities of daily living.

The caregivers of the stroke survivors who were present during follow-up were interviewed using the following standard questionnaires to assess caregiver burden, family needs, and coping strategies.

7. Zarit Burden Interview Schedule (ZBI)

8. Family need questionnaire (FNQ)

9. Coping Checklist by Rao Subbakrishna and Prabhu (CCL)

The quality of life of the post-stroke survivors were assessed using the WHO-Quality of life BREF questionnaire (WHO Qol BREF).

However caregiver details were not collected during the interview.

Tools used in the study:

1. The National Institutes of Health Stroke Scale (NIHSS) [228]

National Institutes of Health Stroke Scale (NIHSS) is a 15-item impairment scale for stroke severity measurement and is now widely used as a standardized evaluation of symptoms and signs for strokes. The scoring range is 0 to 42 points, with higher numbers indicating greater severity. A score of <5 represents no stroke symptoms or a minor stroke, a score of 5 to 15 represents a moderate stroke, a score of 16 to 20 represents a moderate to severe stroke, and a score of 21 to 42 represents a severe stroke. Baseline NIHSS scores have been reported to strongly predict major clinical outcomes after stroke.

2. Modified Rankin Scale.[229]

The Modified Rankin Scale (mRS) is a single item, global outcomes rating scale for patient's post-stroke. It is used to categorize level of functional independence with reference to pre-stroke activities rather than on observed performance of a specific task. A single mRS grade should be assigned based on the following criteria (Dromerick, Edwards, & Diringer, 2003):

Table 8 : mRS scores and its descriptions

Rankin Grade	Description
0	No symptoms
1	No significant disability despite symptoms; able to carry out all usual duties and activities
2	Slight disability: unable to carry out all previous activities but able to look after own affairs without assistance
3	Moderate disability: requiring some help, but *able to walk without assistance
4	Moderately severe disability: unable to walk without assistance, and unable to attend to own bodily needs without assistance
5	Severe disability: bedridden, incontinent, and requiring constant nursing care and attention

3. Addenbrooke's Cognitive Examination III (ACE III)[230]

A screening tool to detect dementia and mild cognitive impairment. This consists of 19 activities which test the five cognitive domains: attention, memory, fluency, language and visuospatial processing. The tool was originally developed in English and later was translated into many other languages like Spanish, Thai, Japanese, Malayalam and Hindi including Kannada and Marathi. It is scored out of 100, with a higher score denoting better cognitive function. At the recommended cut-

off scores of 88 and 83, the ACE is reported to have good sensitivity and specificity for identifying dementia and MCI.

4. Neuropsychiatric inventory (NPI)-Q [231]

Neuropsychiatric Inventory (NPI) is a tool to obtain information on the presence of psychopathology in patients with brain disorders. The NPI was developed for application to patients with Alzheimer's disease and other dementias, but it is also used in the assessment of behavioral changes in other neurological conditions.

Ten behavioral and two neuro vegetative areas included in the NPI questionnaire are delusions, hallucinations, agitation/ aggression, depression/ dysphoria, anxiety, elation/ euphoria, apathy /indifference, disinhibition, irritability/ lability, aberrant motor behaviour, sleep and night-time behaviour disorders and appetite and eating disorders. Each domain is assessed by a standard subset of 7-10 questions. The NPI score is calculated as a product of frequency and severity. Each of these symptoms is scored for frequency (of 4), severity (of 3) and distress (of 5).

Frequency is rated in the following way:

1 - Occasionally – occurring less than once a week

2 - Often – occurring around once a week

3 - Frequently – occurring many times in a week but not on a daily basis

4 - Very frequently – occurring daily or continuously present

Severity is rated in the following way:

1 - Mild – producing little distress to the patient

2 - Moderate –disturbing the patient more but the caregiver can redirect it

3 - Severe – disturbing the patient very much and is difficult for caregiver to redirect

The score for each domain is the product of frequency and severity.

In the present study, the tool was used to screen stroke survivors for psychopathology.

5. Hamilton Depression Rating scale [232]

The HDRS (also known as the Ham-D) is the most widely used clinician-administered depression assessment scale. Main purpose is to assess the severity of, and change in, depressive symptoms. The original version contains 17 items (HDRS17) pertaining to symptoms of depression experienced over the past week. The HDRS was originally developed for hospital inpatients, thus the emphasis on melancholic and physical symptoms of depression. For the HDRS17, a score of 0–7 is generally accepted to be within the normal range (or in clinical remission), while a score of 20 or higher indicating at least moderate severity.

6. The Modified Barthel Index (MBI) [233]

The MBI assesses 10 activities of daily living (ADL) and mobility domains: personal hygiene, bathing, feeding, toilet, stair climbing, dressing, bowel control, bladder control, ambulation and wheelchair mobility and transfers. Each item is scored numerically based on the extent of assistance the person requires. A maximum numerical score of 100 can be obtained. Scores of 0–24 denote total dependency, 25–

49 severe dependency, 50–74 moderate dependency and 75–90 little dependency. Internal consistency and validity of the MBI is well established as excellent.

7. Family Need Questionnaire (FNQ) [234]

The tool is modified version of family need questionnaire (FNQ) Serio et al. (1997). The FNQ consists of 40 items reflecting commonly reported family needs. It provides information regarding the extent to which these needs are perceived to be important. The questionnaire is a four-point rating scale in which caregiver has to rate the needs items related to caregiving of stroke patients at Not important (1), Slightly important (2), Important (3) and Very important (4). 40 Items are grouped into six independent scales, namely: Health information (HI, 12 items), Emotional support (ES, 8 items), Instrumental support (IS, 5 items), Professional support (PS, 7 items), Community support network (CSN, 7 items), and Involvement in care (IC, 1 items). The FNQ has total score range of 40-160 and score further categorized in four categories: 'Not Important (0-40)', 'Slightly important (41-80)', 'Important (81-120)' and 'Very important (121-160)'. Obtaining higher score indicates more importance of a particular need in a particular domain.

8. Zarit Burden Interview Schedule (ZBIS) [235]

It is designed by Steven H Zarit (USA), to reflect the stresses experienced by caregivers of disabled patients. It is 5-point rating scale ranging from never (0), rarely (1), sometimes (2), quite frequently (3), or nearly always (4). The domains of ZBIS include 'burden in relationship' (6 items), 'emotional well-being' (7 items), 'social and family life' (4 items), 'finances' (1 item), 'loss of control over one's life' (4 items). 'Personal strain' (12 items) and 'role strain' (6 items). Getting high score in a particular domain indicates higher burden.

9. The Coping Checklist (CCL) [236]

The coping checklist (CCL) of Rao, Subbakrishna and Prabhu (1989) was used in the study. It is a comprehensive list of 70 items which has been grouped under 7 categories: Problem-Solving (10 items), Distraction Positive (14 items), Distraction Negative (9 items), Acceptance (11 items), Religion/Faith (9 items), Denial/Blame (11 items), and Social Support (6 items). Items are scored dichotomously (Yes/No) indicative of the presence or absence of a particular coping behaviour with a total score range of 0-70. Getting a high mean score indicates more use of that particular coping strategy. The validity of the scale was established through experts' opinions in the field of nursing and psychiatry.

10. The World Health Organization Quality of Life (WHOQoL BREF)[237]

WHO has devised this questionnaire to measure health-related quality of life (HRQoL). The questionnaire consists of 26 items categorized under 4 domains namely Physical (7 items), Psychological (6 items), Social relationship (3 items), and Environment (8 items). Obtaining higher score on domains indicate a good quality of life and vice versa.

RESULTS

STATISTICAL ANALYSIS

Collection and analysis of data

The collected information on all the variables was entered into a Microsoft Excel sheet and data corrections were done. Statistical analysis was done using SPSS software version 26. The data includes both qualitative data and quantitative data. The normality assumptions for the data were done using both histogram and normal PP plot for age and stroke severity scores. It is found that the data is of normal distribution. Hence parametric tests were administered. Descriptive statistics such as frequency, percentage, mean and standard deviation were used for clinical variables. Mean and standard deviation values were determined for all the continuous quantitative data. For inferential statistical analysis, to analyze the data based on the various impairments the data was divided into two groups.

Based on disability- High functional group (MRS score 0-2) and low functional group (MRS score 3-5) Physical disability was assessed using Modified Rankin Scale. The FDA accepted dichotomous cutoffs of 0–2 vs 3–6 approach for the mRS as the primary outcome measure for subsequent acute stroke trials. A score of 6 on mRS scale indicates death. And they are not included in the study.[429]

Based on cognitive impairment – Normal (ACE score <81) impaired (ACE score >82 (lower threshold) or 88/100).[430]

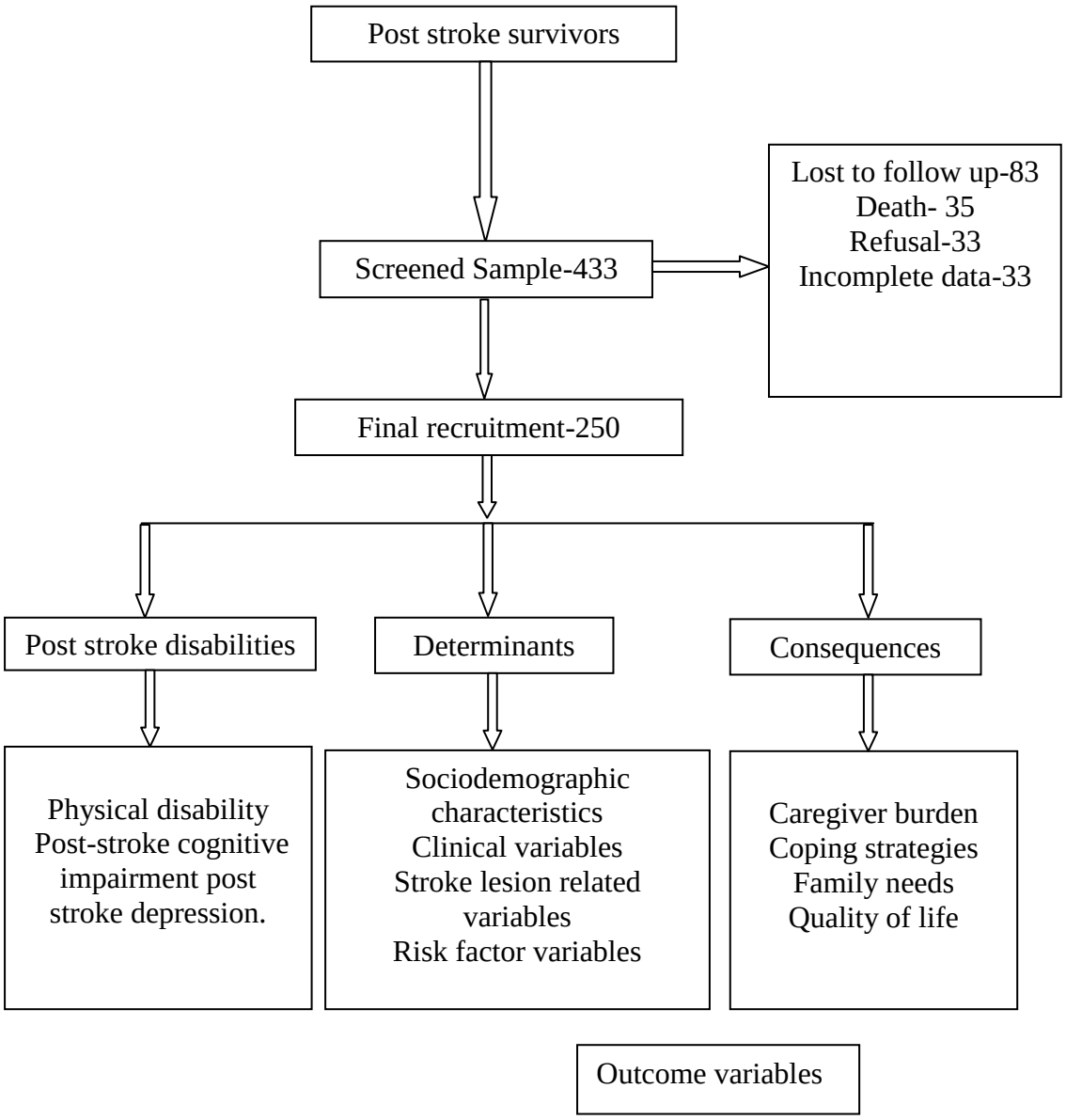
Based on with and without depression. (Hamilton Depression rating scale score <9 is considered as no depression and scores> 10 are considered as suffering from depression).[431]

To test the difference between the two groups, a chi-square test for qualitative data and a student t-test for two independent variables were used. Correlation is a statistical measure expressing the strength of the relationship between the two variables. The correlation coefficient r quantifies the strength of the relationship. Correlations are tested for statistical significance. + indicates a positive correlation. And – indicates a negative correlation. The square of the correlation coefficient r^2 (coefficient of determination) was evaluated in correlations representing the fraction of variation in one variable which is dependent on the other variable. Pearson correlation is used in the current study.

To predict or estimate the value of dependent variables, in our study physical disability, cognitive impairment and post-stroke depression (psychological impairment) corresponding to independent variables (predictors) like sociodemographic characteristics, clinical variables, stroke lesion variables and vascular risk factor variables, both linear regression analysis and logistic regression analysis were applied in the study.

The outcome variables were also correlated and regressed with the consequences of stroke like the caregiver burden, family needs, coping strategies, stroke impact and quality of life. A p-value of 0.05 is set as statistically significant. All the analyzed interpretation data are presented as tables and bar charts wherever appropriate.

Conceptual framework of the study:



RESULTS

The study was conducted in a tertiary teaching hospital with 250 stroke survivors. Keeping in line with the objective of the study, the determinants and consequences of the post stroke disability, post stroke cognitive impairment and post stroke depression are presented in the following manner

X.1. Sample Characteristics

X.2 Post-stroke Disability

X.2.1 Post-stroke Disability chi-square tables

X.2.2 Post-stroke Disability Correlations

X.2.3 Post-stroke Disability Regression

X.3 Post-stroke Cognitive impairment

X.3.1 Post-stroke Cognitive impairment chi-square tables

X.3.2 Post-stroke Cognitive Impairment Correlations

X.3.3 Post-stroke Cognitive Impairment Regression

X.4 Post-stroke depression

X.4.1 Post-stroke depression chi-square tables

X.4.2 Post-stroke depression Correlations

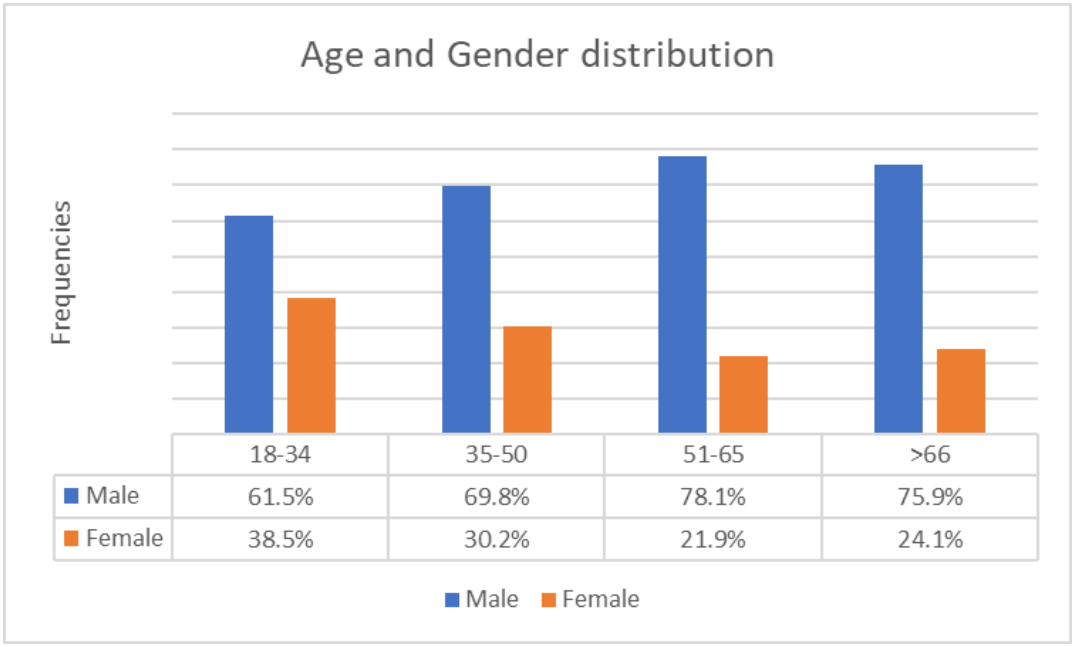
X.4.3 Post-stroke depression regression

X.1. Sample Characteristics

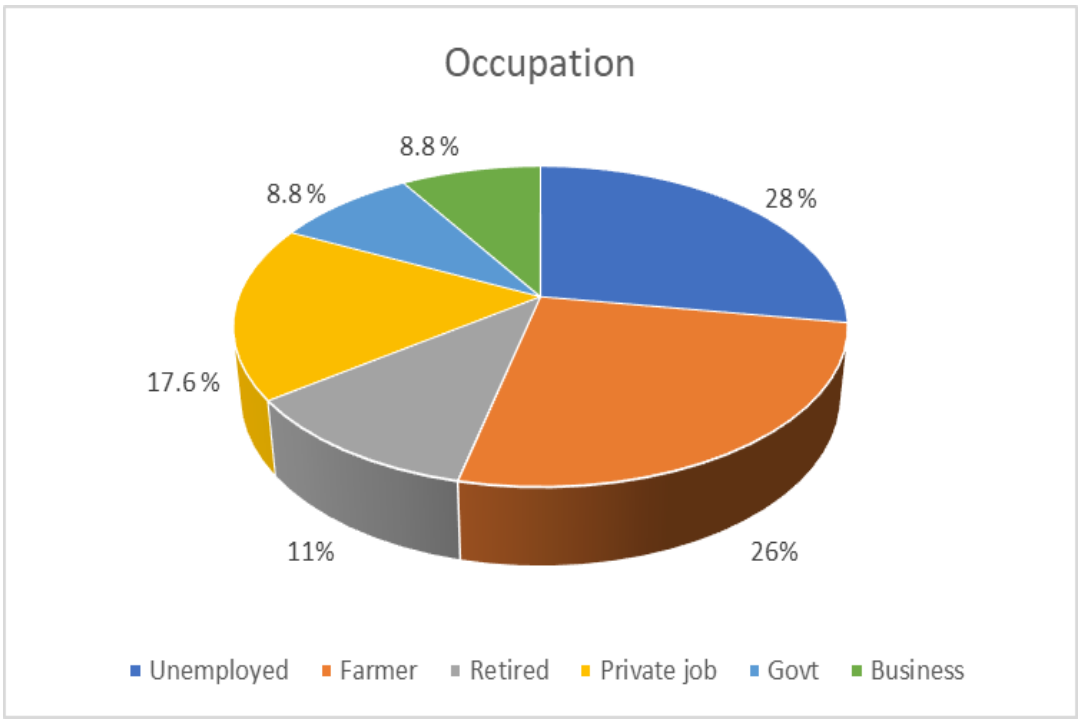
Table 7: Socio-demographic characteristic profile of stroke survivors (N=250).

Socio-demographic characteristics	Categories	Frequency	Percent	Cumulative Percent
Age group in years	18-34	13	5.2	5.2
	35-50	53	21.2	26.4
	51-64	105	42	68.4
	>66	79	31.6	100
Gender	Male	187	74.8	74.8
	Female	63	25.2	100
Marital status	Married	221	88.4	88.4
	Others	29	9.8	88.8
Religion	Hindu	219	87.6	87.6
	Others	31	12.4	99.2
Education	Illiterate	32	12.8	12.8
	High school	85	34	46.8
	10th Grade	33	13.2	60
	12th Grade	28	11.2	71.2
	UG Degree	65	26	97.2
	PG Degree	7	2.8	100
Occupation	Unemployed	69	28	33
	Farmer	65	26	53.6
	Retired	28	11.2	64.8
	Private sector	44	17.6	82.4
	Government	22	8.8	91.2
	Business	22	8.8	100
Socio-economic status	Lower	16	6.4	6.4
	Lower Middle	104	41.6	48
	Upper Lower	117	46.8	94.8
	Upper Middle	13	5.2	100
Residence	Rural	141	56.4	56.4
	Urban	109	43.6	100
Hypertension	Present	173	69.2	69.2
Diabetes	Present	82	32.8	32.8
Dyslipidemia	Present	49	19.6	19.6
Cvd	Present	32	12.8	12.8
Tobacco use	Present	112	44.8	44.8
Alcohol use	Present	136	54.4	54.4
Family history	Present	104	41.6	41.6
Vitamin B12 levels	Vit B12 deficiency	54	21.6	21.6
Homocysteine levels	Normal	167	66.8	66.8
	Increased	83	33.2	87.6

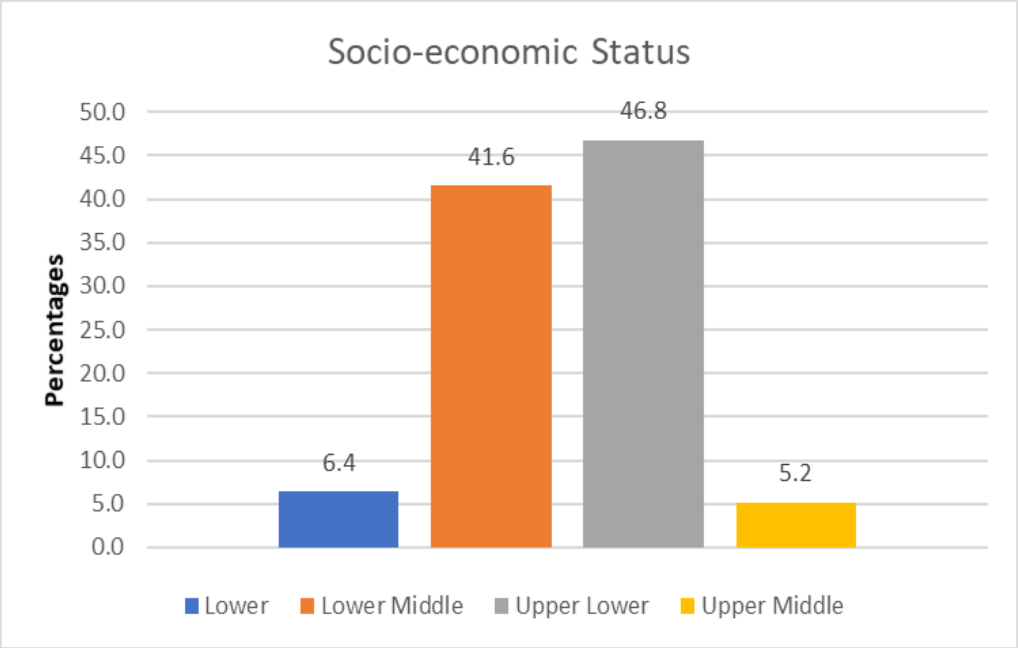
Graph 1: Age and gender wise distribution of the study group.



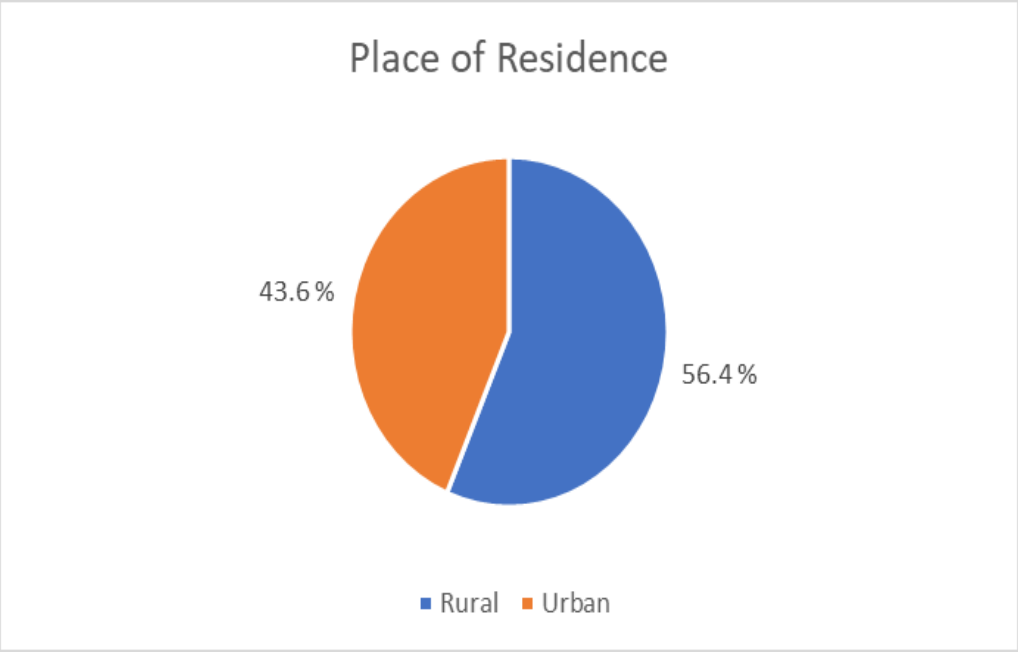
Graph 2: Occupation wise distribution of study group



Graph 3: Socio-economic status wise distribution of study group.



Graph 4: Residence wise distribution of study group.



Graph 5: Presence of risk factors among the study group

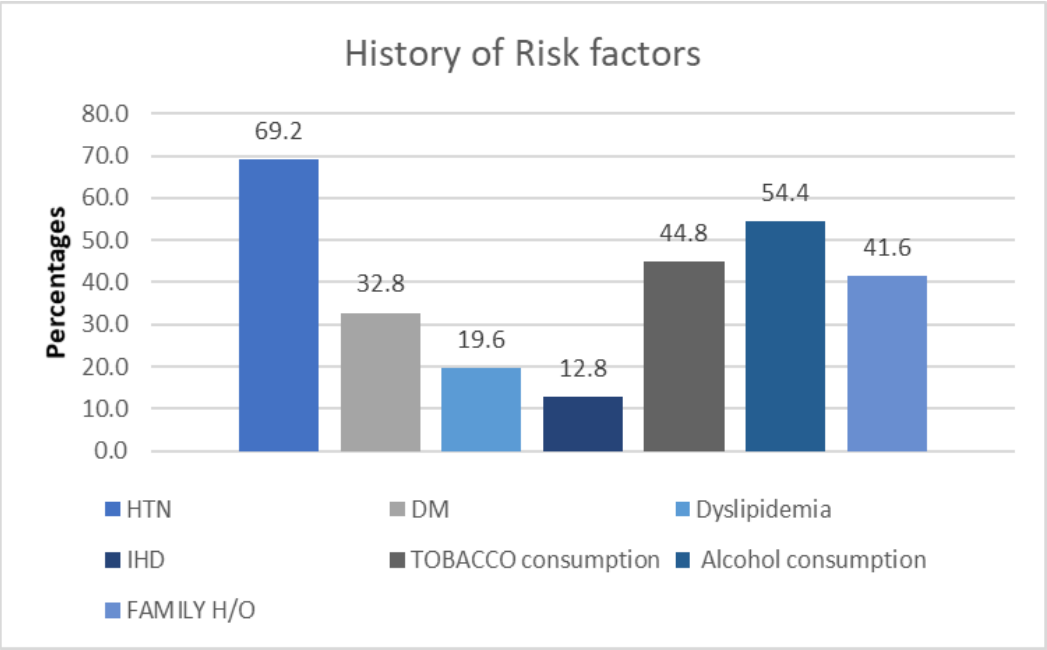


Table 9 and graphs1-5 explains about the sociodemographic characteristics and risk factor profile of all the stroke survivors. Out of the 250 stroke survivors in the study group, the majority of those affected by stroke were aged between 51-65 years, accounting for 42% of cases. The next most affected age group was 66 years and above. The average age of the study population was 58.7± 13.537. In the study group, the majority of subjects were males making up 74% and male to female ratio is 2.9:1. Majority of them were Hindus and married. In terms of education within the study group, 12.8% were unable to read or write, while 34% had completed high school, and 28% had achieved a university degree. Most participants (56.4%) came from rural areas.

According to the occupation of the stroke survivors, the highest percentage of stroke survivors are without employment, including housewives which is 28%, followed by farmers at 26%. Socio-economic status as measured by Modified Kuppuswamy classification (updated in 2020) shows that 46.4% of the group belong

to the upper lower socioeconomic group, while 41.6% belong to the lower middle group. Most of the participants in the study (56.4%) were from rural areas, with the remaining 43.6% residing in urban areas.

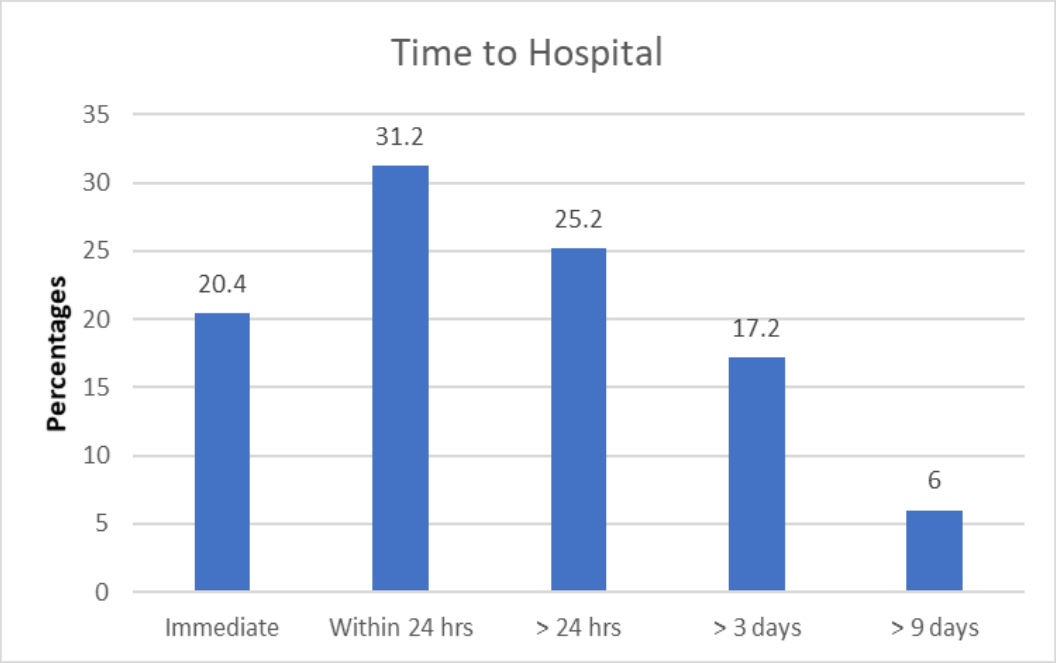
Among the risk factors for stroke, it was found that 69.2% had preexisting hypertension, and 32.8% had diabetes mellitus. Dyslipidemia was found in 32.8%, and the use of tobacco was seen in 44.8% of the individuals. Alcohol addiction was found in 54.4% of individuals. Cardiovascular risk actors like ischemic heart disease were found in 12.8% of the individuals. family history of stroke was present in 41.6% of the study subjects.

Biochemical examination of the patients with the acute first episode during admission period, revealed that Vitamin B12 deficiency was noted in 22% of the patients. Vitamin B12 is one of the lesser-known factors contributing to stroke risk. Another risk factor for stroke especially in persons with hypertension is the increase in levels of homocysteine in the blood. In the current study moderately increased levels of homocysteine was found in 21% of the individuals and intermediately high in 11% of the patients and abnormally high in 4% patients.

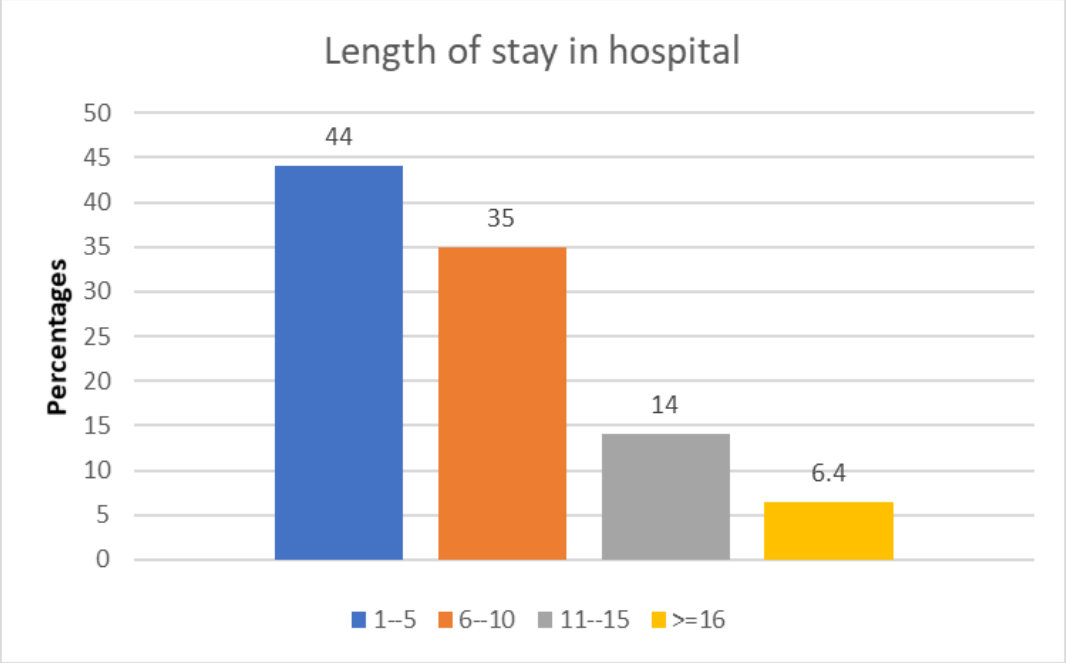
Table 10: Clinical characteristics of stroke survivors (N=250)

Variables	Categories	Frequency	Per cent	Cumulative percent
Arrival at the hospital	Immediate	51	20.4	20.4
	Within 24 hrs	78	31.2	51.6
	> 24 hrs	63	25.2	76.8
	> 3 days	43	17.2	94
	> 9 days	15	6	100
Length of stay (in days)	1-5	110	44	44
	6-10	89	35.6	79.6
	11-15	35	14	93.6
	≥16	16	6.4	100
Complications	No	211	84.4	84.4
	Yes	39	15.6	100
Type of stroke	Ischaemia	198	79.2	79.2
	Haemorrhage	52	20.8	100
Side of stroke	Right	124	49.6	49.6
	Left	109	43.6	93.2
	Bilateral	17	6.8	100

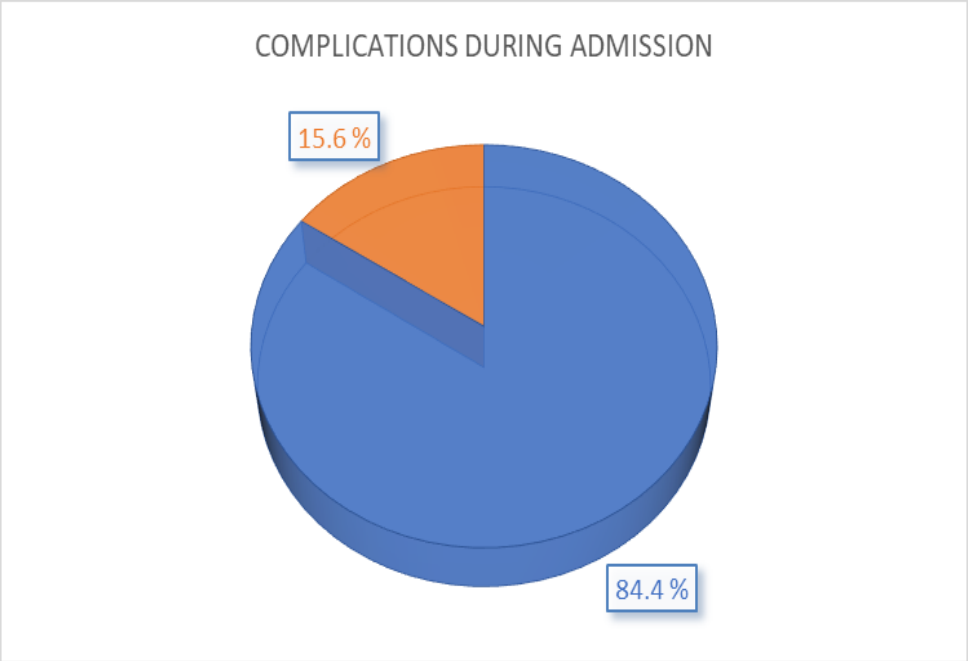
Graph 6: Time of arrival to hospital after acute stroke incident



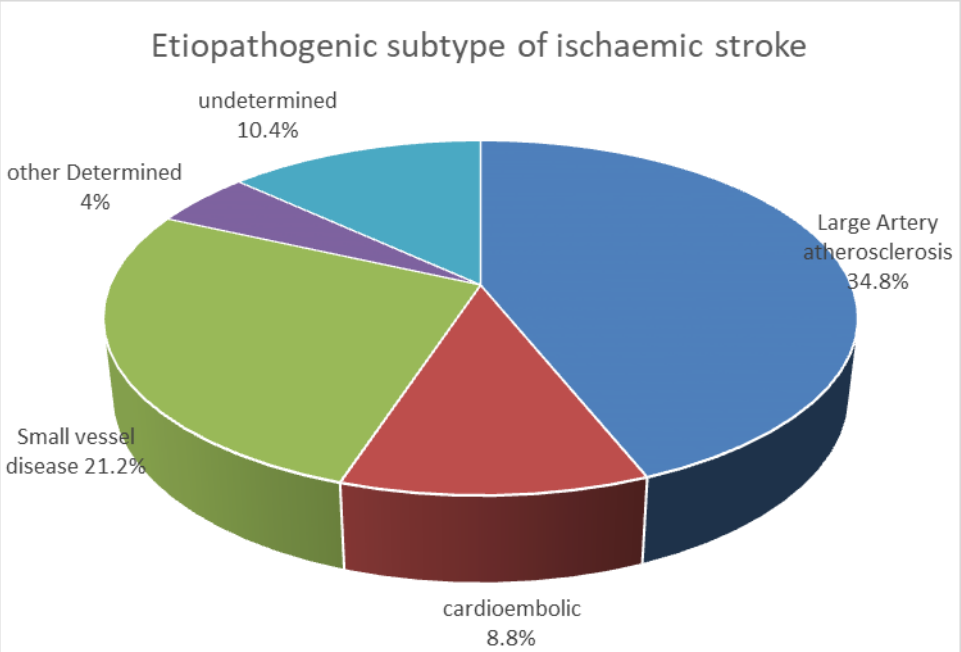
Graph 7: Distribution of length of stay in the hospital after acute stroke incident.



Graph 8: Distribution of presence of complications during admission



Graph 9: Distribution of Etiopathogenic subtype of ischaemic stroke.



Further analysis of the etiologic subtype of ischaemic strokes as per TOAST criteria, revealed that majority of the subtype is of Large artery atherosclerosis (34.8%), small vessel disease (21.2%) and cardio-embolic type (8.8%) in the study group.

Graph 10: Distribution of side of the brain involved in stroke

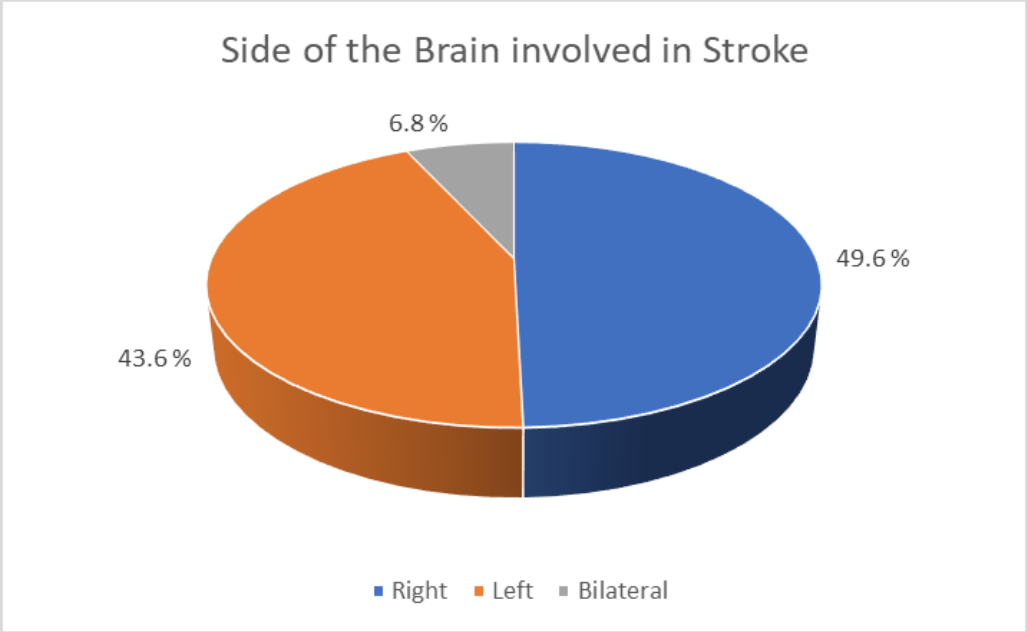


Table 10 and graphs 6-10 explains about the various stroke related variables among the stroke survivors. After the acute onset of first episode of stroke, 20% of the patients were brought to the hospital immediately and 31% received emergency care in the hospital within 24 hours. It was seen that 49% of the acute stroke patients came to hospital after more than 24 hours of onset of the acute stroke episode. Delay in hospitalization and emergency stroke management can result in deficits with subsequent disability.

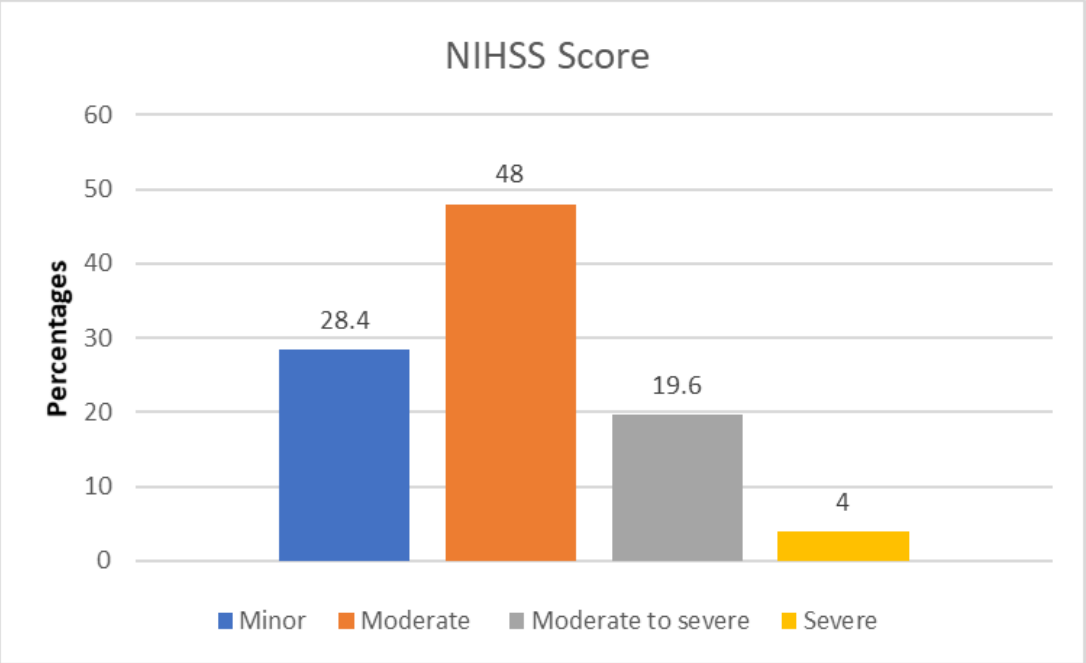
The length of stay in the hospital is the duration of a single episode of hospitalization. Decreased length of stay is associated with decreased risks of opportunistic infections, complications and side effects of medication, with improvements in treatment. In the current study, 44% of persons with acute stroke were discharged within a week and 35% stayed upto 10 days and only 6% stayed beyond 15 days. it also indicates the severity of the stroke and development of any complications during admission.

Complications during admission were noted in 17.6% of the stroke patients. the complications included delirium, recurrent stroke, urinary tract infections etc. In the current study, the most common type of stroke seen is the ischaemic type (79%) and 21% is haemorrahagic type of stroke. Right-sided stroke lesions were more common (49.6%) than the left sided stroke lesions (43.6%) and bilateral brain involvement was seen in 7% of the patients.

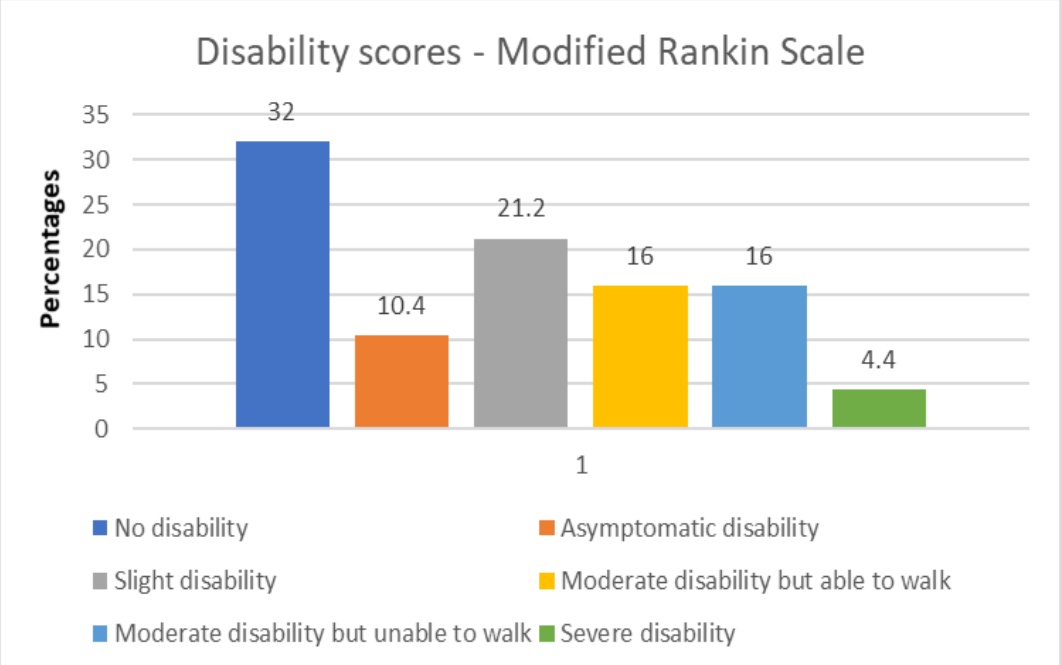
Table 11: Stroke severity, MRS, ACE, BDI and ZBI-wise distribution (N=250)

Variable	Categories	Number	Percent	Cumulative percent
NIHSS	Minor	71	28.4	28.4
	Moderate	120	48	76.4
	Moderate to severe	49	19.6	96
	Severe	10	4	100
MRS	No disability	80	32	32
	Asymptomatic disability	26	10.4	42.4
	Slight disability	53	21.2	63.6
	Moderate disability but able to walk	40	16	79.6
	Moderate disability but unable to walk	40	16	95.6
	Severe disability	11	4.4	100
ACE	Normal	126	69.2	69.2
	Cognitive impairment	56	30.7	100
BDI	Normal	25	10	10
	Slight	88	35.2	45.2
	Moderate	87	34.8	80
	Severe	40	16	96
	Total	10	4	100

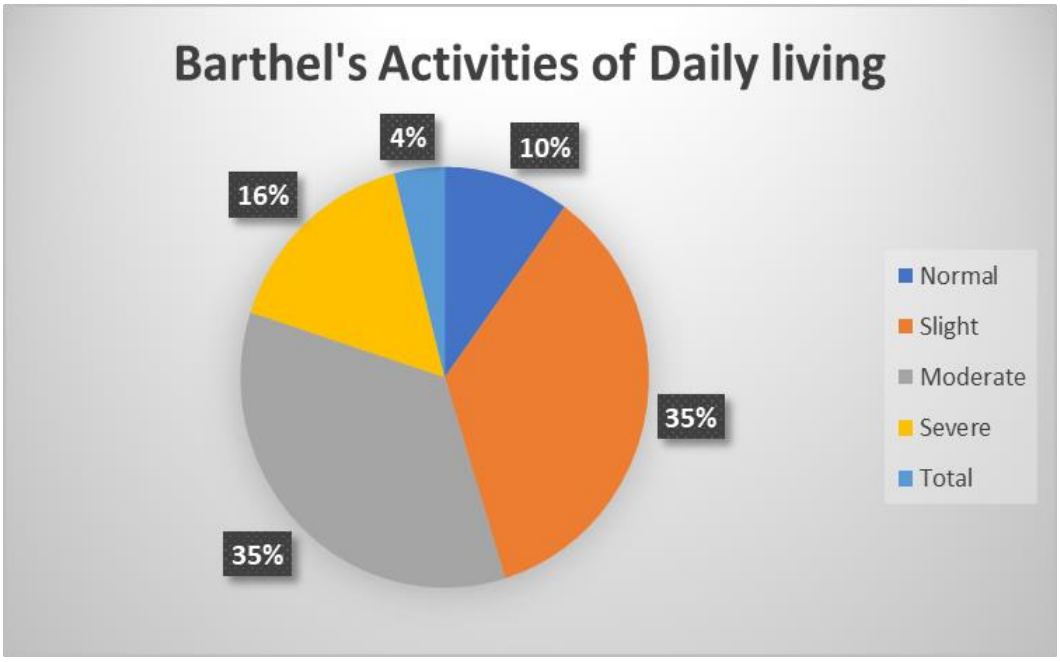
Graph 11: Distribution of stroke severity of the stroke survivors



Graph 12: Distribution of disability among the stroke survivors



Graph 13: Distribution of dependence on activities of daily living among study group.



Graph 14: Distribution of cognitive impairment among study group.

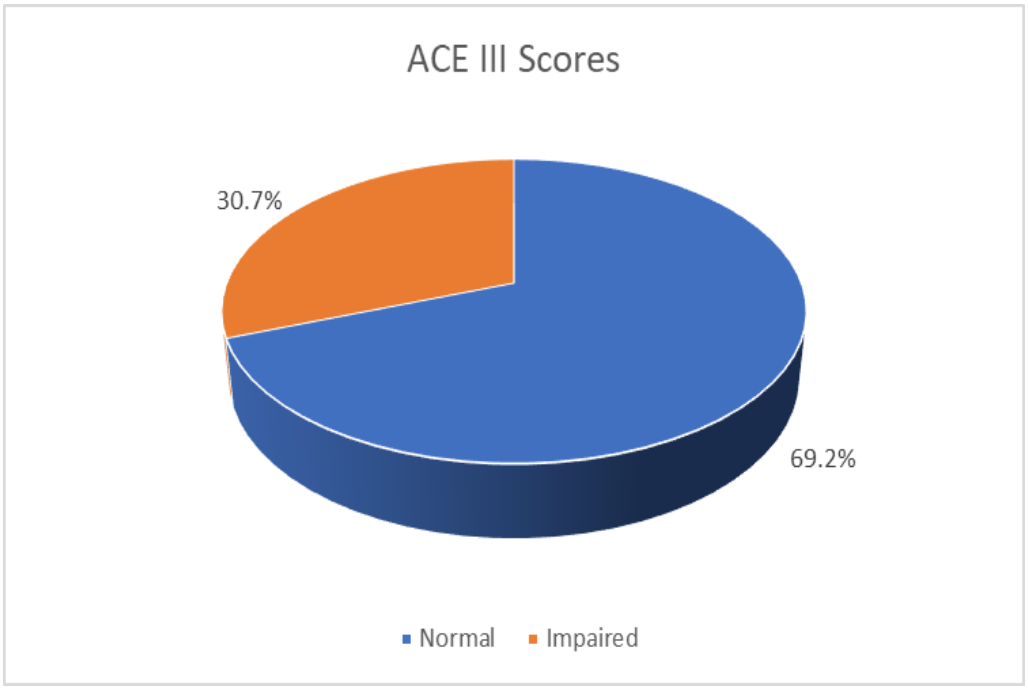


Table 11 and Graphs 11-14 explains about stroke severity and the disabilities and functional dependence. Stroke severity was measured during the admission period using NIHSS scale. Moderate severity was found in 48% of the patients with acute first episode of stroke. Stroke severity was minor in 28% of the study subjects and severe in 24% of the patients.

Disability due to stroke was assessed using the Modified Rankin Scale. There was no disability in 32% of the patients with acute first episode of stroke. Asymptomatic disability in 10% of the individuals, slight disability in 21%, 16% had moderate disability but able to walk, moderate disability but unable to walk are 16% and severe disability in 4%.

Assessment of functional independence in activities of daily living using BDI at 3 months, the results seen are total dependence in 4% of stroke survivors, severe dependence in 16% of stroke survivors, moderate dependence in 35%, slight dependence in 35% and normal activities of daily living in 10% of the individuals.

Assessment of cognitive impairment was done using the Addenbrookes Cognitive Examination III. Results show that 30.7 per cent had impaired scores.

Table 12: Distribution of psychological impairment in the study group

variable	categories	Frequency	Percent	Cumulative Percent
Agitation	Yes	76	30.4	30.4
	No	174	69.6	100
Depression	Yes	68	27.2	27.2
	No	182	72.8	100
Anxiety	Yes	30	12	12
	No	220	88	100

Graph 15: Distribution of psychological impairment in the study group

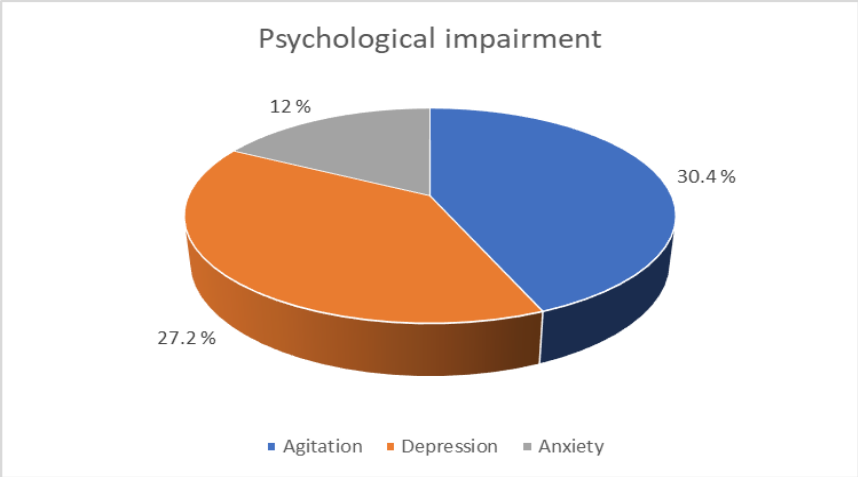


Table 12 and Graph 15 describes the neuropsychiatric disorders after stroke. Neuropsychiatric Inventory (NPI) was used to obtain information on the presence of psychopathology in the current study. Agitation or aggressive behaviours were noted in 30.4% of the stroke survivors. Depression was found in 27.2% of the individuals. Anxiety noted in 12 % of the stroke survivor. There was a patient who developed delusions and Hallucinations but the patient did not survive beyond 4 months. Care giver distress using NPI was not assessed in the current study.

Table 13: Hamilton Depression Rating scale scores- Severity of depressive symptoms.

HAD score	Depression level	Frequency	Percent	Cumulative Percent
10-13	Mild	11	16.1	16.1
14-17	Mild to moderate	25	36.7	52.8
>17	Severe	32	47.1	100
Total		68	100	100

Graph 16: Hamilton Depression Rating scale scores- Severity of depressive symptoms.

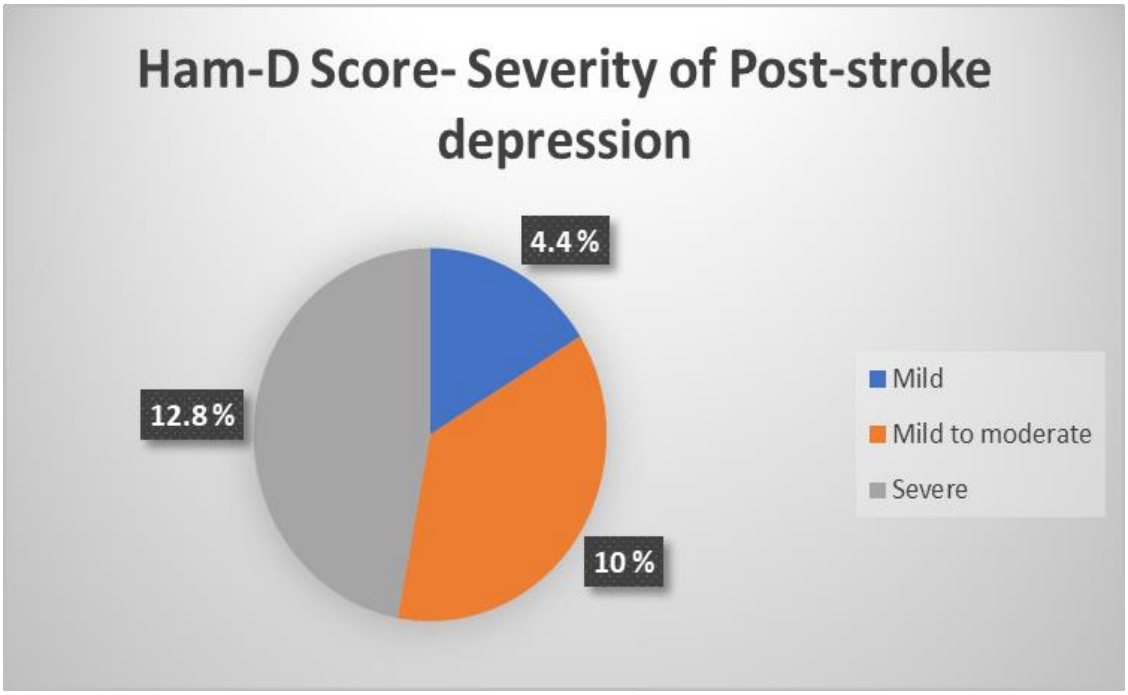


Table 13 and Graph 16 describes the post stroke severity. The HDRS (also known as the Ham-D) is the most widely used clinician-administered depression assessment scale. Main purpose is to assess the severity of, and change in, depressive symptoms. In the current study, the focus was on the Post-stroke depression than on

any other psychological symptoms. Hence, after screening post stroke survivors with NPI, stroke survivors were evaluated with HAM-D to assess for severity of depressive symptoms.

Based on the above results it can be said that post-stroke depression is seen in 27.2% of the stroke survivors and among them 4.4% had mild depression, 10% moderate depression and 12.8% had severe symptoms. It is also difficult to separate symptoms of depression with behavioral problems associated with cognitive impairment, as both are coexisting in the study sample.

Table 14: Association between the etiologic subtype of stroke as per Toast criteria and disability, cognitive score and presence of depression

variable		Etiopathogenesis subtype					Chi-square value	df	p value
		Toast 1	Toast 2	Toast 3	Toast 4	Toast 5	37.366a	25	0.053*
Disability	Asymptomatic	8 (30.8%)	1(3.8%)	5(19.2%)	1(3.8%)	4(15.4%)			
	No disability	23(28.4%)	9(11.1%)	28(34.6%)	4(4.9%)	10(12.3%)			
	Slight disability	19(35.8%)	3(5.7%)	9(17%)	3(5.7%)	7(13.2%)			
	Moderate disability but able to walk	17(42.5%)	3(7.5%)	9(22.5%)	1(2.5%)	2(5%)			
	Unable to walk	14(35.9%)	5(12.8%)	2(5.1%)	1(2.6%)	2(5.1%)			
Cognitive scores	Normal	42(33.3)	9(7.1)	28(22.2)	9(7.1)	18(14.3)	12.444a	5	0.029*
	Impaired	19(33.9)	6(10.7)	12(21.4)	1(1.8)	1(1.8)			
PSD	Present	31(45.6%)	4(5.9%)	12(17.6%)	1(1.5%)	4(5.9%)	8.245a	5	0.143
	Absent	56(30.8%)	18(9.9%)	41(22.5%)	9(4.9%)	22(12.1%)			
Total		87(34.8%)	22(8.8%)	53(21.2%)	10(4%)	26(10.4%)			

*p value<0.05 considered as significant

The results from the above table infer that the etiological subtype of stroke as per Toast criteria, are significantly associated with physical disability and cognitive scores in the post-stroke survivors. The presence of post-stroke depression is not significantly associated with stroke subtype.

X.2 Post-stroke Disability

X.2.1 Post-stroke Disability chi-square tables

Table 15: Association between socio-demographic characteristics with disability group based on MRS Score.

Variables	Groups	Disability group		Chi-square	df	P value
		High functional n=160(%)	Low functional n=90(%)			
Age in years	18-35	13(8.2)	1(.6)	11.119	3	0.01*
	36-50	33(20.6)	20(22.2)			
	51-65	71(44.4)	34(37.8)			
	>65	43(26.8)	36(40)			
Gender	Male	123(76.8)	64(71.1)	1.015	1	0.31
	Female	37(23.2)	26(22.9)			
Marital status	Married	141(88.1)	81(90)	2.933	2	0.23
	Others	19(11.9)	9(10)			
Religion	Hindu	137(85.6)	82(91.8)	1.596	1	0.2
	others	23(14.4%)	8(8.2)			
Education	Illiterates	17(10.6)	15(16.7)	8.176	5	0.14
	Primary	53(33.1)	32(35.6)			
	Secondary	21(13.1)	12(13.4)			
	PUC	20(12.5)	8 (8.8)			
	Degree	47(29.4)	18 (20)			
	PG	2(1.3)	5 (5.5)			

Occupation	Unemployed	10(6.2)	4 (4.4)	8.22	6	0.22
	Housewife	30 (18.7)	25(27.7)			
	Farmer	40 (25)	25 (27.7)			
	Retired	15 (9.4)	13 (14.4)			
	Private job	34 (21.3)	10 (11.1)			
	Government	15 (9.4)	7 (7.7)			
	Business	16(10)	6(6.6)			
Socioeconomic status	Lower	9 (5.6)	7 (7.7)	1.73	3	0.63
	Lower middle	63 (39.4)	41(45.5)			
	Upper lower	79 (49.4)	38 (42.3)			
	Upper middle	9 (5.6)	4 (4.4)			
Place of residence	Rural	91 (56.8)	50(55.5)	0.041	1	0.84
	Urban	69 (43.2)	40 (45.5)			
Hypertension	Present	107(66.8)	66(73.3)	1.127	1	0.28
Diabetes	Present	56 (35)	26(28.8)	0.976	1	0.32
Dyslipidemia	Present	35 (21.8)	14 (15.5)	1.46	1	0.22
Cvd	Present	21(13.2)	11(12.2)	0.042	1	0.83
Tobacco use	Present	65 (40.6)	47 (52.3)	3.133	1	0.07
Alcohol use	Present	85 (53.2)	51(56.6)	0.291	1	0.58
Family h/o	Present	92(57.5)	54(60)	0.148	1	0.7
Vit B12 deficiency	Present	40(25)	14(15.6)			
Homocysteine	Increased	58(36.3)	25(27.7)	3.703	3	0.295

*p value<0.05 considered as significant

Table 14 explains about the association of various sociodemographic variables with a post-stroke disability based on MRS score. The study group was divided into two groups based on the Modified Rankin scale score. The two groups are MRS with a low score (0-2) and MRS with a high score (3-5).

It is seen that there is a significant positive association between different age groups and MRS score (χ^2=11.119, p value<0.05). The other sociodemographic variables like gender ($\chi^{2=}$1.0150, p value=0.31), marital status (χ^2=2.9330, p

value=0.23), education level (χ^2=8.1760, p value=0.14) occupation (χ^2=8.2200, p value=0.22), socioeconomic status (χ^2 =1.730, p value=0.63), place of residence (rural/urban) (χ^2 =0.0410, p value=0.84) and site of lesion, did not show any statistically significant association with post-stroke disability. In the current study, no statistically significant association was found between disability and hypertension (χ^2 =1.1270, p value=0.28), diabetes mellitus (χ^2=0.9760, p value=0.32), dyslipidemia (χ^2=1.460, p value=0.22), presence of cardiovascular disorders like IHD (χ^2=0.042, p value=0.83). No significant association found between modifiable risk factors like tobacco (χ^2=3.133, p value=0.07) and alcohol consumption (χ^2=0.291, p value=0.58), and family history of stroke (χ^2=0.148, p value=0.70).

There appears to be no significant statistical association between disability and several biochemical changes, including Vitamin B12 deficiency (χ^2=3.0340, p value=0.08), homocysteine levels (χ^2=3.7030, p value=0.29).

Table 16: Association between Clinical characteristics with disability group based on MRS Score.

Variables	Groups	Disability group		Chi-square	df	P value
		High functional n=160(%)	**Low functional n=90**(%)			
Time of arrival at the hospital	Immediate	30(18.7)	21(23.4)	2.099	4	0.71
	Within 24 hrs	48(30)	30(33.4)			
	> 24 hrs	41(25.6)	22(24.4)			
	> 3 days	31(19.3)	12(13.3)			
	> 9 days	10(6.4)	5(5.5)			
Length of stay	1--5	84 (52.5)	26 (28.8)	29.021	3	0.001*
	6--10	59(36.8)	30(33.4)			
	11--15	13 (8.2)	22(24.4)			
	>=16	4 (2.5)	12(13.3)			
Complications	No	145(90.6)	66(73.3)	13.081	1	0.001*
	Yes	15(9.4)	24(26.7)			
Type of stroke	Ischaemia	134(83.7)	64(71.1)	5.585	1	0.018*
	Haemorrhage	26(16.3)	26(28.8)			
Side of the lesion	Right	77(48.2)	47(52.2)	1.813	2	0.404
	Left	74(46.2)	35(38.8)			
	Bilateral	9 (5.6)	8 (8.8)			
Stroke severity	Mild	68(42.5)	3(3.3)	70.332	3	0.001*
	Moderate	77(48.1)	43(47.8)			
	Moderate to severe	11(6.9)	38(42.2)			
	Severe	4(2.5)	6(6.7)			

*p value<0.05 considered as significant

Table 15 describes about the association between clinical variables of the first episode of stroke with post-stroke disability. There is no significant association between whether the patient with an acute episode of stroke was brought immediately or there was a time gap between the onset of stroke and emergency management of stroke (χ^2=2.099, p value=0.71). A significant association exists between length of stay (χ^2=29.021, p value<0.05) and disability. The other clinical variables significantly associated with disability are complications developed during admission period (χ^2=13.081, p value<0.05).

The study found a significant link between the type of stroke and the level of disability experienced by patients. Specifically, the most common type of stroke observed in the study - ischaemic stroke - was associated with disability (χ2=5.585, p value<0.05). However, there was no statistically significant association between the side of the lesion (χ2=1.813, p value=0.40).

Among the high functional group, 42.5% had a mild NIHSS score, 48.1% had a moderate score, 6.9% reported moderate to severe, and 2.5% had a severe score, as measured by NIHSS. In the low functional group, 3.3% had mild severity, 47.8% had moderate severity, 42.2% had moderate to severe severity, and 6.7% had severe severity, as per NIHSS score. The results indicate that there is a statistically significant association between stroke severity at the time of admission and residual disability (χ^2= 70.332, p value < 0.05).

Table 17: Association between Activities of Daily living (functional disability) with disability group based on MRS Score.

Variables	Groups	Disability group		Chi-Square	df	P value
		High functional n=160(%)	Low functional n=90(%)			
BDI	Total	0	10(11.1)	151.679	4	0.001*
	Severe	1(0.6)	39(43.3)			
	Moderate	46(28.7)	41(45.6)			
	Slight	88(55)	0			
	Normal	25(15.6)	0			
ZBI	No Burden	39(24.4)	0	225.017	3	0.001*
	Mild	117(73.1)	2(2.2)			
	Moderate	3(1.9)	45(50)			
	Severe	1(0.6)	43(47.8)			

*p value<0.05 considered as significant

Table 16 describes the association of activities of daily living with disability. The functional disability of stroke survivors was assessed based on their ability to perform daily activities. In the low functional group, 11% were completely dependent on family members, 45.6% had moderate dependence, and 43.3% had severe dependence. In contrast, the high functional group had a higher degree of independence, with 15.6% being completely independent, 55% having slight dependence, 28.7% having moderate dependence, and only 0.6% having severe dependence. These differences were found to be statistically significant, with a chi-square value of 151.679 and a p value of less than 0.05.

Based on the results, 24.4% of the high functional group did not experience caregiver burden. Mild caregiver burden was noted in 73% of the high functional group and 2.2% of the low functional group. Moderate burden was observed in 3% of the high functional group and 50% of the low functional group. Severe caregiver burden was seen in 47.8% of the low functional group and only 0.6% of the high functional group. These findings are statistically significant, with a chi-square value of 225.017 and a p value less than 0.05.

X.2.2 Post-stroke Disability Correlations

Table 18: Correlation of domains of burden, coping strategies, needs and quality of life with disability.

Variables	Categories	High functional n=160 Mean±SD	Low functional n=90 Mean±SD	r value	r^2 value	p-value
Caregiver burden Domains	ZBI	20.3±11.40	57.67±11.18	0.85	0.72	<0.01
	Burden in relationship	5.44±3.12	15.72±3.20	0.84	0.71	<0.01
	Emotional well being	6.18±3.69	17.76±3.74	0.83	0.69	<0.01
	Social& family life	3.47±2.36	10.52±1.77	0.84	0.71	<0.01
	Loss of control on one's life	4.2±2.25	11.13±2.19	0.83	0.69	<0.01
	Finances	1.01±0.65	2.53±0.60	0.76	0.57	<0.01
	Personal strain	10.46±6.02	31.71±6.17	0.86	0.74	<0.01
	Role strain	5.23±3.43	15.21±2.95	0.83	0.68	<0.01
Coping strategies domains	Problem solving	6.75±0.73	4.26±1.43	-0.76	0.57	<0.01
	Distraction positive	6.46±0.75	4.1±1.2	-0.77	0.59	<0.01
	Distraction negative	6.29±0.67	3.84±1.45	-0.76	0.57	<0.01
	Acceptance	6.37±1.03	4.21±1.28	-0.68	0.46	<0.01
	Denial	6.4±0.63	4.21±1.51	-0.71	0.51	<0.01
	Religion	6.86±0.78	4.83±1.60	-0.65	0.42	<0.01
	Social support	6.68±0.85	4.12±1.32	-0.76	0.58	<0.01
Family needs Domains	Health information	23.72±3.17	38.78±2.92	0.92	0.85	<0.01
	Emotional support	18.93±4.61	34.02±3.06	0.87	0.76	<0.01

	Instrumental support	10.23±3.07	21.36±2.88	0.87	0.76	<0.01
	Professional support	11.2±3.06	20.09±2.06	0.84	0.71	<0.01
	Community support network	8.88±2.29	16.58±1.56	0.87	0.76	<0.01
	Involvement in care	3.17±1.02	6.49±0.52	0.88	0.77	<0.01
Quality of life Domains	Physical	15.7±1.61	9.58±3.003	-0.80	0.64	<0.01
	Psychological	14.47±1.72	9.3±2.72	-0.76	0.58	<0.01
	Social	14.43±1.14	13.42±1.53	-0.35	0.12	<0.01
	Environment	14.52±1.06	12.57±1.44	-0.61	0.38	<0.01

*p value<0.05 considered as significant correlation

Table 17 describes the correlation of different domains of caregiver burden, coping strategies, family needs and quality of life with post stroke disability. The mean scores for all caregiver burden domains are higher in stroke survivors with low functional ability, indicating a higher burden for this group with p value<0.05. The overall burden for those in the high functional group is 20.3±11.403, which is significantly lower than the low functional group's burden of 57.67±11.182 (p value < 0.05). The coping strategies domains of the low functional group have significantly lower mean scores than those of the high functional group, with a p-value of less than 0.05.

The mean average scores for all family needs domains are significantly higher in the low functional group compared to the high functional group with p value< 0.05. The low functional group has significantly lower mean scores in all WHO QOL BREF domains compared to the high functional group, with a p value of less than 0.05. Correlation coefficient results show that there is strong positive correlation of all the domains with disability with significant p value.

X.2.3 Post-stroke Disability Regression

Table 19: Logistic regression analysis of Disability groups with socio-demographic characteristics

Variables	Categories	OR	95% CI		p-value
			Lower	Upper	
Age (Years)	> 65	1			0.26
	18 – 50	0.606	0.25	1.465	0.266
	51 – 65	0.556	0.274	1.128	0.104
Gender	Male	1			
	Female	1.392	0.404	4.795	0.601
Marital status	Others	1			
	Married	1.31	0.51	3.364	0.574
Religion	Others	1			
	Hindu	1.539	0.543	4.36	0.418
Education	PG	1			0.339
	Illiterates	0.29	0.029	2.955	0.296
	Primary	0.197	0.023	1.684	0.138
	Secondary	0.188	0.022	1.632	0.13
	PUC	0.156	0.018	1.324	0.089
	Degree	0.134	0.021	0.86	0.034*
Occupation	Business	1			0.644
	Unemployed	0.587	0.103	3.362	0.55
	Housewife	1.919	0.349	10.542	0.453
	farmer	1.016	0.264	3.903	0.982
	Retired	1.317	0.327	5.305	0.698
	Private job	0.601	0.157	2.301	0.458
	Government	0.71	0.144	3.493	0.673
Socioeconomic status	Upper Middle	1			0.345
	Lower	1.263	0.172	9.299	0.819
	Lower Middle	1.852	0.393	8.722	0.436
	Upper lower	1.03	0.193	5.499	0.973
Residence	Urban	1			
	Rural	0.948	0.491	1.831	0.873
Hypertension	No	1			
	Yes	1.376	0.764	2.478	0.287
Diabetes	No	1			
	Yes	0.769	0.422	1.4	0.391
Dyslipidemia	No	1			
	Yes	0.716	0.355	1.442	0.35

Cvd	No	1			
	Yes	0.991	0.429	2.289	0.982
Tobacco use	No	1			
	Yes	1.969	0.892	4.346	0.093
Alcohol use	No	1			
	Yes	0.703	0.316	1.565	0.388
Family h/o	No	1			
	Yes	0.931	0.541	1.604	0.798
Vitamin B12	Deficiency	1			
	Normal	1.267	0.329	4.876	0.731
Homocysteine levels	Increased	1			0.549
	Normal	0.555	0.005	64.906	0.809

*p value<0.05 considered as significant

Table 18 describes the logistic regression analysis of the disability group with sociodemographic characteristics and risk factors. Age- As compared to the age group> 65 years, the Odds of disability are 40% in the 18-50 years of age group. The odds of disability is 45% in the 51-65 years of age group. (OR=0.55, 95% CI 0.274-1.128) this is statistically not significant (p-value- 0.104) Gender - When compared to Males, the Odds of disability is 1.3 times higher in females (OR = 1.392, 95% CI 0.404- 4.795) which is not statistically significant with a p-value of 0.601.

Marital status- when compared to other marital statuses like a widower, or separated, the Odds of disability among the married subjects is 1.3 times higher. (OR =1.310, 95 %CI 0.51- 3.364) which is not statistically significant with a p-value 0. 574.Religion - Among the religion-wise, Hindus were found to have Odds of disability 1.5 times higher than the other religion groups.

Education - Among the education group, the odds of disability is 70% in the illiterate group, 80% in the primary group, secondary school group, 85% in the PUC group and 87% in persons with degree holders and statistically significant in Degree holders with p-value 0.03.

Occupation - Housewives have 1.9 times the Odds of disability, farmers, and retired persons have 1.3 times higher and 40% among private job holders and 30% among govt job holders. Occupation is not significantly associated with disability. **Socioeconomic status**- when compared with the upper middle class, the odds of disability are 1.2 times higher and 1.8 times higher in the lower and 1.03 times in the upper lower group. Residence – when compared to urban residents, rural residents have 16% lesser odds of having a disability.

This table also describes the logistic regression analysis of vascular risk factors with disability. The odds of disability in stroke survivors with hypertension is 1.37 times higher than those without hypertension. Stroke survivors with DM have 25% odds of having disability when compared with those without DM. Stroke survivors with Dyslipidemia have 30% odds of having a disability when compared with those without. The odds of having disability is almost similar in those with and without cardio vascular disorders. When compared to stroke survivors without tobacco use, the odds of disability is 1.96 times higher in stroke survivors with tobacco use. Stroke survivors with alcohol use have 30% odds of having disability when compared with those without. Stroke survivors with family history of stroke have 7% odds of having disability when compared with those without.

Vitamin B12 deficiency does not significantly impact disability status. The odds ratio for individuals with normal Vitamin B12 levels is 1.267, but it is not statistically significant ($p = 0.731$). Homocysteine Levels: Homocysteine levels do not significantly influence disability status. None of the odd's ratios for severe, normal, moderate, or intermediate levels are statistically significant.

Significant factors: In the current study, education of the stroke survivor is found to be the only significant factor contributing to disability.

Table 20: Logistic regression analysis of Disability groups with clinical and lesion characteristics

Variables	Categories	OR	95% CI		p-value
			Lower	Upper	
Arrival at the hospital	>9 days	1			0.451
	Immediate	0.677	0.179	2.557	0.565
	within 24 hours	0.552	0.152	2.003	0.366
	>24 hrs	0.583	0.155	2.189	0.424
	> 3 days	0.307	0.074	1.274	0.104
Length of stay	>16 days	1			0.001*
	1-5	0.142	0.042	0.48	0.002*
	6-10	0.253	0.076	0.845	0.026*
	11-15	0.646	0.167	2.496	0.526
Complications	No	1			
	Yes	0.276	0.124	0.614	0.002*
Type of stroke	Ischaemia	1			
	Haemorrhage	0.636	0.284	1.422	0.27
Side of stroke	Bilateral	1			0.561
	Right	0.688	0.21	2.258	0.538
	Left	0.552	0.167	1.823	0.33
NIHSS	Severe	1			0.001*
	Minor	0.291	0.027	3.178	0.311
	Moderate	1.266	0.183	8.762	0.811
	Moderate to severe	9.361	1.12	78.265	0.039

*p value<0.05 considered as significant

Table 19 explains the logistic regression analysis between clinical and lesion characteristics and disability status.

Arrival at the Hospital: None of the arrival times significantly impact disability status. Length of stay significantly influences disability status. Individuals with longer stays (>16 days) have higher odds of disability, while those with stays between 1-5 days and 6-10 days have significantly lower odds of disability. These results are statistically significant with p-values of 0.001, 0.002, and 0.026, respectively. Having complications significantly impacts disability status. Individuals with complications during their stay have substantially lower odds of disability. This result is statistically significant with a p-value of 0.002.

Type of Stroke and Side of Stroke: Neither the type of stroke (Ischaemia vs. Haemorrhage) nor the side of the stroke (Bilateral, Right, or Left) significantly affects disability status. None of the odds ratios for stroke type or side of stroke are statistically significant. The severity of stroke, as measured by NIHSS, significantly impacts disability status. Individuals with moderate to severe NIHSS scores have significantly higher odds of disability. This result is statistically significant with a p-value of 0.039.

Significant Factors: Length of stay and the presence of complications during the hospital stay are significant factors influencing disability status. Longer stays are associated with higher disability odds, while the presence of complications is associated with lower disability odds.

Non-Significant Factors: Arrival time, type of stroke, side of stroke, and most areas of stroke do not significantly affect disability status in this analysis.

Table 21: Logistic regression analysis of domains of burden, coping strategies, family needs and quality of life with disability groups.

Variables	Categories	B	S.E.	Exp(B)	95% C.I.for EXP(B)		P value
					Lower	Upper	
Caregiver burden	ZBI	-1.27	1.323	0.281	0.021	3.758	0.337
	Burden in relationship	0.833	1.777	2.3	0.071	74.864	0.639
	Emotional well being	-0.443	1.402	0.642	0.041	10.029	0.752
	Social& family life	2.739	2.291	15.47	0.173	1380.326	0.232
	Loss of control on one's life	0.421	1.572	1.524	0.07	33.18	0.789
	Finances	1.601	0.778	4.96	1.078	22.808	0.04*
	Personal strain	0.082	1.186	1.086	0.106	11.099	0.945
	Constant	-12.454	2.903	0			0
Coping strategies	Problem solving	-0.653	0.554	0.521	0.176	1.541	0.239
	Distraction positive	-1.443	0.497	0.236	0.089	0.626	0.004*
	Distraction negative	-0.44	0.473	0.644	0.255	1.627	0.352
	Acceptance	-0.545	0.468	0.58	0.232	1.449	0.244
	Denial	-0.369	0.544	0.692	0.238	2.01	0.498
	Religion	0.9	0.487	2.46	0.946	6.394	0.065
	Social support	-0.644	0.433	0.525	0.225	1.227	0.137
	Constant	16.931	2.82	22541230			0.001
Family needs	Health information	0.681	0.317	1.976	1.061	3.679	0.032*
	Emotional support	0.204	0.577	1.227	0.396	3.805	0.723
	Instrumental support	-0.462	1.247	0.63	0.055	7.257	0.711
	Professional support	-0.589	1.406	0.555	0.035	8.733	0.675
	Community support network	-0.567	3.069	0.567	0.001	232.488	0.853
	Involvement in care	4.589	3.557	98.348	0.092	104901.1	0.197
	Constant	-26.508	8.638	0			0.002
Quality of life	Physical	-4.957	1.081	0.007	0.001	0.059	0.001*
	Psychological	0.26	0.424	1.297	0.565	2.975	0.540
	Social	5.019	1.181	151.328	14.951	1531.715	0.001*
	Environment	0.52	0.658	1.682	0.463	6.103	0.429
	Constant	-18.073	5.846	0			0.002

*p value<0.05 considered as significant

From the table no 20, it can be incurred that in the caregiver burden domains, financial burden (p-value=0.04) is significantly associated with disability. Distraction positive coping strategy (p-value=0.004) is found to significantly associated with disability. Among the domains of family needs, health information (p-value=0.032) appears to be the most important family need. Both Physical (p-value=0.001) and Social (p-value=0.001) domains of quality of life are found to be significantly associated with post stroke disability**.**

Stroke survivors with cognitive impairment

X.4 Post-stroke Cognitive impairment

X.4.1 Post-stroke Cognitive impairment chi-square tables.

Table 22: Association between socio-demographic characteristics with cognitive groups

Variables	Groups	Normal n=126(%)	Impairment n=56(%)	Chi-square	df	P-value
Age (years)	18-34	12 (9.5)	0	24.107	3	0.001*
	35-50	36 (28.6)	7(12.5)			
	51-64	58(46)	23 (41.1)			
	>65	20(15.9)	46 (46.4)			
Gender	Male	92(73)	38 (67.9)	0.506	1	0.47
	Female	34(27)	18(32.1)			
Marital status	Married	116(92.1)	48 (85.7)	8.173	2	0.043*
	Others	10(8)	8(14.3)			
Religion	Hindu	106(84.1)	51(91.1)	4.707	1	0.095
	others	20(15.9)	5(8.9)			
Education	Illiterates	10 (7.9)	10(17.9)	9.193	5	0.102
	Primary	38(30.2)	23(41.1)			
	Secondary	20(15.9)	8(14.3)			
	PUC	18(14.3)	3(5.4)			
	Degree	38(30.2)	11(19.6)			
	PG	2(1.6)	1(1.8)			
Occupation	Unemployed	5(4)	2(3.6)	13.887	6	0.031*
	Housewife	28 (22.2)	19 (33.9)			
	Farmer	29(23)	18 (32.1)			

	Retired	8(6.3)	7(12.5)			
	Private job	30 (23.8)	3 (5.4)			
	Government	13 (10.3)	3(5.4)			
	Business	13 (10.3)	4(7.1)			
Socioeconomic status	Lower	7 (5.6)	4(7.1)	0.746	3	0.86
	Lower middle	56(44.4)	26(46.4)			
	Upper lower	55(43.7)	24(42.9)			
	Upper middle	8(6.3)	2(3.6)			
Place of residence	Rural	72(57.1)	32(57.1)	0.014	1	0.98
	Urban	54(42.9)	24(42.9)			
Hypertension	Present	81 (64.3)	44 (78.6)	0.084	1	0.772
Diabetes	Present	40(31.7)	19(33.9)	0.084	1	0.772
Dyslipidemia	Present	27 (21.4)	11 (19.6)	0.075	1	0.78
CVD	Present	10 (7.9)	11 (19.6)	5.205	1	0.023
Tobacco use	Present	53 (42.1)	26(46.4)	0.301	1	0.583
Alcohol use	Present	68(54)	30(53.6)	0.002	1	0.96
Family h/o	Present	51 (40.5)	24 (42.9)	0.091	1	0.763
Vitamin b12	Normal	92 (73)	46(82.1)	1.762	1	0.184
	Vit B12 deficiency	34(27)	10(17.9)			
Homocysteine	Normal	76(60.3)	44(78.6)	6.117	3	0.106
	Increased	50(39.6)	12(21.4)			

*p value<0.05 considered as significant

Table 21 describes the association between socio-demographic characteristics with cognitive groups. The study found a significant link between post-stroke cognitive impairment (PSCI) and certain age groups. The age groups of 51-65 years

and over 66 years had a higher number of cases of PSCI ($\chi 2$=24.107, p value<0.05) marital status ($\chi 2$=8.173, p value=0.043) and occupation ($\chi 2$=13.888, p value=0.0031), However, there was no significant association found between cognitive impairment and other demographic factors such as gender ($\chi 2$=0.506, p value=0.47) education ($\chi 2$=9.193, p value=0.102), socioeconomic status ($\chi 2$=0.746, p value=0.862), and place of residence ($\chi 2$=3.678, p value=0.055).

This study aimed to investigate the relationship between post-stroke cognitive impairment and various vascular risk factors. The results showed that there was no significant association between hypertension (χ^2=0.084, p=0.772), diabetes mellitus (χ^2=0.084, p=0.772), dyslipidemia (χ^2=0.075, p=0.78), tobacco use (χ^2=0.301, p=0.583), alcohol consumption (χ^2=0.002, p=0.96), and positive family history of stroke (χ^2=0.091, p=0.763) Vitamin B12 deficiency ($\chi 2$=1.762, p=0.184) and Homocysteine levels (χ^2=6.117, p=0.106).

This study found that there is a significant association between cardiovascular conditions such as IHD (χ^2=5.205, p=0.023) and post-stroke cognitive impairment.

Table 23: Association between Clinical characteristics with cognitive groups

Variables	Groups	ACE normal n=126(%)	ACE Impaired n=56(%)	Chi-square	df	P value
Time of arrival at the hospital	Immediate	23(18.3)	18(32.1)	6.048	4	0.196
	Within 24 hrs	33(26.2)	16(28.6)			
	> 24 hrs	36 (28.6)	13 (23.2)			
	> 3 days	26(20.6)	6(10.7)			
	> 9 days	8 (6.3)	3(5.4)			
Length of stay	1-5	66(52.4)	17 (30.4)	17.213	3	0.001*
	6-10	47(37.3)	20(35.7)			
	11-15	10(7.9)	12(21.4)			
	≥16	3 (2.4)	7 (12.5)			
Complications	No	116 (92.1)	48 (85.7)	1.754	1	0.185
	Yes	10(7.9)	8(14.3)			
Type of stroke	Ischaemia	138(84.6)	60 (68.9)	8.484	1	0.004*
	Haemorrhage	25(15.4)	27 (31.1)			
Side of the lesion	Right	60 (47.6)	31(55.4)	1.456	2	0.483
	Left	57(45.2)	20(35.7)			
	Bilateral	9(7.1)	5(8.9)			
Stroke severity	Mild	54(42.9)	3(5.4)	28.340	2	0.001*
	Moderate	58(46)	36(64.3)			
	Moderate to severe	14(11.1)	17(30.4)			

*p value<0.05 considered as significant

Table 22 explains the association between Clinical characteristics with cognitive groups. The current study found a significant association between post-stroke cognitive impairment and various clinical variables from the acute episode of stroke. These variables included the length of hospital stay (χ^2=17.213, p value <0.05), complications during hospitalization (χ^2=1.754, p value=0.185), Interestingly, cognitive functions were not affected by the timing of the patient's arrival to emergency care or any delays in post-stroke recovery management (χ^2=6.048, p=0.196). This study analyzed the association between post-stroke cognitive impairment (PSCI) and stroke characteristics. The results showed that the subtype of stroke (specifically, the ischaemic type) was significantly associated with PSCI (χ2=8.4840, p value <0.05). However, the side of the lesion (χ2=1.456, p value=0.483).

The results show that 64.3% of poststroke survivors with impaired cognitive scores had moderate NIHSS scores. Moderate to severe NIHSS scores were noted in 30% of stroke survivors with impaired cognitive scores. The Chi-square value was 28.340 with a p value of less than 0.05.

Table 24: Association of cognitive impairment with site of infarction.

Area	Cognitive scores		chi-square	df	p-value
	Normal n=126(%)	Impaired n=56(%)			
Cerebellum	4(3.2)	3(5.4)			
Fronto-parietal cortex	8(6.4)	2(3.6)			
Basal ganglia	13(10.3)	3(5.4)			
Internal capsule	8(6.4)	5(8)			
Parietal cortex	49(38.4)	18(32.1)			
Parieto-occipital cortex	9(7.2)	1(1.8)			
Pons	3(2.4)	3(5.4%)			
Temporal cortex	2(1.6)	1(1.8)			
Temporo-parietal cortex	5(4)	47.1)			
Thalamus	20(15.9)	16(29.5)	27.773	21	0.147

p value<0.05 considered as significant

The results show that the predominant site of infarction in stroke survivors with cognitive impairment in the present study are parietal (32.1%), thalamus (29.5%) and internal capsule (8%), this is statistically not significant with p value at 0.164.

Table 25: Association between cognitive impairment with disability, activities of daily living and caregiver burden.

Variables	Categories	Normal n=163(%)	Impaired n=87(%)	Chi-Square	df	P value
MRS	Asymptomatic	22(17.5)	0	12.444	5	0.029*
	No disability	64(50.8)	3(5.4)			
	Slight disability	32(25.4)	11(19.6)			
	Moderate disability but able to walk	7(5.6)	25(44.6)			
	Unable to walk	1(0.8)	17(30.4)			
BDI	Severe	2(1.6)	17(31,6)	69.066	3	0.001*
	Moderate	35(28)	33(57.9)			
	Slight	67(53.6)	6(10.5)			
	Normal	21(16.8)	0			
ZBI	No Burden	31(25.6)	0	98.439	3	0.001*
	Mild	85(68.1)	13(22.6)			
	Moderate	6(4.8)	27(47.4)			
	Severe	2(1.6)	16(29.6			

*p value<0.05 considered as significant

Table 23 explains the association between cognitive impairment with disability, activities of daily living and caregiver burden. According to the study, stroke survivors who experienced cognitive impairment reported that 44.6% experienced moderate disability but were still able to walk. Slight disability was noted in 10.5% of individuals. The results of the study were statistically significant, with a chi square value of 12.444 and a p value of less than 0.05.

A moderate functional impairment of 57.9% was noted in poor cognitive scores Among those with cognitive impairment and functional impairment was severe in 31.6% - a statistically significant finding. The chi-square value for this analysis was 69.066, with a p value of less than 0.05.

A study on stroke survivors with cognitive impairment found that 29.6% experienced severe caregiver burden, 47.4% experienced moderate burden, and 22.6% experienced mild burden. Statistical analysis showed that these results were significant with a value of 98.439 and a p value of less than 0.05.

X.4.2 Post-stroke Cognitive Impairment Correlations

Table 26: Correlation of caregiver burden, coping strategies, family needs and quality of life with Post stroke cognitive impairment

Variables	Categories	ACE normal n=126	ACE impaired n=56	r value	r^2value	p-value
		Mean±SD	Mean±SD			
Caregiver burden domains	ZBI	22.29±13.73	55.22±15.32	0.74	0.55	<0.01
	Burden in relationship	5.96±3.71	15.1±4.28	0.74	0.55	<0.01
	Emotional well being	6.76±4.35	17.06±4.89	0.74	0.54	<0.01
	Social& family life	3.85±2.81	10.06±2.57	0.74	0.54	<0.01
	Loss of control on one's life	4.63±2.72	10.57±3.04	0.71	0.50	<0.01
	Finances	1.1±0.71	2.43±0.77	0.65	0.43	<0.01
	Personal strain	11.73±7.55	30.07±8.92	0.74	0.54	<0.01
	Role strain	5.69±3.94	14.69±3.85	0.74	0.55	<0.01
Coping strategies domains	Problem solving	6.63±0.89	4.4±1.58	-0.67	0.45	<0.01
	Distraction positive	6.32±0.93	4.28±1.37	-0.66	0.44	<0.01
	Distraction negative	6.18±0.86	3.98±1.56	-0.67	0.45	<0.01
	Acceptance	6.24±1.09	4.38±1.50	-0.58	0.34	<0.01
	Denial	6.33±0.74	4.28±1.58	-0.66	0.44	<0.01
	Religion	6.75±0.93	4.97±1.67	-0.57	0.32	<0.01
	Social support	6.52±1.02	4.32±1.536	-0.65	0.43	<0.01
Family needs domains	Health information	24.85±5.10	37.18±5.46	0.75	0.56	<0.01
	Emotional support	19.77±5.79	32.97±4.86	0.76	0.57	<0.01
	Instrumental support	10.94±4.08	20.4±4.30	0.74	0.54	<0.01
	Professional support	11.69±3.69	19.48±2.98	0.73	0.54	<0.01

	Community support network	9.36±2.96	15.93±2.65	0.74	0.55	<0.01
	Involvement in care	3.4±1.32	6.17±1.102	0.73	0.53	<0.01
Quality of life domains	Physical	15.32±2.11	10.09±3.58	-0.68	0.46	<0.01
	Psychological	14.29±1.91	9.46±2.96	-0.71	0.50	<0.01
	Social	14.48±1.17	13.3±1.42	-0.41	0.17	<0.01
	Environment	14.44±1.09	12.65±1.56	-0.56	0.31	<0.01

*p value<0.05 considered as significant correlation

Table 24 describes Correlation of caregiver burden, coping strategies, family needs and quality of life with Post stroke cognitive impairment. Stroke survivors with cognitive impairment have higher mean scores in all domains of caregiver burden compared to those without cognitive impairment. This difference is statistically significant with a p-value of less than 0.05. The stroke survivors with cognitive impairment have lower mean scores in all domains of coping strategies compared to those without cognitive impairment. This difference is statistically significant with a p-value of less than 0.05. The average scores for all categories of family needs are higher in stroke survivors with cognitive impairment compared to those without, with a statistically significant p-value of less than 0.05. The scores for all domains of WHO QOL BREF are lower in stroke survivors who have cognitive impairment compared to those without cognitive impairment. This difference is statistically significant with a p-value of less than 0.05.

Correlation coefficient results show that all the domains of caregiver burden, coping strategies, family and quality of life except social and environment domain are strongly correlated with post stroke cognitive impairment.

X.4.3 Post-stroke Cognitive Impairment Regression

Table 27: Logistic regression analysis of Cognitive score group with socio-demographic characteristics

Variables	Categories	OR	95% CI		p-value
			Lower	Upper	
Age (Years)	> 65	1			0.004*
	18 - 50	0.197	0.075	0.514	0.001*
	51 - 65	0.449	0.221	0.911	0.027*
Gender	Male	1			
	Female	1.063	0.306	3.688	0.923
Marital status	Others	1			
	Married	0.863	0.336	2.217	0.759
Religion	others	1			
	Hindu	1.973	0.652	5.973	0.229
Education	PG	1			0.623
	Illiterates	1.808	0.189	17.341	0.608
	Primary	0.838	0.106	6.64	0.867
	Secondary	0.903	0.113	7.213	0.924
	PUC	0.725	0.092	5.719	0.760
	Degree	0.555	0.097	3.171	0.508
Occupation	Business	1			0.735
	Unemployed	0.452	0.078	2.61	0.374
	Housewife	1.151	0.198	6.71	0.875
	farmer	0.764	0.187	3.123	0.708
	Retired	1.117	0.276	4.522	0.877
	Private job	0.514	0.129	2.049	0.346
	Government	0.969	0.199	4.713	0.969
Socioeconomic status	Upper Middle	1			0.486
	Lower	0.716	0.102	4.999	0.736
	Lower Middle	1.323	0.314	5.578	0.703
	Upper lower	0.76	0.155	3.717	0.734
Residence	Urban	1			
	Rural	0.961	0.487	1.897	0.908
Hypertension	No	1			
	Yes	1.606	0.881	2.927	0.122
Diabetes mellitus	No	1			
	Yes	0.961	0.531	1.74	0.896
Dyslipidemia	No	1			
	Yes	0.634	0.31	1.293	0.210
CVD	No	1			
	Yes	1.308	0.58	2.953	0.517
Tobacco use	No	1			
	Yes	1.505	0.687	3.298	0.307

Alcohol use	No	1			
	Yes	0.689	0.313	1.517	0.355
Family h/o	No	1			
	Yes	1.151	0.668	1.983	0.613
Vitamin B12	Deficiency	1			
	Normal	1.854	0.452	7.595	0.391
Homocysteine levels	Increased	1			0.237
	Normal	0.465	0.007	33.195	0.725

*p value<0.05 considered as significant

Table 25 explains the Logistic regression analysis of Cognitive score group with socio-demographic characteristics. The presented logistic regression analysis explores the relationship between cognitive scores and various socio-demographic characteristics. Age significantly impacts cognitive scores. Older individuals (age > 65) have higher odds of cognitive impairment. Both the 18-50 age group (OR = 0.197, p = 0.001) and the 51-65 age group (OR = 0.449, p = 0.027) have significantly lower odds of cognitive impairment compared to those above 65. Gender does not significantly influence cognitive scores. The odds ratio for females is 1.063, but it is not statistically significant (p = 0.923). Marriage does not significantly impact cognitive scores. The odds ratio for married individuals is 0.863, but it is not statistically significant (p = 0.759). Religion does not significantly affect cognitive scores.

Individuals with a Degree have significantly lower odds of cognitive impairment (OR = 0.555, p = 0.508) compared to those with a PG degree, indicating a strong association. Illiterates have 1.8 times higher odds of suffering from cognitive impairment. Occupation does not significantly influence cognitive scores. Socioeconomic Status does not significantly impact cognitive scores.

The type of residence (Urban vs. Rural) does not significantly influence cognitive scores. The odds ratio for rural residents is 0.961, but it is not statistically significant (p = 0.908).

The presented logistic regression analysis explores the relationship between cognitive scores and various risk factors. Having hypertension (HTN) does not significantly impact cognitive scores. The odds ratio for individuals with HTN is 1.606, but it is not statistically significant (p = 0.122). Having diabetes mellitus (DM) does not significantly influence cognitive scores. The odds ratio for individuals with DM is 0.961, but it is not statistically significant (p = 0.896).

The odds ratio for individuals with dyslipidemia is 0.634, but it is not statistically significant (p = 0.210). Having history of cardiovascular diseases does not significantly influence cognitive scores. The odds ratio for individuals with CVD is 1.308, but it is not statistically significant (p = 0.517).The odds ratio for tobacco users is 1.505, but it is not statistically significant (p = 0.307).The odds ratio for alcohol users is 0.689, but it is not statistically significant (p = 0.355).

Having a family history of relevant medical conditions does not significantly impact cognitive scores. The odds ratio for individuals with a family history is 1.151, but it is not statistically significant (p = 0.613). Vitamin B12 deficiency does not significantly impact cognitive scores. The odds ratio for individuals with deficiency compared to normal levels is 1.854, but it is not statistically significant (p = 0.391). Homocysteine levels do not significantly influence cognitive scores. Severe, moderate, and intermediate levels do not have statistically significant associations with cognitive impairment.

Significant factors: The analysis suggests that age and, to some extent, education level are significant predictors of cognitive impairment.

Non-significant factors: Other factors like gender, marriage, religion, occupation, SES, and residence do not appear to have significant associations with cognitive impairment in the studied population. The analysis suggests that in the studied population, none of the considered risk factors (HTN, DM, dyslipidemia, IHD, tobacco use, alcohol use, and family history) have a statistically significant impact on cognitive scores.

Table 28: Logistic regression analysis of Cognitive score group with clinical and lesion characteristics

Variables	Categories	OR	95% CI		p-value
			Lower	Upper	
Arrival at the hospital	>9 days	1			0.399
	Immediate	0.727	0.197	2.686	0.633
	within 24 hours	0.758	0.216	2.655	0.665
	>24 hrs	0.521	0.142	1.914	0.326
	> 3 days	0.345	0.086	1.389	0.134
Length of stay	>16 days	1			0.003*
	1-5	0.275	0.086	0.879	0.029*
	6-10	0.351	0.111	1.113	0.075
	11-15	1.342	0.356	5.06	0.664
Complications	No	1			
	Yes	0.287	0.13	0.631	0.002*
Type of stroke	Ischaemia	1			
	Haemorrhage	0.611	0.275	1.359	0.227
Side of stroke	Bilateral	1			0.484
	Right	1.588	0.469	5.374	0.457
	Left	1.121	0.328	3.827	0.855
NIHSS	Severe				0.49
	Minor	1.819	0.108	30.525	0.678
	Moderate	4.346	0.359	52.644	0.248
	Moderate to severe	3.3	0.252	43.189	0.363
BDI	Slight				0.001*
	Severe	62.079	7.737	498.089	0.001*
	Moderate	3.356	0.852	13.219	0.083

*p value<0.05 considered as significant

The table 26 describes the logistic regression analysis explores the relationship between cognitive scores and various clinical and lesion characteristics. None of the arrival times (immediate, within 24 hours, >24 hours, >3 days) show statistically significant associations with cognitive impairment. Length of stay significantly influences cognitive scores. Patients with longer stays (>16 days) have higher odds of cognitive impairment. Additionally, patients with stays between 1-5 days have

significantly lower odds of cognitive impairment (OR = 0.275, p = 0.029), indicating a protective effect.

Having complications significantly impacts cognitive scores. Patients without complications have substantially lower odds of cognitive impairment (OR = 0.287, p = 0.002). The type of stroke (Ischaemia vs. Haemorrhage) does not significantly affect cognitive scores. Neither type shows a statistically significant association with cognitive impairment. The side of stroke (Bilateral, Right, Left) does not significantly influence cognitive scores. Stroke severity as measured by NIHSS scores does not have statistically significant association with cognitive impairment.

BDI scores significantly impact cognitive scores. Individuals with severe BDI scores have higher odds of cognitive impairment (OR = 62.079, $p < 0.05$). Moderate scores show a trend towards significance (OR = 3.356, p = 0.083).

Significant Factors: Length of stay, presence of complications and functional disability are significantly associated with cognitive impairment.

Non-Significant Factors: Arrival time, type of stroke, and side of stroke do not significantly affect cognitive scores in this analysis. Vitamin B12 deficiency, homocysteine levels, and NIHSS scores do not show significant associations with cognitive impairment in this analysis.

Table 29: Logistic regression analysis of domains of caregiver burden, coping strategies, family needs and quality of life with cognitive impairment.

Variables	Domains	B	S.E.	Exp(B)	95% C.I.for EXP(B)		p-value
					Lower	Upper	
Caregiver burden	ZBI	-0.643	0.639	0.526	0.15	1.838	0.314
	Burden in relationship	1.427	0.802	4.165	0.865	20.056	0.075
	Emotional well being	0.969	0.704	2.635	0.663	10.462	0.169
	Social& family life	1.818	1.063	6.157	0.767	49.419	0.087
	Loss of control on one's life	0.434	0.81	1.543	0.316	7.542	0.592
	Finances	-0.528	0.432	0.59	0.253	1.374	0.221
	Personal strain	-0.052	0.713	0.95	0.235	3.841	0.942
	Constant	-6.794	1.032	0.001			0
Coping strategies	Problem solving	-0.358	0.333	0.699	0.364	1.343	0.283
	Distraction positive	-0.464	0.324	0.629	0.333	1.187	0.152
	Distraction negative	-0.344	0.32	0.709	0.378	1.328	0.283
	Acceptance	-0.153	0.277	0.858	0.499	1.476	0.580
	Denial	-0.626	0.354	0.535	0.267	1.069	0.077
	Religion	0.617	0.3	1.853	1.029	3.336	0.040*
	Social support	-0.279	0.286	0.756	0.432	1.325	0.329
	Constant	7.985	1.27	2936.535			0
Family needs	Health information	-0.023	0.103	0.977	0.799	1.195	0.823
	Emotional support	0.647	0.205	1.91	1.279	2.854	0.002*
	Instrumental support	-1.026	0.403	0.359	0.163	0.79	0.011*
	Professional support	0.822	0.325	2.274	1.203	4.299	0.011*
	Community support network	0.357	0.855	1.429	0.268	7.635	0.676
	Involvement in care	-0.583	1.028	0.558	0.074	4.19	0.571
	Constant	-16.054	2.838	0			0
Quality of life	Physical	-0.093	0.15	0.911	0.679	1.222	0.534
	Psychological	-1.116	0.233	0.328	0.207	0.517	0.001*
	Social	-0.135	0.184	0.874	0.609	1.254	0.463
	Environment	1.183	0.379	3.264	1.553	6.861	0.002*
	Constant	-0.065	3.269	0.937			0.984

*p value<0.05 considered as significant

The table 27 shows the logistic regression analysis of domains of caregiver burden, coping strategies, family needs and quality of life with cognitive impairment. It can be explained that the changes observed in care giver burden are not significantly associated with cognitive impairment. Among the domains of coping strategies, religion (p value=0.040) is found to be significantly regressed with cognitive impairment. The domains of family needs show that emotional support (p-value=0.002), instrumental support (p-value=0.011) and professional support (p-value=0.011) are significantly associated with cognitive impairment. The domains of quality of life which are significantly associated with cognitive impairment are psychological (p-value=0.001) and environmental domains (p-value=0.002).

X.4.Stroke survivors with Post-stroke depression

X.4.1 Post-stroke depression chi-square tables

Table 30: Association of socio-demographic characteristics with post-stroke depression groups

Variables	Categories	Depression group		chi-square	df	p-value
		PSD n=68(%)	PSWD n=182(%)			
Age	18-34	1(1.5)	12(6.6)	7.625	3	0.054*
	35-50	15(22.1)	38(20.9)			
	51-65	23(33.8)	82(45.1)			
	>65	29(42.6)	50(27.5)			
Sex	Male	39(57.4)	148(81.3)	15.084	1	0.001*
	Female	29(42.6)	34(18.7)			
Marital status	Married	56(82.4)	165(90.7)	5.832	3	0.12
	Others	12(17.7)	17(9.3)			
Religion	Hindu	60(88.2)	159(87.4)	5.978	1	0.05*
	Others	8(11.8)	23(12.6)			
Education	Illiterate	13(19.1)	19(10.4)	7.51	5	0.185
	High school	26(38.2)	59(32.4)			
	SSLC	10(14.7)	23(12.6)			
	PUC	6(8.8)	22(12.1)			
	Degree	11(16.2)	54(29.7)			
	PG Degree	2(2.9)	5(2.7)			
Occupation	Unemployed	3(4.4)	11(6.0)	21.115	6	0.002*
	Housewives	28(41.2)	27(14.8)			
	Farmer	15(22.1)	50(27.5)			
	Retired	7(10.3)	21(11.5)			
	Private job	7(10.3)	37(20.3)			
	Govt	4(5.9)	18(9.9)			
	Business	4(5.9)	18(9.9)			

Socioeconomic status	Lower	7(10.3)	9(4.9)	2.909	3	0.406
	Lower Middle	25(36.8)	79(43.4)			
	Upper Lower	33(48.5)	84(46.2)			
	Upper Middle	3(4.4)	10(5.5)			
Residence	Rural	36(52.9)	105(57.7)	0.454	1	0.567
	Urban	32(47.1)	77(42.3)			
Hypertension	Present	53(77.9)	120(65.9)	3.345	1	0.09
Diabetes	Present	20(29.4)	62(34.1)	0.486	1	0.295
Dyslipidemia	NO	56(82.4)	145(79.7)	0.226	1	0.389
CVD	Present	5(7.4)	27(14.8)	2.483	1	0.139
Tobacco use	Present	25(36.8)	87(47.8)	2.439	1	0.153
Alcohol use	Present	30(44.1)	106(58.2)	3.981	1	0.063
Family history	Present	30(44.1)	74(40.7)	0.244	1	0.666
Vitamin B12	Deficiency	12(17.6)	42(23.1)	0.862	1	0.392
Homocysteine level	Increased	19(37)	91(44.1)	2.145	3	0.543

*p value<0.05 considered as significant

Table 28 explains the association of socio-demographic characteristics with post-stroke depression groups. In the current study, 27.2% (68) of stroke survivors were suffering from depression. Severity of depression was assessed using Hamilton depression rating scale. Among the stroke survivors with depression, 42.6% were more than 65 years of age and 33.8% were 50 years and above. (χ^2=7.625, p value=0.054) Though depression was more frequent among men almost 50% of the women who suffered from stroke had depression. (χ^2=15.084, p<0.05). Depression was more common among the married (82%) but was not statistically significant (χ^2 =5.832, p=0.12) and also similarly, Hindus (88%) were more affected by depression, which is significant (χ^2 =5.978, p=0.05)

Depression was found in much higher percentage among people with no formal education (19.1%) and those who have completed their education upto high school (38.2%) but this is not statistically significant. (χ^2 =7.51, p=0.185). Depression is found to be more frequently seen among housewives (41.2%), farmers (22%) and is significantly associated with the occupation of the stroke survivors. (χ^2 =21.115, p value<0.05). In the current study there is no significant association of depression with socioeconomic status (χ^2=2.909, p value=0.406) and residence (χ^2=0.454, p value=0.567)

The common vascular risk factors like hypertension, diabetes mellitus, dyslipidemia etc are associated with stroke. Analysis was done to see if these factors influence the occurrence of depression after stroke. In this study, hypertension was more frequent among post stroke survivors with depression (77.9%) but statistically not significant (χ^2 =3.345, p value=0.09). Diabetes mellitus was more frequent among stroke survivors without depression (70%) and similarly dyslipidemia (82%).

Cardiovascular disorders like IHD are commonly known to be associated with secondary depression. In the current study IHD was not associated with post stroke depression (χ^2 =2.483, p=0.139). Tobacco consumption (χ^2=2.439, p value=0.153), Alcohol consumption (χ^2=3.981, p=0.063). and family history of stroke (χ^2=0.244, p value=0.666) also were not associated with post-stroke depression. There was no significant association between post-stroke depression and other risk factors like vitamin B12 levels (χ^2=0.862, p value=0.392) and homocysteine levels (χ^2=2.145, p value=0.543).

Table 31: Association of clinical characteristics with post-stroke depression groups

Variables	Categories	Depression group		Chi-square	df	p-value
		PSD n=68(%)	PSWD n=182(%)			
Arrival at the hospital	Immediate	19(27.9)	32(17.6)	5.884	4	0.208
	within 24 hrs	22(32.4)	56(30.8)			
	24-72 hrs	15(22.1)	48(26.4)			
	3-7 days	7(10.3)	36(19.8)			
	>7 days	5(7.4)	10(5.5)			
Length of stay	1-5	21(30.9)	89(48.9)	13.178	3	0.004*
	6-10	23(33.8)	65(35.7)			
	11-15	16(23.5)	18(9.9)			
	>16	8(11.8)	10(5.5)			
Complications	Absent	54(79.4)	157(86.3)	1.765	1	0.239
	Present	14(20.6)	25(13.7)			
Type of stroke	Ischaemia	52(76.5)	146(80.2)	0.422	1	0.600
	Haemorrhagia	16(23.5)	36(19.8)			
Side of stroke	Right	39(57.4)	85(46.7)	2.652	2	0.266
	Left	24(35.3)	85(46.7)			
	Bilateral	5(7.4)	12(6.6)			
stroke severity	Mild	3 (4.4)	68(37.4)	30.402	2	0.001*
	Moderate	38(55.9)	82(45.1)			
	severe	27(39.7)	32(17.6)			

*p value<0.05 considered as significant

Table 29 explains the association of clinical characteristics with post-stroke depression groups. Depression is more common among stroke survivors who arrived late to hospital, and delay in the acute stroke management. This delay in treatment was not significantly associated with depression (χ^2 =5.884, p value=0.208). Depression is found to be more common among stroke survivors with hospital stay more than one week (33.8%). Length of stay is significantly associated with post stroke depression (χ^2 =13.178, p value<0.05). Complications during admission period will increase the duration of stay, also suggesting severity of the illness. Though there were complications during admission, no association was found with post-stroke depression. (χ^2 =1.765, p value=0.239). In the current study, there is no association found between type of stroke (χ^2=0.422, p value=0.600), side of the lesion (χ^2 =2.652, p value=0.266) and site of lesion. Post-stroke depression is found to be significantly associated with stroke severity, measured by NIHSS score (χ^2=30.402, p value<0.05). PSD is more prevalent among stroke survivors with moderate to severe stroke severity.

Table 32: Association of Disability with post-stroke depression groups.

Variables	Categories	PSD n=68(%)	PSWD n=182(%)	Chi-square	df	p-value
MRS	Asymptomatic	0	26(14.3)	104.34	5	0.001*
	No disability	1(1.5)	80(44)			
	Slight disability	12(17.6)	41(22.5)			
	Moderate disability but able to walk	30(44.1)	10(5.5)			
	Unable to walk	23(33.8)	16(8.8)			
	Total	2(2.9)	9(4.9)			
ACE	Normal	15(22.1)	148(81.3)	76.619	1	0.001*
	Impaired	53(77.9)	34(18.7)			
BDI	Total	1(1.5)	9(4.9)	79.111	4	0.001*
	Severe	25(36.8)	15(8.2)			
	Moderate	40(58.8)	47(25.8)			
	Slight	2(2.9)	86(47.3)			
	Normal	0	25(13.7)			
ZBI	No Burden	0	39(21.4)	96.162	3	0.001*
	Mild	11(16.2)	108(59.3)			
	Moderate	35(51.5)	13(7.1)			
	Severe	22(32.4)	22(12.1)			

*p value<0.05 considered as significant

Table 30 describes the association of Disability with post-stroke depression groups. PSD is significantly associated with disability as measured by MRS score. (χ^2 =104.340, p value<0.05). PSD is more prevalent among stroke survivors with moderate to severe disability. PSD is significantly associated with cognitive impairment as measured by ACE score. (χ^2=76.619, p value<0.05). The PSD

condition has been found to have a strong correlation with the ability to perform daily tasks, as measured by BDI (χ^2=79.111 and a significant p-value < 0.05). It is more commonly found in stroke survivors with moderate to severe disabilities.

Caregiver burden measured by ZBI is associated with presence of depression in stroke survivors. (χ^2 =96.162, p value <0.05) which is statistically significant. The coping strategies are found to be adequate in 23.5% of stroke survivors with post-stroke depression, and moderately adequate in 52.9% which is statistically significant with (χ^2 =68.536, p value<0.05). Coping strategies are adequate in 78.6% in stroke survivors without depression.

X.4.2 Post-stroke depression Correlations

Table 33: Correlation of domains of caregiver burden, coping strategies, family needs and quality of life with post stroke depression

Variables	Domains	PSD n=68	PSWD n=182	r-value	r^2-value	p-value
		Mean±SD	Mean±SD			
Caregiver burden	ZBI	51.1±13.80	27.27±19.85	-0.50	0.25	<0.01
	Burden in relationship	14±3.90	7.33±5.42	-0.51	0.26	<0.01
	Emotional well being	15.68±4.44	8.35±6.29	-0.49	0.24	<0.01
	Social& family life	9.37±2.49	4.75±3.78	-0.51	0.26	<0.01
	Loss of control on one's life	9.82±2.66	5.53±3.80	-0.48	0.23	<0.01
	Finances	2.24±0.67	1.31±0.94	-0.43	0.18	<0.01
	Personal strain	27.81±7.79	14.49±11.10	-0.50	0.25	<0.01
	Role strain	13.63±3.62	7.03±5.43	-0.51	0.26	<0.01
Coping strategies	Problem solving	4.85±1.49	6.23±1.45	0.39	0.15	<0.01
	Distraction positive	4.69±1.25	5.95±1.40	0.38	0.15	<0.01
	Distraction negative	4.32±1.50	5.82±1.37	0.43	0.18	<0.01
	Acceptance	4.74±1.29	5.91±1.49	0.34	0.12	<0.01
	Denial	4.71±1.51	5.95±1.32	0.38	0.14	<0.01
	Religion	5.25±1.58	6.46±1.33	0.36	0.13	<0.01
	Social support	4.75±1.35	6.13±1.54	0.38	0.15	<0.01
Family needs	Health information	36.16±5.41	26.52±6.99	-0.55	0.30	<0.01
	Emotional support	31.76±4.71	21.6±7.70	-0.54	0.30	<0.01
	Instrumental support	19.35±4.05	12.32±5.67	-0.51	0.26	<0.01
	Professional support	18.69±2.87	12.8±4.78	-0.52	0.27	<0.01
	Community support network	15.28±2.50	10.29±3.94	-0.53	0.28	<0.01
	Involvement in care	5.97±1.03	3.76±1.68	-0.54	0.29	<0.01
Quality of life	Physical	10.93±3.42	14.46±3.30	0.43	0.18	<0.01
	Psychological	10.42±2.96	13.43±3.06	0.41	0.17	<0.01
	Social	13.63±1.56	14.23±1.278	0.20	0.04	<0.01
	Environment	13.19±1.56	14.06±1.45	0.253	0.064	<0.01

* Correlation is significant at 0.05 level.

Table 31 explains the Correlation of domains of caregiver burden, coping strategies, family needs and quality of life with post stroke depression. For the PSD group, there are strong positive correlations between post-stroke depression and all the burden domains, indicating that as the burden related to relationships, emotional well-being, social and family life, loss of control on one's life, finances, personal strain, and role strain increases, the severity of post-stroke depression also increases.

For the PSD group, there are moderate negative correlations between post-stroke depression and various coping domains, indicating that as the use of problem-solving, positive distraction, negative distraction, acceptance, denial, reliance on religion, and social support decreases, the severity of post-stroke depression increases.

For the PSD group, there are moderate positive correlations between post-stroke depression and various family need domains, indicating that as the need for health information, emotional support, instrumental support, professional support, community support network, and involvement in care increases, the severity of post-stroke depression also increases.

For the PSWD group, the correlations are weak or negligible, indicating that in the absence of depression, family need domains are not significantly correlated with the absence of post-stroke depression.

These results suggest that individuals with post-stroke depression have specific needs in terms of information, emotional and practical support, and community involvement. Addressing these needs may be crucial in providing holistic care for individuals dealing with post-stroke depression.

Physical and Psychological Domains: PSD groups show strong negative correlations in these domains. This suggests that as the quality of life in the physical and psychological domains decreases, the likelihood of post-stroke depression increases.

Social Domain: The PSD group shows a negative correlation, it's moderate. It implies that social quality of life is moderately related to post-stroke depression.

Environment Domain: The PSD group shows a moderate negative correlation in the environmental domain. This indicates that environmental factors affecting quality of life have a moderate influence on post-stroke depression.

X.4.3 Post-stroke depression regression

Table 34: Logistic regression analysis of Post-stroke depression with sociodemographic characteristics

Variables	Categories	OR	95% CI		p-value
			Lower	Upper	
Age (Years)	> 65	1			
	18 - 50	1.592	0.611	4.147	0.341
	51 - 65	1.83	0.841	3.98	0.128
Gender	Male	1			
	Female	1.574	0.451	5.493	0.477
Marital status	Others	1			
	Married	2.001	0.783	5.112	0.147
Religion	others	1			
	Hindu	0.771	0.255	2.327	0.644
Education	PG	1			
	Illiterates	0.87	0.075	10.111	0.912
	Primary	1.234	0.129	11.855	0.855
	Secondary	1.264	0.131	12.235	0.84
	PUC	1.656	0.171	16.03	0.663
	Degree	1.881	0.276	12.818	0.519
Occupation	Business	1			
	Unemployed	2.349	0.342	16.133	0.385
	Housewife	0.423	0.069	2.605	0.353
	farmer	1.012	0.215	4.76	0.988
	Retired	0.94	0.187	4.728	0.941
	Private job	1.135	0.237	5.43	0.874
	Government	0.917	0.145	5.794	0.926
Socioeconomic status	Upper Middle	1			
	Lower	0.675	0.087	5.229	0.707
	Lower Middle	1.041	0.216	5.01	0.96
	Upper lower	1.059	0.19	5.895	0.948
Residence	Urban	1			
	Rural	1.406	0.679	2.914	0.359
HTN	No	1			
	Yes	0.524	0.269	1.021	0.058
DM	No	1			
	Yes	1.227	0.645	2.332	0.533
Dyslipidemia	No				
	Yes	1.306	0.62	2.753	0.483

CVD	No	1			
	Yes	2.019	0.708	5.757	0.189
Tobacco use	No	1			
	Yes	1.244	0.539	2.871	0.609
Alcohol use	No	1			
	Yes	1.5	0.659	3.415	0.334
Family h/o	No	1			
	Yes	0.782	0.435	1.409	0.413
Vitamin B12	Deficiency	1			
	Normal	1.579	0.428	5.824	0.493
Homocysteine levels	Increased	1			0.722
	Normal	0.386	0.019	7.816	0.535

*p value<0.05 considered as significant

Table 32 explains the logistic regression analysis of Post-stroke depression with sociodemographic characteristics. The table explains the regression analysis of the sociodemographic and risk factors with poststroke depression. In the current study none of the sociodemographic factors and the risk factor profile are significantly associated with post stroke depression.

Table 35: Logistic regression analysis of Post-stroke depression with clinical and stroke lesion characteristics

Variables	Categories	OR	95% CI		p-value
			Lower	Upper	
Arrival at the hospital	>9 days	1			0.069
	Immediate	1.6	0.433	5.918	0.481
	within 24 hours	2.373	0.662	8.508	0.185
	>24 hrs	3.051	0.812	11.467	0.099
	> 3 days	6.09	1.399	26.511	0.016*
Length of stay	>16 days	1			0.005*
	1-5	3.552	1.142	11.044	0.029*
	6-10	1.987	0.657	6.006	0.224
	11-15	0.68	0.198	2.339	0.541
Complications	No	1			
	yes	1.42	0.627	3.214	0.400
Type of stroke	Ischaemia	1			
	Haemorrhage	0.829	0.352	1.953	0.669
Side of stroke	Bilateral	1			0.264
	Right	0.764	0.227	2.565	0.663
	Left	1.312	0.384	4.478	0.665
Stroke severity	Severe	1			0.085
	Minor	13.161	1.294	133.858	0.029*
	Moderate	4.924	0.78	31.079	0.09
	Moderate to severe	8.943	1.331	60.106	0.024*
BDI	Slight	1			0.001
	Severe	0.383	0.053	2.786	0.343
	Moderate	0.095	0.018	0.495	0.005*
Cognitive Impairment	Normal	1			
	Impaired	6.312	2.181	18.269	0.001*
Physical disability	low disability				
	High disability	4.932	1.591	15.292	0.006*

*p value<0.05 considered as significant.

Table 33 explains the logistic regression analysis for Post-stroke Depression concerning clinical and lesion characteristics. The timing of arrival at the hospital appears to have a significant impact on the likelihood of post-stroke depression. This result is statistically significant (p value <0.05), indicating a strong association. Individuals with a hospital stay between 1-5 days and > 16 days have significantly higher odds (OR = 3.552) of experiencing post-stroke depression. This result is statistically significant (p value <0.05). Having complications during the hospital stay does not significantly influence the odds of post-stroke depression.

The type of stroke (Ischaemia vs. Haemorrhage) does not significantly affect the odds of post-stroke depression. The side of the stroke (Bilateral, Right, or Left) does not significantly influence the odds of post-stroke depression.

The severity of stroke, as measured by NIHSS, significantly impacts the odds of PSD. Individuals with minor strokes have substantially higher odds (OR = 13.161, p value < 0.05) of experiencing PSD compared to those with severe strokes. Also, those with moderate to severe strokes have significantly higher odds (OR = 8.943, p value < 0.05) of PSD.

BDI (Barthel Disability Index): The severity of functional dependence, as measured by BDI, significantly impacts the odds of PSD. Individuals with moderate (OR = 0.095, p value < 0.05) and slight (OR = 1, p value < 0.05) disability have significantly different odds of experiencing PSD compared to those with severe disability.

Cognitive Impairment: Cognitive impairment significantly impacts the odds of PSD. Individuals with impaired cognitive function have substantially higher odds (OR = 6.312, p value < 0.05) of experiencing PSD compared to those with normal cognitive function.

Physical Disability: The level of physical disability significantly impacts the odds of PSD. Individuals with high disability have significantly higher odds (OR = 4.932, p value < 0.05) of experiencing PSD compared to those with low disability.

Significant factors: The analysis indicates that time of arrival at the hospital, length of stay, the severity of stroke (NIHSS score), the level of functional dependence (BDI score), cognitive impairment, and physical disability are significant predictors of PSD in this study.

Table 36: Logistic regression analysis of caregiver burden, coping strategies, family needs and quality of life with post stroke depression

Variables	Domains	B	S.E.	Exp(B)	95% C.I.for EXP(B)		p-value
					Lower	Upper	
Caregiver burden	ZBI	1.018	0.547	2.769	0.948	8.084	0.062
	Burden in relationship	-1.325	0.68	0.266	0.07	1.007	0.051*
	Emotional well being	-0.463	0.587	0.629	0.199	1.989	0.43
	Social& family life	-1.483	0.811	0.227	0.046	1.112	0.067
	Loss of control on one's life	-0.791	0.676	0.453	0.12	1.706	0.242
	Finances	-0.158	0.311	0.854	0.464	1.572	0.612
	Personal strain	-0.263	0.5	0.768	0.289	2.046	0.598
	Constant	3.48	0.55	32.466			0
Coping strategies	Problem solving	-0.01	0.252	0.99	0.604	1.621	0.967
	Distraction positive	0.036	0.255	1.036	0.629	1.707	0.889
	Distraction negative	0.548	0.246	1.729	1.068	2.801	0.026*
	Acceptance	0.011	0.205	1.011	0.677	1.51	0.958
	Denial	-0.096	0.236	0.908	0.571	1.444	0.684
	Religion	-0.046	0.213	0.955	0.629	1.448	0.827
	Social support	0.182	0.222	1.2	0.776	1.855	0.413
	Constant	-2.237	0.624	0.107			0
Family needs	Health information	-0.04	0.087	0.961	0.81	1.139	0.644
	Emotional support	-0.472	0.169	0.624	0.448	0.869	0.005*
	Instrumental support	1.041	0.317	2.831	1.521	5.269	0.001*
	Professional support	-0.718	0.274	0.488	0.285	0.834	0.009*
	Community support network	1.306	0.621	3.692	1.094	12.466	0.035*
	Involvement in care	-3.44	0.995	0.032	0.005	0.225	0.001*
	Constant	10.042	1.759	22972.58			0
Quality of life	Physical	0.447	0.143	1.564	1.181	2.072	0.002*
	Psychological	0.507	0.182	1.66	1.161	2.373	0.005*
	Social	-0.041	0.168	0.96	0.69	1.336	0.809
	Environment	-1.514	0.364	0.22	0.108	0.449	0.001*
	Constant	10.513	2.883	36790.48			0

*p value<0.05 considered as significant.

Table 34 explains the Logistic regression analysis of Post-stroke depression with clinical and stroke lesion characteristics. In stroke survivors with depression, burden in relationship (p-value=0.051) domain among caregiver burden domains is found to be significantly associated. The coping strategy which is significantly associated is distraction negative (p-value=0.026). Family need domains which are significantly associated include emotional support (p-value=0.005) Instrumental support (p-value=0.001), Professional support (p-value=0.009), Community support network (p-value=0. 0.035), and involvement in care (p-value=0.001). Among the domains of quality of life physical (p-value=0. 0.002), psychological (p-value=0. 0.005), and environment (p-value=0.001), are significantly regressed with post stroke depression.

DISCUSSION

Stroke is a major cause of long-term disability worldwide, and understanding the factors associated with post-stroke disability is crucial for developing targeted interventions and support services. In the present study, we focused on physical disability, cognitive impairment and depression following stroke. The determinants for each disability will be discussed separately along with the consequences of each disability on caregiver burden, needs, coping strategies and quality of life.

General description of the stroke survivors.

AGE: Our study reports the most affected age by stroke among the study population is 51-65yrs (42%) with the mean age of the study sample 58.7±13.537 with ages ranging from 18 to 88 years. Similarly in other studies from Batticaloa, Sri Lanka the most common age group affected was 60-69.[238] Similar findings were noted by Itagi et al in North Karnataka[239]and in Vadodara by Vaishali et al.[240]with an age range of 55 to 64 yrs. (mean age 55.5yrs) and in the Assam study,[241] the mean age was 57 years and in the Northeast Indian population study, 55.25 ±1.322 years.[242]Age is considered the most common non-modifiable risk factor for stroke.[243]

GENDER: Male predominance was observed at 74.4%. The Male to female ratio is 2.9:1. Itagi et al in their study reported a ratio of 2.44:1.[239] In the study in north India by Mehndiratta et al reported an M: F ratio of 1.08.[244] whereas, Zunni et al demonstrated a ratio of 1.2:1 in Africa which is less than the current study.[245]In a study by Umakanth et al the male-to-female ratio was 1.6:1.[238] Studies from Asia show Male predominance whereas studies from Europe and North America reported a lower Male / Female ratio.[246] Men compared to women, were found to have a high prevalence of hypertension and also likely to have a history of Nicotine and Alcohol

abuse. This may be one of the reasons for the high prevalence among men. Elderly women have a similar prevalence to men as the risk factors increase with age.[247]

TYPE OF STROKE: In this study, the predominant subtype of acute stroke is ischaemic type 79.2% and 20.8% are haemorrhagic type which is similar to earlier studies. Analysis of the etiologic subtype of ischaemic strokes as per TOAST criteria, revealed that majority of the subtype is of Large artery atherosclerosis (34.8%), small vessel disease (21.2%) and cardio-embolic type (8.8%) in the study group.

Similar findings were noted in a study by Itagi et al,[239] Vaidya et al.[248] Among patients with first-ever stroke studied in Tamilnadu, 72.8% had ischemic strokes and 27.1% haemorrhagic strokes.[249]

The frequency of ischemic stroke observed in the present study was consistent with epidemiological studies in the literature which state that, in India, the frequency of ischemic stroke is between 60 to 80%.[250,251,252] Whereas in a study in Assam, the majority presented with haemorrhagic cerebrovascular accidents 63.6%, while 36.4% had ischemic CVA.[253] however in the Ethiopian study, it was noted that 51.7% of patients had the ischemic type of stroke while 48.3% had haemorrhagic stroke.[220]

SIDE OF STROKE: In the present study, 50% of the lesion was found on the right side, 43.2% on the left side and 6.8% had bilateral lesions. In the study by Raghuvanshi et al, left-side stroke was found in 47.08% of patients, right-side lesions were found in 52.08% of patients and 0.08% of patients had bilateral stroke.[254] In a study from Maharashtra, most of the patients had the ischemic type of stroke (133 patients), with left-sided lesions (88 patients) being the most common.[255]

RISK FACTORS: It was noted that 59.6% of patients brought to the hospital with a history of acute first episode of stroke had high blood pressure. In the present study, among the risk factors for Stroke, it was found that 69.2% had pre-existing hypertension, and 32.8% had diabetes mellitus. Dyslipidaemia was found in 32.8%, and the use of tobacco was seen in 44.8% of the individuals. Alcohol addiction was found in 54.4% of individuals. Cardiovascular risk actors like ischemic heart disease were seen in 12.8% of the individuals. A family history of stroke was present in 41.6% of the study subjects. The study shows that the most frequently identified risk factor associated with stroke is **Hypertension**. In the study by Vaidya et al in Gujarat, Hypertension (34%) was the most frequently identified risk factor followed by a past history of stroke (15%), smoking (14%), and dyslipidaemia (13%).[248] In the study by Raghuvanshi et al, it was found that dyslipidaemia (62.86%) was the most common risk factor associated with stroke. The other factors were hypertension (52.57%), smoking (41.14%), and diabetes (29.14%).[254]

In the study by Jebasingh et al, the most common risk factor was hypertension 48.5%, followed by diabetes mellitus 37.14%, dyslipidaemia 25.7%, 44.2% smoking and alcohol use 41.4%.[249] In the Ethiopian study, hypertension 75.9% was the most frequently identified risk factor and the other important risk factors include family history (33.6%), alcohol intake (22.4%), smoking (17.2%) and heart failure (17.2%).[110] In Nepal study common risk factor was hypertension (50%).[250]

Most of the studies have identified Hypertension as the frequent vascular risk factor associated with stroke. Vitamin B12 deficiency was noted in 22% of the individuals. Homocysteine levels are found to be high in 33.2% of the individuals with acute first episode of stroke. Vitamin B12 is crucial to neurological health, and deficiencies can lead to neurological symptoms. Age-related increases in

homocysteine levels, vitamin B12 insufficiency, and the presence of atrial fibrillation are all risk factors for stroke.[251]

In the present study, we also assessed the treatment-seeking behaviour and it was noticed that only 20.4% of cases of acute stroke were brought immediately to the hospital. The average length of stay in the hospital is 7.32 days, which is similar to a review study by Helen.[252]A recent study from Taiwan, the average length of stay was 18 days.[253]The time elapsed between the onset of the symptoms and the treatment received is crucial from the point of view of recovery and minimizes further complications.

During the hospital stay, 19.6% developed complications. The most frequent complications include delirium, seizures, electrolyte imbalance and worsening of the condition. Complications during hospital admission in a prospective and multi-centre study, recurrent stroke(9%) epileptic seizures(3%), infections- Urinary tract infections(24%), chest infection(22%), others(19%), mobility-related falls (25%), pain(9%) and psychological -depression and anxiety and confusion(56%) were noted in 265 patients.[254]In a review study, the most common complications were fever, pain, progressing stroke, pneumonia and sometimes pulmonary embolisms and myocardial infarctions can also occur.[255]

POST-STROKE DISABILITY

Physical disability due to stroke was assessed using the Modified Rankin Scale (mRS). The study group of stroke survivors was divided into two categories based on their mRS scores. The low-score group (mRS 0-2) represents individuals with minimal to moderate disability, while the high-score group (mRS 3-5) includes individuals with more severe disability. It was found that 32% of the stroke survivors

did not have a disability and 31.6% had slight disability. Study results show that 32% had moderate disability and severe disability was in seen 4% of stroke survivors. A national survey conducted in China reported a disability frequency of 45% (mRS scores ≥2).[256]

Barthel disability index is the most commonly used outcome measure for disability after stroke across various studies. Assessment of functional independence in activities of daily living using BDI at 3 months, the results show functional dependence was seen in 90% of the stroke survivors ranging from total to slight dependence. Study from Sweden, functional dependence was seen in 60% of the stroke survivors at 3 months which is less than the current study. Old age and cognitive impairment contributed to dependence.[257]

Different studies have shown that the determinants affecting functional independence include age, sex, stroke severity, volume of the stroke lesion and type of stroke. According to Musa et al, age, length of stay and type of stroke are the factors contributing to functional dependence.[258] In a community-based study from Kolkata, the mean value of BDI was 76.4±30.8 and female gender, depression and cognitive impairment were associated with functional dependence.[259]

The analysis revealed a significant positive association between different age groups and mRS scores. A positive correlation means that as age increases, disability also tends to increase. Age is a crucial factor in stroke recovery and can impact functional outcomes. Similar findings were noted in studies in China and America.[256, 260]

In the current study, mRS scores were not significantly associated with other sociodemographic factors like gender, marital status, education level, socioeconomic

status, and place of residence. In a study from Lebanon, no significant association was found between mRS score and sociodemographic factors except arrhythmia was significantly more frequently found in mRS>2 and >3.[261]

The analysis of the data revealed that there was no statistically significant association between post-stroke disability and any of the cerebrovascular risk factors. Cerebrovascular risk factors play a critical role in the development and outcomes of stroke. Identifying the association between these risk factors and post-stroke disability is essential for understanding the impact of modifiable and non-modifiable factors on stroke recovery. The risk factors considered included hypertension, diabetes mellitus, dyslipidaemia, presence of cardiovascular disorders (e.g., ischemic heart disease - IHD), tobacco consumption, alcohol consumption, and family history of stroke.

These results suggest that while these are risk factors for stroke, they may not be strong predictors of post-stroke disability in our study population. Cerebro-vascular risk factors remain crucial in stroke prevention, and their role in post-stroke recovery and disability might still be influential, albeit not strongly reflected in this specific study.

Length of Stay: A longer hospital stay is indicative of more severe stroke cases or more complex medical needs, which could contribute to lower functional outcomes in this group. A longer length of stay is found to be associated with a high mRS score.[262]

The average length of stay in the study from Turkey was 7 days (interquartile range: 5–13 days). The LOS was dramatically extended in patients with hemorrhagic infarct, aphasia, infection, atrial fibrillation, and smoking history. Functional impairment level (measured using the modified Rankin Scale) and the presence of

infection were found to be significant predictors for LOS.[263] The presence of significant correlations between disability and factors like **length of hospital stay and complications** highlights the importance of timely and appropriate medical interventions to improve outcomes in stroke patients.

The significant association observed between **stroke type** and disability with a positive correlation reaffirms the notion that ischemic strokes, which involve blockages of blood vessels in the brain, can lead to more profound and diverse neurological deficits. The lack of statistically significant associations between the side of the lesion with post-stroke disability may indicate the complexity of stroke-related disability. Brain function is highly interconnected and distributed across various regions, allowing the brain to compensate for damage to some extent. Moreover, individual differences in neurological resilience and rehabilitation outcomes can also contribute to the lack of significant associations.

According to the NEMESIS study, disability was associated with the stroke subtype.[264] The modified SOAR (mSOAR) score, which includes the stroke subtype, Oxfordshire Community Stroke Project (OCSP) classification, age, pre-stroke modified Rankin score (mRS), and National Institutes of Health Stroke Scale (NIHSS), was studied to predict the outcome of strokes in Egypt. It was found to be significantly correlated with post-stroke disability.[265]

The results of our study support the notion that stroke severity is strongly associated with functional outcomes. Similar findings were noted in the mSOAR study of Egypt. Several studies have demonstrated Baseline NIHSS score strongly predicts post-stroke disability.[266,267]

There is a strong positive correlation between cognitive impairment and disability. Similar findings were found in a study from Indonesia and China.[256, 268] however a negative correlation was found between cognitive impairment and disability in a study from NIMHANS.[269] There is a statistically significant negative correlation between the presence of depression and disability. This suggests that the presence of depression is associated with higher disability levels in stroke survivors.[256] Cognitive impairment and depression can significantly impact a person's ability to carry out daily activities and contribute to functional disabilities.

Age, length of stay, stroke severity, cognitive impairment, and depression are found to be associated with functional outcomes. Post-stroke disability is influenced by a combination of factors, including neurological damage, comorbidities, rehabilitation, and social support. Isolating the impact of specific risk factors can be challenging in such a multifactorial scenario.

Consequences of post stroke disability

Caregiver burden and disability

Caregiver burden refers to the physical, emotional, and financial stress experienced by individuals who provide care and support to stroke survivors. Results suggest an association between disability and caregiver burden. Similar findings have been observed in a study from Bangalore, a positive correlation was noted between disability as measured by mRS and caregiver burden.[270] Caregiver burden is positively correlated with urinary incontinence, mRS scores and stroke severity (NIHSS score).[195]

The findings indicate that **caregiver burden, financial burden is significantly associated with physical disability in stroke survivors.** Whereas in one study from India, the burden in relationships, feelings of loss of control in life, personal strain, and emotional burden were the domains most affected.[8] Financial challenges, physical strain, family and emotional adjustments, and sleep. disruption contributed to the stress of CGs, giving a high mean Caregiver Stress Index score of 11.3 (0.93) in the Chintamani Taluka study.[271] In the caregiver burden, females and older CGs bore more financial burden.[272] The factors contributing to increased caregiver burden from a study done in India in all the domains include age, being female, family support and employment status.[273]

Family needs and disability groups

The results indicate that there is a strong positive correlation between the caregivers' needs and all the domains of family needs, and this correlation is statistically significant. The results suggest that caregivers of stroke survivors with disabilities require Health **information** as the most important need.

Coping strategies and disability groups

The results suggest a substantial association between the coping strategies of the caregivers and disability level. The results show that there is a negative correlation between all the domains of coping strategies and disability in both the high-functional group and the low-functional group. This means that as disability increases, the utilization of coping strategies tends to decrease. It suggests that family members of stroke survivors facing higher levels of disability may find it challenging to cope effectively with the situation compared to those with lower disability levels.

Distraction positive coping strategy is found to be significantly associated with post stroke disability. Distraction-positive coping involves redirecting one's attention to positive and enjoyable activities to manage stress. The lower utilization of this coping strategy may indicate that caregivers of stroke survivors with a disability may be more focused on addressing the challenges of caregiving rather than seeking positive distractions.

Quality of life

The WHO QOL BREF assesses different domains of quality of life, and the findings suggest that stroke survivors with higher levels of disability experience more challenges and limitations in these areas. The negative correlation between disability and all the domains of the WHO QOL BREF indicates that as the level of disability increases, the quality of life decreases across various aspects. The regression analysis suggests that physical disability significantly affects the **physical** and **social** domains of quality of life in this study population.

POST-STROKE COGNITIVE IMPAIRMENT

Determinants of post-stroke cognitive impairment

Assessment of cognitive impairment was done using the Addenbrookes Cognitive Examination III. Lower ACE scores indicate more significant cognitive impairment, while higher scores indicate better cognitive function. Based on the scores cognitive impairment was found in 30.8% of the individuals at 3 months post-stroke. The results are less than the recent study from Uganda, where 66.4% were found to have cognitive impairment using the Montreal Cognitive Assessment scale[274] and less than the studies conducted in Singapore (54.5%)[275] and Ireland (56.6%).[276]

The prevalence was found to be higher than the study from China,[277] and similar to a study from India (31.7%).[278]

Study from Mumbai reported a prevalence to be of 66.6% in the elderly.[279]Another prospective study from the eastern part of India documented a prevalence of 13.8% at one-year post-stroke.[280] There is a wide range in prevalence of PSCI, reasons could be the tools used for the assessment, post-stroke duration, ethnicity and other stroke-related factors.

Determinants of Post stroke cognitive impairment

The study found that stroke survivors aged 51-65 years and over 66 years are more susceptible to cognitive impairment following a stroke. The mean age of the stroke survivors with cognitive impairment is 64.46±11.52 which is more than those without CI. (55.68±13.572) It is well known that PSCI prevalence increases with age and peaks at age > 70 years.[73]Age-related changes in the brain, along with the cumulative effects of vascular risk factors over time, can contribute to cognitive decline. Education is considered a protective factor against cognitive decline, as it may enhance cognitive reserve and brain health and it may also have an impact on risk factor profiles and lifestyles.[281]

Gender, level of education, socioeconomic status, and place of residence do not seem to have a significant association with PSCI. A study by Mahon et al reported that male sex and unemployment status contributed to PSCI.[282]The determinants of PSCI in the Mok et al study were age, education and recurrent stroke.[283] In the study from Uganda, the determinants of CI are age, low level of education, functional disability, and high LDL cholesterol levels.[274]

The results of the study indicate that there is significant association between PSCI and dyslipidemia but not with any of the other examined vascular risk factors, whereas the study from Varanasi found an association between hypertension and Diabetes with PSC and insignificant association between age, sex, education duration and occupation.[280]

The lack of significant association between the time of arrival to the hospital and cognitive impairment is unexpected, as delayed hospital arrival has been associated with worse stroke outcomes, including cognitive impairment. However, the lack of significance in this study might be influenced by other factors not accounted for in the analysis or differences in the specific study population.

The study highlights several clinical variables during the acute episode of stroke that are significantly associated with post-stroke cognitive impairment. These variables include the **length of hospital stay, stroke severity.** The positive correlations between cognitive impairment and length of stay and complications during hospital stay indicate that **longer hospital stays** and **increased complications** are associated with higher cognitive impairment. The longer length of stay in stroke survivors with cognitive impairment suggests that cognitive impairment may be associated with more complex medical needs, greater functional deficits, or delayed recovery, leading to extended hospitalization. A study from Saudi Arabia has demonstrated that short LOS are significantly associated with cognitive Functional Independence measure scores.[284]

The study found a significant association between the stroke-related factors like **subtype o**f stroke, specifically the ischemic type, and PSCI. The study did not

find a significant association between the side of the lesion, areas involved in stroke and PSCI.

There was no significant association between Vitamin B12 deficiency and Homocysteine levels and PSCI. The negative correlation between cognitive impairment and homocysteine levels suggests that higher homocysteine levels may be associated with a higher risk of cognitive impairment. Vitamin B12 deficiency and hyperhomocysteinaemia are associated with cognitive decline. Hyperhomocysteinaemia causes brain damage which is asymptomatic as a result of oxidative stress, atherosclerosis and cerebral atrophy.[285]

Studies have shown that Vitamin B12 deficiency and increased Homocysteine levels are associated with stroke and stroke outcome, the mechanism through which changes occur in the brain is largely unknown. Homocysteine is an amino acid that has been linked to vascular health, and elevated levels of homocysteine have been implicated in various cardiovascular and cerebrovascular conditions, including stroke and cognitive impairment. More research models are required to understand this mechanism.[286]

Higher NIHSS scores indicate more severe neurological deficits and, in this study, are associated with a higher prevalence of cognitive impairment among stroke survivors. Many studies in the past have demonstrated the role of NIHSS score as a predictor of PSCI. NIHSS score >6 are considered a predictor of PSCI.[287]

The findings indicate a significant association between cognitive impairment and functional disability, specifically in activities of daily living (ADLs) in stroke survivors. The study observed that cognitively impaired stroke survivors experienced varying degrees of dependence for ADLs. The negative correlation with activities of

daily living indicates that cognitive impairment may be associated with greater dependence on caregivers for daily activities.

The determinants significantly associated with Post-stroke cognitive impairment in the present study are age, marital status, occupation, length of stay, dyslipidemia, subtype of stroke, stroke severity, disability.

In a study from Brazil, a significant association was found between cognitive impairment and age, female gender, stroke severity and functional ability.[288] The study from London found that Cognitive impairment is common 3 months after stroke and is independently associated with older age, ethnicity, lower social class, left hemispheric stroke, visual field defect, and urinary incontinence.[289]

Another multi-centre study determinants of PSCI such as age, stroke severity and the presence of vascular risk factors, also leg paralysis is associated with subsequent of PSCI up to 3 years after stroke.[290]

The STROKOG consortium found associations between cognition and diabetes mellitus, previous stroke, hypertension, atrial fibrillation, and smoking early after a stroke.[291] In a systematic review and meta-analysis of studies with both short- and long-term follow-ups after stroke, diabetes mellitus, atrial fibrillation, and previous stroke were shown to be predictors of post-stroke dementia. In the Oxford Vascular Study, post-stroke dementia was associated with previous stroke and diabetes mellitus in the long-term following a stroke.[292]

Caregiver burden

The study observed that caregivers of stroke survivors with cognitive impairment experienced varying degrees of burden. There is significant positive

correlation of domains of caregiver burden with post-stroke cognitive impairment, but logistic regression analysis did not reveal any significant association.

Family needs

There is a significant association between cognitive impairment in stroke survivors and the importance of family needs. There is a strong positive correlation between cognitive impairment in stroke survivors and all domains of family needs. The statistically significant correlations highlight a robust relationship between cognitive impairment and the impact on the needs of family members in various aspects of their caregiving role.

The results indicate that **emotional support, instrumental support** (practical assistance with daily tasks) and **professional support** (specialized assistance and guidance) are found to be significantly associated with post-stroke cognitive impairment. These needs reflect the essential support that caregivers require in managing the care and overall well-being of stroke survivors.

Coping strategies

There is a significant negative correlation between the presence of cognitive impairment in stroke survivors and all domains of coping strategies adopted by family members. This suggests that when stroke survivors have cognitive impairment, family members tend to use coping strategies less frequently across various domains. **Religion** appears to be the most important coping mechanism among caregivers of stroke survivors with cognitive impairment.

Quality of life

Cognitive impairment can affect physical, psychological, social, and environmental well-being, leading to lower overall QOL. The results indicate that cognitive impairment is significantly associated with the **psychological** and **environmental** domains of the WHO Quality of Life BREF, while the physical and social domains did not show a significant association.

POST-STROKE DEPRESSION

Neuropsychiatric disorders are common after stroke and a wide spectrum of both neurocognitive and non-cognitive disorders are included. However uncommon conditions like apathy, personality disorders, emotional lability, emotional incontinence, fatigue, mania, and catastrophic reactions were not included in the current study and their manifestations do not have widely acknowledged diagnostic criteria at present, or are not considered standard neuropsychiatric diseases in the fifth edition of the diagnostic and statistical manual of mental disorders (DSM-5).[293]

Neuropsychiatric Inventory (NPI) was used to obtain information on the presence of psychopathology in the current study. Agitation or aggressive behaviours were noted in 30.4% of the stroke survivors. Depression was found in 27.2% of the individuals. Anxiety is noted in 12 % of stroke survivors. Caregiver distress using NPI was not assessed in the current study.

In the study from Maharashtra, out of 150 patients, 52.66% had a psychiatric illness. 33.33% had Major Depressive Disorder, 16% had Generalized Anxiety Disorder (GAD), 2% were diagnosed with psychotic disorder whereas 1.33% had

social phobia.[294] In the Study from Lebanon on post-stroke survivors at 3 months detected that 51.3% suffered from anxiety and 76.1% suffered from depression.[295]

The severity of Post-stroke depression was assessed using HAMD. Based on the HAMD scores, it can be said that post-stroke depression is seen in 27.2% of the stroke survivors and among them 4.4% had mild depression, 10% had moderate depression and 12.8% had severe symptoms. It is also difficult to separate symptoms of depression from behavioural problems associated with cognitive impairment as both coexist in the study sample.

One Indian study reported a prevalence of 35.29%.[296] Systematic review and meta-analysis from Indian studies show that the prevalence of PSD in India is about 55% and ranges from 24% to 90%.[297] In a study from Egypt, the prevalence was found to be 36.9%.[298]

Recent studies from Nigeria show a prevalence of 22.9% and 42.9% respectively.[299,300] In systematic reviews of post-stroke depression from the Middle East and North Africa reported prevalence ranging from 17% to 73%.[301]

The literature review has shown variation in the frequency of PSD. This variation could be influenced by patient selection, socioeconomic status, educational level, the location and severity of the lesion, the study design, the timing of the assessment after the stroke, and the related risk factors.

Determinants of post-stroke depression.

The study suggested that **older** stroke survivors are at a higher risk of developing depression. Previous research has also highlighted the increased risk of depression in older adults after experiencing a stroke. While depression was more

frequent among men, the study found that almost 50% of women who suffered from stroke had depression.

This study found a significant association of PSD with older age and female gender. Several studies have consistently found that female gender is associated with depression.[302] Some previous studies suggest that age is not a risk factor or determinant for PSD.[303]

Occupation was significantly associated with depression among stroke survivors. Housewives and farmers had higher rates of depression, indicating that certain occupational groups are more vulnerable to depression after stroke. In a recent study from Bhuvaneshwar, post-stroke depression was not associated with age, gender, type of stroke and hemispherical involvement.[304]

The regression analysis reveals that **age, gender, and occupation** are significantly associated with post-stroke depression. Other sociodemographic characteristics, including, marital status, education, socioeconomic status, and place of residence, do not show significant associations with PSD.

Risk factors such as smoking, alcohol use, ischemic heart disease, dyslipidemia, Diabetes and Hypertension were not found to be associated with PSD, which is like many other studies. Smoking was found to be a risk factor in one study.[298] A study examined the inconsistencies and suggested that female gender, stroke severity, functional disability and support as risk factors for PSD.[305]

The study found that depression was more common among stroke survivors who had a hospital stay of more than one week (33.8%). This suggests that a longer hospital stay is a potential risk factor for post-stroke depression. Prolonged hospitalization can lead to increased stress, social isolation, and disruptions in daily

routines, all of which can contribute to the development of depression. Furthermore, a longer hospital stay may be an indicator of more severe strokes or complications, which could also influence the likelihood of post-stroke depression.

The current study did not find any statistically significant association between stroke lesion characteristics, such as type and side of stroke with poststroke depression. Similar findings were noted in some studies.[306,307,308] However there have been few studies that found left hemispheric lesions correlated with PSD.[307,309]The lack of significance in this study might be due to the sample size or other factors influencing the relationship between stroke type and depression.

The role of vitamin B12 levels and homocysteine levels in post-stroke depression is not well-established, and more research is needed to understand their potential impact on depressive symptoms in stroke survivors.

Stroke Severity: The study's finding suggests that stroke severity affects post-stroke depression. In our study, stroke survivors with minor stroke severity have more incidences of PSD. This could be due to loss of independence, limitations in mobility, financial burden, challenges in performing daily activities and poor social support can be emotionally overwhelming and contribute to feelings of sadness, frustration, and helplessness.

This is an important observation as it highlights the impact of **stroke severity** on the mental health outcomes of stroke survivors. The results supported the association of Stroke severity and the level of functional disability with PSD, which is similar to many previous studies.[302,305]

The study's result suggests that stroke survivors with moderate to severe disability, as indicated by higher mRS scores, are more likely to experience post-stroke depression. The reasons behind the association between PSD and disability are multifactorial, like psychological impact, social isolation, coping mechanisms, neurobiological factors

Stroke survivors with cognitive impairment, as indicated by lower ACE scores, are more likely to experience post-stroke depression. This finding is in line with previous research, which has consistently shown an association between cognitive impairment and an increased risk of post-stroke depression. The relationship between PSD and cognitive impairment can be bidirectional and complex. Cognitive deficits resulting from stroke can lead to emotional distress and frustration. Difficulties in memory, attention, problem-solving, and communication can significantly impact daily activities and reduce the individual's sense of control and independence, potentially contributing to the development of depression.

The study's result suggests that stroke survivors with moderate to severe functional impairment, as indicated by lower BDI scores, are more likely to experience post-stroke depression. Physical disability, activities of daily living limitations, and the presence of cognitive impairment are found to be significantly associated with PSD.

Caregiver burden

The result suggests caregivers of stroke survivors with post-stroke depression experience moderate to severe burden. **Burden in relationship** is the most significant domain of caregiver burden affected among caregivers of stroke survivors with depression.

A study published in the journal "Stroke" in 2013 examined caregiver burden and its association with post-stroke depression. The researchers found that caregivers of stroke survivors with depression reported higher levels of burden, emotional distress, and reduced quality of life compared to caregivers of stroke survivors without depression. The emotional burden was particularly pronounced in caregivers dealing with the challenging emotional dynamics associated with depression in stroke survivors.[310]

Another study published in the "Archives of Physical Medicine and Rehabilitation" in 2015 investigated caregiver burden in the context of stroke recovery. The researchers found that caregivers of stroke survivors with depression experienced higher levels of physical and mental health strain, social isolation, and financial stress. [311]

A systematic review and meta-analysis reviewed multiple studies examining caregiver burden in stroke survivors with and without depression. The analysis demonstrated that post-stroke depression was consistently associated with higher levels of caregiver burden. The domains of emotional burden, social burden, and overall strain were significantly affected in caregivers of stroke survivors with depression.[312]

Furthermore, a study published in 2018 specifically focused on caregiver burden related to stroke survivors with depression in the elderly population. The researchers found that caregivers of older stroke survivors with depression experienced elevated levels of burden and a higher risk of burnout. The emotional toll of dealing with depression and the additional caregiving responsibilities contributed to the caregiver burden.[313]

Coping strategies

All domains of coping strategies in stroke survivors are positively correlated with the presence of depression. **Distraction-Negative Coping.** Both groups of stroke survivors use **distraction-negative coping** strategies to manage stress and emotional challenges. Distraction-negative coping involves attempting to avoid or distract oneself from stressors without effectively addressing the underlying issues.

Some studies have found that certain coping strategies, such as active problem-solving and seeking social support, can be associated with better psychological outcomes and lower levels of depression. However, other studies have found that maladaptive coping strategies, such as avoidance and denial, can be linked to higher levels of depressive symptoms.[314]

Family needs

Family members often serve as primary caregivers and play a vital role in providing emotional, practical, and social support during the stroke recovery process. The study's findings suggest a significant association between family needs and post-stroke depression (PSD) in stroke survivors. Emotional Support, instrumental support, Professional Support, community support network and Involvement in Care needs were considered as important family needs by caregivers of stroke survivors with depression.

Quality of life

The observation that **physical, psychological,** and **social** domains of QOL are affected more in the PSD group is consistent with existing research. Post-stroke depression can have a profound impact on a stroke survivor's physical health and

functional abilities, leading to reduced mobility, fatigue, and challenges in performing daily activities. Additionally, depression can impair psychological well-being, leading to feelings of sadness, hopelessness, and reduced self-esteem.

Consequences of Post-stroke disabilities

Caregiver burden

According to Zarit et al., CG load is "the state resulting from necessary caring tasks or restrictions that cause the CG discomfort."[315] The cost of providing care, the amount of physical support and intervention required to help with Activities of Daily Living (ADL) due to greater physical handicap, cognitive impairments, and housekeeping activities can all be considered as part of the CG burden.

The CG must strike a balance between caring for a stroke victim who is incapacitated and altering that person's way of life. A stroke survivor's needs can range from physical (walking, getting from bed to chair to toilet), communication (verbal and nonverbal with family members, friends), nursing (feeding, changing clothes, personal toilet), emotional and psychological changes to adapt to the effects of stroke, and financial (loss of employment, medical bills).

Depending on the community and culture, the CG burden is viewed differently in the Indian setting. In Indian society, men are the primary provider and head of the household, while women often take care of the family's welfare at home. The care of an older family member at home will surely create a tremendous burden on the female CGs because of the chronic nature of stroke.

The determinants of caregiver burden are age, length of stay, complications, subtype of stroke, stroke severity (NIHSS Score), and physical disability (mRS score).

Cognitive impairment, functional independence (BDI score) and Post-stroke depression. Similar findings were noted in the study of first-ever stroke survivors from Mumbai and Uttar pradesh, the factors were urinary incontinence, disability (mRS score) and NIHSS score.[316,317]

CG of patients with cognitive impairment and depression experienced greater caregiver stress.[318] Another study from Korea found that Patient factors related to the burden scores were being unemployed, the presence of diabetes mellitus, aphasia, dysarthria, dysphagia, cognitive dysfunction, severe MRS score, emotional incontinence, and depression.[319]

Contrary to a study from Korea, the education and employment status of the CGs were not related to higher levels of stress in our study, whereas caregiving time (>4 hours per day), anxiety, restless nights, and financial stress were. Our study, in contrast to earlier studies demonstrated that the patient's morbidity (severe MRS score of 3-5) was a significant factor contributing to higher caregiving stress.[320]

The study from Turkey focused on the family's financial state and strain, comparable to the study by Tsai Y. H. et al. which demonstrated the connection between carers' financial circumstances and hardship.[321,322]

It was also discovered that caregiver burden was lower for those who needed only information and care help from their families or relatives as opposed to those who received only financial support. According to Yu et al. (2013), caregivers frequently require social support.[323]

According to Efi, P. et al. (2017) there is a significant link between caregiver stress and quality of life, anxiety, and depression. Significant associations were found

in our study between the caregiver burden and depression. This indicates that a higher caregiver burden results from higher anxiety and depression scores as well as lower quality of life.[324]

The cognitive status and activities of daily living (ADL) were found to be significantly correlated with caregiver burden as measured by the ZBI. It has been observed that when the cognitive level and level of ADL independence increased, the caregiver burden for stroke survivors reduced. The literature reveals comparable results. According to Caro, C. et al. (2017) there is a strong association between caregiver burden, stroke patients' level of independence, and their cognitive status.[325]

In a study from Malaysia, caregiver burden correlated positively with disability and cognitive impairment similar to our study but no significant correlation was found with depression.[326] A study from Western India convincingly demonstrates that a greater educational level of CG is connected with a lower level of CG burden. Contrary to our study education is not significantly associated with caregiver burden.[327]

Family needs

The contributing factors of family needs are age, length of stay, complications, subtype of stroke, stroke severity (NIHSS Score), physical disability (mRS score). Cognitive impairment, functional independence (BDI score) and Post stroke depression.

Caregivers of stroke survivors with disabilities require varied family needs. Similar to a study by Kumar et al, wherein they reported that health information, instrumental support and community support network subscale were considered the

most important.[328] Similarly, another study from China, revealed that family caregivers prioritized the needs for psychological support, treatment and care, social support and health information.[329]

In a study from Indonesia, results found that family caregivers need information on Physical education (education about medical rehabilitation training at home, mobilization and transfer of patients, training of handling of patients ADL, signs, symptoms and risk of future stroke episodes, psychological support and structured discharge planning education.[330]

A strong need for information was indicated by about 82% of the demands listed by stroke survivors and 92% of the needs listed by caregivers. 70% and 75%, respectively, of stroke survivors and caregivers reported having financial needs. Stroke survivors and their caregivers identified a key barrier to accessing stroke rehabilitation services as a lack of stroke knowledge. Parents and other caregivers acknowledged a great need for assistance in handling family relations.[331]

One study explored the experiences and needs of caregivers in Malaysia and came up with two major needs of caregivers expressed as educational and informational support to caregivers and psychological support.[332]

Coping strategies

The stroke survivor factors contributing to coping mechanisms among the caregivers are hypertension, use of tobacco, length of stay, complications, subtype of stroke, stroke severity (NIHSS Score), and physical disability (mRS score). Cognitive impairment, functional independence (BDI score) and Post-stroke depression.

Problem-solving coping involves actively addressing and managing stressors and challenges related to the disability, which may be an essential coping strategy for caregivers to help manage the care and support needed by individuals with disabilities.

Distraction-negative coping involves avoiding or suppressing negative emotions and stressors, which may suggest that caregivers of stroke survivors with disability may resort to this coping strategy to manage the emotional toll of caregiving. Social support coping involves seeking help, advice, or emotional support from others, which may highlight the importance of social networks and support systems for caregivers of individuals with disabilities.

Caregivers employed a wide range of coping mechanisms. In the study by Kumar et al, the most common coping mechanisms employed by carers of stroke patients were problem-solving, positive distraction, seeking social support, identifying a few solutions, and assistance from religious objects. The least common coping mechanisms were denying/blaming one's fate and negatively distracting.[314] According to research on carers, problem-solving or problem-focused coping methods are the most frequently used, along with emotion- and task-focused coping strategies.[333]

Similar to our study, the least prevalent coping mechanisms used by relatives to deal with difficult caregiving situations include denying/blaming and distracting adversely. In a similar vein, problem resolution, acceptance, religion, and seeking out social support are common.[334,335]

Quality of life

According to WHO, Quality of life is defined as “Individuals’ perception of their life in the context of their culture and value systems in which they live and concerning their goals, expectations, standards, and concerns.[336]

The stroke survivor factors contributing to poor quality of life are age, education, use of tobacco, length of stay, complications, subtype of stroke, stroke severity (NIHSS Score), physical disability (mRS score). Cognitive impairment, functional independence (BDI score) and Post stroke depression.

Functional status, age, and gender were revealed to be the patients' most significant drivers of QOL after 16 months in a study by Jonsson.[337] In research by Chandran et al. on the assessment of quality of life (QoL) of stroke survivors in a rural area of North Kerala, it was discovered that just 2 (or 5%) of the 40 patients were completely independent, while the remainder required assistance to varied degrees and some were completely bedridden. The major determinant of QOL in this study was the functional disability of the stroke survivors.[338]

In a longitudinal study, it was seen that there is significant improvement in all physical, psychological and social domains of QOL after 6 months of follow up. Improvements in activities of daily living contributed to improved QOL.[339] The length and difficulty of caregiving, the CG's age, and the functional level of stroke survivors were the factors that determined the CG's quality of life in a systematic review in south Africa.[340]

It is important to note that caregiving can be complex and multifaceted, and the results presented in this study provide valuable insights. However, it is crucial to

consider other factors that may influence caregiver burden, such as the duration of caregiving, available social support, and caregiver coping mechanisms. Providing adequate resources, education, and support services for caregivers can help alleviate the burden and enhance the overall quality of care provided to stroke survivors. Additionally, longitudinal studies that follow caregivers over time could offer further insights into the evolving nature of caregiver burden and its potential impact on long-term outcomes for both caregivers and stroke survivors. Identifying caregivers at risk of severe burden is crucial to providing timely interventions and support to ensure the well-being of both the caregivers and care recipients.

Addressing these areas of concern through appropriate interventions, support, and rehabilitation can contribute to improving the quality of life and well-being of individuals with disabilities. It emphasizes the importance of a holistic approach in stroke management, which considers not only physical functioning but also the psychological, social, and environmental aspects of the individual's life. By addressing these factors, healthcare professionals can better support stroke survivors and their caregivers in adapting to and managing the challenges of living with a disability.

CONCLUSION

The current study focused on the determinants and consequences of post-stroke disabilities in an Indian setting. This study contributes valuable information to the existing literature on post-stroke disability and its association with various sociodemographic variables. The determinants of disability are age, length of stay in the hospital, stroke severity and type of stroke. The determinants of PSCI are age, length of stay, complications, vitamin B12 deficiency and increased homocysteine levels, stroke severity, type of stroke, and disability. The determinants of PSD are age, gender, occupation, stroke severity, length of stay, physical disability and cognitive impairment.

The current study highlights the significant association between stroke type and post-stroke disabilities, particularly with ischemic strokes. However, no statistically significant associations were found between the side of the lesion and the area of the brain involved with post-stroke disability. These findings emphasize the complexity of post-stroke disabilities and the need for a comprehensive approach to stroke care and rehabilitation.

Future research with larger and more diverse stroke populations, longitudinal designs, and advanced neuroimaging techniques may provide further insights into the intricate relationship between stroke characteristics and post-stroke disabilities. A deeper understanding of these associations can inform personalized rehabilitation plans, targeted interventions, and improved support systems for stroke survivors, ultimately enhancing their recovery and overall quality of life.

As the prevalence of stroke in India is high the effects of stroke are not limited to the affected person alone. It affects family, community and society. The secondary

effects of stroke in terms of burden, (economic, emotional and physical) are going to influence family and society.

This is the first study on a comprehensive evaluation of caregiver burden, needs, coping strategies and quality of life of stroke survivors affected by physical, cognitive and psychological impairment.

Caregiver burden ranging from mild to severe burden observed in caregivers of the majority of stroke survivors. Adequate coping strategies were observed in two-thirds of the caregivers. All the domains of Family needs were found to be important for caregivers of stroke survivors. The quality of life is poor in stroke survivors with disabilities. Caring for a stroke survivor with disabilities can have a huge impact on caregivers with physical and psychological consequences. Caregivers adopt varied types of coping strategies to mitigate the burden and balance their own lives.

There may be other factors influencing the disability profile in the Indian setting. The cultural and economic influence on the prevalence and morbidity can't be ruled out. Future studies are required with a larger community-based population, incorporating the cultural belief practices. Long-term follow-up of these cases would also yield better outcome results.

SUMMARY OF THE RESULTS

This was a hospital-based study with 250 post stroke survivors. The mean age of the study population is 58.7± 13.537, with male predominance (male: female ratio is 2.9:1) and from a rural background. The majority of the subjects had ischaemic type of stroke. Right-sided lesions were more common. Risk factors for stroke, like preexisting hypertension, diabetes mellitus, dyslipidemia, tobacco and alcohol use were found among the stroke survivors.

Post-stroke physical disability

Post stroke disability was noted in 2/3 of the stroke survivors. The mean age of stroke survivors with moderate to severe disability is 61.26±3.277 and the age group of >65 years are more affected by physical disability. The determinants of disability are age, education, length of stay, complications during admission and stroke severity. Activities of daily living (functional independence) is affected by physical disability.

Consequences of post stroke disability in terms of caregiver burden, needs, coping strategies and quality of life. From the current study, it can be incurred that in the caregiver burden domains, financial burden is significantly associated with disability. Distraction positive coping strategy is found to be the most preferred coping strategies. Among the domains of family needs, health information appears to be the most important family need. Both Physical and Social domains of quality of life are found to be significantly associated with post stroke disability**.**

Post-stroke cognitive impairment

Cognitive impairment was noted to be present in 30.8% of the stroke survivors. The mean age of the stroke survivors is 64.46±1.522 seen more frequently in >65 years of age group. The determinants of PSCI are age, length of stay, marital status, complications, dyslipidemia, stroke severity, type of stroke, and disability. The activities of daily living (functional independence) are affected by the presence of PSCI.

The consequences of post-stroke cognitive impairment in terms of caregiver burden, family needs, coping strategies and quality of life. It can be observed that care giver burden is not significantly associated with cognitive impairment though significant correlation is noted. Among the domains of coping strategies, religion is found to be significantly regressed with cognitive impairment. The domains of family needs show that emotional support, instrumental support and professional support are significantly associated with cognitive impairment. The domains of quality of life which are significantly associated with cognitive impairment are psychological and environmental domains.

Post-stroke depression

Post-stroke depression was observed in 27.2% of the individuals. The mean age of stroke survivors with post-stroke depression is 61.97±13.453 with more prevalence of PSD >65 years of age. The determinants of PSD are age, gender, occupation, stroke severity, length of stay, physical disability and cognitive impairment. The activities of daily living (functional independence) are affected by the presence of PSD.

The consequences of post-stroke cognitive impairment in terms of caregiver burden, family needs, coping strategies and quality of life. In stroke survivors with depression, burden in relationship domain among caregiver burden domains is found to be significantly associated. The coping strategy which is significantly associated is distraction negative. Family need domains which are significantly associated include Instrumental support, Professional support, Community support network and involvement in care. Among the domains of quality of life physical, psychological and environment are significantly regressed with post stroke depression.

LIMITATIONS OF THE STUDY

1. This is a cross-sectional evaluation of predictors and consequences of stroke disabilities in a hospital setting. The recovery from stroke depends on various factors and can last upto 1 year. It is difficult to track changes in severity of the disability and prevalence. In the present study, Consequences were evaluated at 3 to 6 months. This is only a preliminary study in this field and generalization of the study results is limited.
2. Long-term consequences with time intervals would have yielded better results. Caregiver burden, family needs and coping techniques depend on the stage of the illness. The needs, caregiver burden, and coping would differ in acute stroke, convalescence, and chronic phase. Prospective follow up of these patients with their caregivers probably would yield long-term outcomes.
3. In the present study caregiver details were not collected hence insightful evaluation of caregiver factors contributing to the various consequences were not studied.
4. In depth exploration of the care needs of family members, coping mechanisms and quality of life was limited as the data is from one hospital and sociodemographic characteristics of the patients attending the hospital is limited. Bias cannot be ruled out in this study including observer bias, recall bias and attrition bias.

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ANNEXURES

ANNEXURE – I - ETHICAL CLEARANCE LETTER

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Formerly known as KLE University)
(Deemed-to-be-University established u/s 3 of the UGC Act, 1956)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JNMC Campus, Nehru Nagar, Belagavi-590 010, Karnataka State, India
☎: 0831-2444444 FAX: 0831-2493777 Web: http://www.kledeemeduniversity.edu.in E-mail: info@kledeemeduniversity.edu.in

Ref.No.KAHER/EC/19-20/2906 1900 | 28th June 2019

To,
Dr. Saraswathi N
Part-Time Ph.D. Research Scholar,
2018-19 Batch, Faculty of Medicine,
KAHER, Belagavi.

Dear Research Scholar

The KAHER Ethics Committee on Human Subjects for Ph.D. Research Project met on th **14th May 2019** to consider your application for approval of the research project **"Determinants and consequences of post stroke disabilities - A Hospital based study."**

As there are no ethical issues involved in your proposed research project, the committee has provided approval for this research project.

You are requested to report to Ethical Committee of the following:

1. Any deviation from or change of the protocol.
2. Any changes in study documents.

(Dr. Anita Dalal)
Member-Secretary
Ethical Committee (Human) for Ph. D. Research
KAHER, Belagavi.

(Dr. B.C. Kotintot)
Chairman
Ethical Committee (Human) for Ph. D. Research
KAHER, Belagavi.

CC to: - The Director Research Foundation, KAHER, Belagavi.
- The Director Academic Affairs, KAHER, Belagavi.
- The Registrar, KAHER, Belagavi.
- Special Officer to Hon. Vice Chancellor, KAHER, Belagavi.

ANNEXURE-II - INFORMED CONSENT FORM

Informed consent form

This Informed Consent Form is for patients who attend Neurology clinic, KLE's Prabhakar kore Hospital with history of Stroke who are invited to participate in research.

The title of our research project is "**Determinants and Consequences of Post Stroke Disabilities-A Hospital based study"**

Name of Principal Investigator- Dr. Saraswathi N, Consultant Psychiatrist

Guide- Dr.Saroja , Professor of Neurology, JNMC

PART I: Information Sheet

Introduction- I Dr. Saraswathi N am doing research on Post Stroke disabilities as a result of cognitive and psychiatric impairment after Stroke. For this research I will be doing Cognitive and psychiatric assessment with standard questionnaires. We would also like to know your knowledge and perception about your quality of life, needs, coping strategies and burden of caring the stroke affected person. I am going to give you information and invite you to be part of this research. There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. Whether you choose to participate or not, all the services you receive at this hospital will continue and nothing will change. If you choose not to participate in this research project, you will be offered the treatment that is routinely offered in this hospital.

Confidentiality

The information that we collect from this research project will be kept confidential. Information about you that will be collected during the research will be put away and no-one but the researchers will be able to see it. Any information about you will have a number on it instead of your name

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so. You may also stop participating in the research at any time you choose. It is your choice and all of your rights will still be respected.

Whom to Contact

If you have any questions you may ask now or later, even after the study has started. If you wish to ask questions later, you may contact the following: Dr. Saraswathi. N -9844177019

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

PART II: Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of Participant_____

Signature of Participant _____

Date :

If illiterate

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely. Name of witness_____ AND

Thumb print of participant

Signature of witness _____

Date:

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands the procedure.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informattion has been provided to the participant.

Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date :

ತಿಳುವಳಿಕೆಯ ಒಪ್ಪಿಗೆ ಪತ್ರ

ಕೆ.ಎಲ್.ಇ.ನ ಪ್ರಭಾಕರ್ ಕೋರೆ ಆಸ್ಪತ್ರೆಗೆ ನರವಿಜ್ಞಾನದ ಚಿಕಿತ್ಸಾಲಯಕ್ಕೆ ಹಾಜರಾಗುವ ಸ್ಕೊಟ್ಸ್‌ಕ್ ಇತಿಹಾಸದೊಂದಿಗೆ ಬರುವ ರೋಗಿಗಳಿಗೆ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಈ ಮಾಹಿತಿಯುಕ್ತ ಸಮ್ಮತಿ **ಪತ್ರವಾಗಿದೆ**

ನಮ್ಮ ಸಂಶೋಧನಾ ಯೋಜನೆಯ ಶೀರ್ಷಿಕೆ– "ಪೋಸ್ಟ್ ಸ್ಕೊಟ್ಸ್‌ಕ್‌ನಿಂದ ಆಗುವ ನ್ಯೂನತೆಗಳ ಕಾರಣಗಳು ಮತ್ತು ಪರಿಣಾಮಗಳು-ಆಸ್ಪತ್ರೆ ಆಧಾರಿತ ಅಧ್ಯಯನ"

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿ ಹೆಸರು- ಡಾ. ಸರಸ್ವತಿ ಎನ್, ಮಾನಸಿಕ ರೋಗ ತಜ್ಞವೈದ್ಯರು

ಮಾರ್ಗದರ್ಶಿ- ಡಾ. ಸರೋಜಾ, ಪ್ರೊಫೆಸರ್, ನರರೋಗ ವಿಭಾಗ ಜೆಎನ್‌ಎಂಸಿ

ಭಾಗ ೧: ಮಾಹಿತಿ

ಪರಿಚಯ - ನಾನು ಡಾ. ಸರಸ್ವತಿ ಎನ್ ಸ್ಕೊಟ್ಸ್‌ಕ್ ನಂತರ ಅರಿವಿನ ಮತ್ತು ಮನೋವೈದ್ಯಕೀಯ ದೌರ್ಬಲ್ಯಗಳನ್ನು ಸಂಶೋಧನೆ ಮಾಡುತ್ತಿದ್ದೇನೆ. ಈ ಸಂಶೋಧನೆಗೆ ನಾನು ಪ್ರಮಾಣಿತ ಪ್ರಶ್ನಾವಳಿಗಳೊಂದಿಗೆ ಅರಿವಿನ ಮತ್ತು ಮಾನಸಿಕ ಮೌಲ್ಯಮಾಪನವನ್ನು ಮಾಡುತ್ತೇನೆ. ನಿಮ್ಮ ಜೀವನದ ಗುಣಮಟ್ಟ, ಅಗತ್ಯತೆಗಳು, ಸ್ಕೊಟ್ಸ್‌ಕ್ ಪೀಡಿತ ವ್ಯಕ್ತಿಯನ್ನು ಕಾಳಜಿ ಮಾಡುವ ಕಾರ್ಯವಿಧಾನಗಳು ಮತ್ತು ಹೊರೆಗಳನ್ನು ನಿಭಾಯಿಸುವ ಬಗ್ಗೆ ನಿಮ್ಮ ಜ್ಞಾನ ಮತ್ತು ಗ್ರಹಿಕೆಯನ್ನು ನಾವು ತಿಳಿದುಕೊಳ್ಳಲು ಬಯಸುತ್ತೇವೆ. ನಾನು ನಿಮಗೆ ಮಾಹಿತಿಯನ್ನು ನೀಡುತ್ತೇನೆ ಮತ್ತು ಈ ಸಂಶೋಧನೆಯ ಭಾಗವಾಗಿ ನಿಮ್ಮನ್ನು ಆಹ್ವಾನಿಸುತ್ತೇನೆ. ನಿಮಗೆ ಅರ್ಥವಾಗದ ವಿಷಯಗಳ ಬಗ್ಗೆ ನೀವು ಪ್ರಶ್ನೆ ಮಾಡಿ ತಿಳಿದುಕೊಳ್ಳಬಹುದು.

ಸ್ವಯಂಪ್ರೇರಿತ ಭಾಗವಹಿಸುವಿಕೆ

ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ನಿಮ್ಮ ಭಾಗವಹಿಸುವಿಕೆ ಸಂಪೂರ್ಣವಾಗಿ ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ. ಭಾಗವಹಿಸುವುದು ಅಥವಾ ಇಲ್ಲ ಎಂಬುದು ನಿಮ್ಮ ಆಯ್ಕೆಯಾಗಿದೆ. ನೀವು ಭಾಗವಹಿಸಿದರೂ ಅಥವಾ ನಿರಾಕರಿಸಿದರೂ, ಈ ಆಸ್ಪತ್ರೆಯಲ್ಲಿ ಎಲ್ಲಾ ಸೇವೆಗಳು ಮುಂದುವರಿಯುತ್ತದೆ ಮತ್ತು ಏನೂ ಬದಲಾಗುವುದಿಲ್ಲ. ಈ ಸಂಶೋಧನಾ ಯೋಜನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಬಾರದೆಂದು ನೀವು ಆಯ್ಕೆ ಮಾಡಿದರೆ, ಈ ಆಸ್ಪತ್ರೆಯಲ್ಲಿ ವಾಡಿಕೆಯಂತೆ ನೀಡಲಾಗುವ ಚಿಕಿತ್ಸೆಯನ್ನು ನೀವು ಪಡೆಯುತ್ತೀರಿ.

ಗೌಪ್ಯತೆ

ಸಂಶೋಧನೆಯ ಸಮಯದಲ್ಲಿ ಸಂಗ್ರಹಿಸಲ್ಪಡುವ ನಾವು ಸಂಗ್ರಹಿಸಿದ ಮಾಹಿತಿಯು ಗೌಪ್ಯವಾಗಿರುತ್ತದೆ. ಸಂಶೋಧನೆಯ ಸಮಯದಲ್ಲಿ ಸಂಗ್ರಹಿಸಲ್ಪಡುವ ನಿಮ್ಮ ಮಾಹಿತಿ ಯಾರಿಗೂ ದೊರಕುವುದಿಲ್ಲ ಮತ್ತು ಸಂಶೋಧಕರಿಗೆ ಮಾತ್ರ ಅದು ಲಭ್ಯವಿರುತ್ತದೆ. ನಿಮ್ಮ ಬಗ್ಗೆ ಯಾವುದೇ ಮಾಹಿತಿ ನಿಮ್ಮ ಹೆಸರಿನ ಬದಲಾಗಿ ಸಂಖ್ಯೆಯನ್ನು ಹೊಂದಿರುತ್ತದೆ

ನಿರಾಕರಿಸುವ ಅಥವಾ ಹಿಂತೆಗೆದುಕೊಳ್ಳುವ ಹಕ್ಕು

ನಿಮಗೆ ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಲು ಇಷ್ಟವಿಲ್ಲದಿದ್ದರೆ ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಬೇಕಾಗಿಲ್ಲ. ನೀವು ಆಯ್ಕೆ ಮಾಡಿದ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವುದನ್ನು ನಿಲ್ಲಿಸಬಹುದು. ಇದು ನಿಮ್ಮ ಆಯ್ಕೆಯಾಗಿದೆ ಮತ್ತು ನಿಮ್ಮ ಎಲ್ಲ ಹಕ್ಕುಗಳನ್ನು ಗೌರವಿಸಲಾಗುವುದು.

ಯಾರನ್ನು ಸಂಪರ್ಕಿಸಬೇಕು

ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಹೊಂದಿದ್ದರೆ ಈಗ ಅಥವಾ ನಂತರ ಕೇಳಬಹುದು, ಅಧ್ಯಯನ ಪ್ರಾರಂಭವಾದ ನಂತರ. ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ಬಯಸಿದರೆ, ನೀವು ಸಂಪರ್ಕಿಸಬಹುದು: ಡಾ. ಸರಸ್ವತಿ. ಎನ್ -೯೪೪೪೧೭೭೦೯

ನೀವು ಬಯಸಿದಲ್ಲಿ, ಸಂಶೋಧನಾ ಅಧ್ಯಯನದ ಯಾವುದೇ ಭಾಗವನ್ನು ಕುರಿತು ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಬಹುದು. ನಿಮ್ಮಲ್ಲಿ ಯಾವುದಾದರೂ ಪ್ರಶ್ನೆಗಳಿವೆಯೆ?

ಭಾಗ ೨: ಸಮ್ಮತಿಯ ಪ್ರಮಾಣಪತ್ರ

ನಾನು ಮೇಲ್ಕಂಡ ಮಾಹಿತಿಯನ್ನು ಓದಿದ್ದೇನೆ ಅಥವಾ ಅದನ್ನು ನನಗೆ ಓದಿ ಹೇಳಲಾಗಿದೆ. ಅದರ ಬಗ್ಗೆ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ನಾನು ಅವಕಾಶ ಹೊಂದಿದ್ದೇನೆ ಮತ್ತು ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ತೃಪ್ತಿಕರವಾಗಿ ಉತ್ತರಿಸಲಾಗಿದೆ.ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಭಾಗವಹಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಮ್ಮತಿಸುತ್ತೇನೆ.

_____ ನ ಹೆಸರು

ಪಾಲ್ಗೊಳ್ಳುವವರ ಸಹಿ _____

ದಿನಾಂಕ:

ಅನಕ್ಷರಸ್ಥರಾಗಿದ್ದರೆ

ಸಂಭಾವ್ಯ ಪಾಲ್ಗೊಳ್ಳುವವರಿಗೆ ಮಾಹಿತಿಯನ್ನು ನಿಖರವಾಗಿ ಓದುವಿಕೆಗೆ ನಾನು ಸಾಕ್ಷಿಯಾಗಿದ್ದೇನೆ ಮತ್ತು ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ಅವಕಾಶವಿದೆ. ರೋಗಿಯು/ ಸಂಬಂಧಿಕರು ಸಮ್ಮತಿಯನ್ನು ಮುಕ್ತವಾಗಿ ನೀಡಿದ್ದಾರೆ ಎಂದು ನಾನು ದೃಢೀಕರಿಸುತ್ತೇನೆ.

ಸಾಕ್ಷಿಯ ಸಹಿ _____

ದಿನಾಂಕ:

ಸಂಶೋಧಕ / ವ್ಯಕ್ತಿಯು ಒಪ್ಪಿಗೆಯನ್ನು ತೆಗೆದುಕೊಳ್ಳುವ ಹೇಳಿಕೆ

ಸಂಭಾವ್ಯ ಪಾಲ್ಗೊಳ್ಳುವವರಿಗೆ ಮಾಹಿತಿಯನ್ನು ನಾನು ನಿಖರವಾಗಿ ಓದಿದ್ದೇನೆ ಮತ್ತು ಭಾಗವಹಿಸುವವರು ಸಂಶೋಧನೆಯ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಅರ್ಥ ಮಾಡಿಕೊಂಡಿದ್ದಾರೆ ಭಾಗವಹಿಸುವವರಿಗೆ ಅಧ್ಯಯನದ ಬಗ್ಗೆ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ಅವಕಾಶ ನೀಡಲಾಗಿದೆ ಎಂದು ನಾನು ದೃಢೀಕರಿಸುತ್ತೇನೆ ಮತ್ತು ಭಾಗವಹಿಸುವವರು ಕೇಳಿದ ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸರಿಯಾಗಿ ಉತ್ತರ ನೀಡಲಾಗಿದೆ. ವ್ಯಕ್ತಿಯನ್ನು ಒಪ್ಪಿಗೆ ನೀಡುವಂತೆ ಒತ್ತಾಯಿಸಲಾಗಿಲ್ಲ ಎಂದು ನಾನು ದೃಢೀಕರಿಸುತ್ತೇನೆ, ಮತ್ತು ಸಮ್ಮತಿಯನ್ನು ಉಚಿತವಾಗಿ ಮತ್ತು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ನೀಡಲಾಗಿದೆ.

ಭಾಗವಹಿಸುವವರಿಗೆ ಈ ಮಾಹಿತಿ ಪತ್ರದ ಒಂದು ಪ್ರತಿಯನ್ನು ಒದಗಿಸಲಾಗಿದೆ.

ಸಂಶೋಧಕರ ಹೆಸರು / ಒಪ್ಪಿಗೆ ತೆಗೆದುಕೊಳ್ಳುವ ವ್ಯಕ್ತಿ

ಸಂಶೋಧಕರ ಸಹಿ / ವ್ಯಕ್ತಿಯು ಒಪ್ಪಿಗೆಯನ್ನು ತೆಗೆದುಕೊಳ್ಳುವರು

ದಿನಾಂಕ:

सूचित सहमति प्रपत्र

यह सूचित सहमति फॉर्म उन रोगियों के लिए है जो न्यूरोलॉजी क्लिनिक, केएलई के प्रभाकर कोरे अस्पताल में भाग लेते हैं, जो स्ट्रोक के इतिहास के साथ हैं, जिन्हें अनुसंधान में भाग लेने के लिए आमंत्रित किया जाता है।

हमारी शोध परियोजना का शीर्षक "निर्धारक और परिणाम पश्चात विकलांगता–एक अस्पताल आधारित अध्ययन" है

प्रधान अन्वेषक का नाम– डॉ। सरस्वती एन, सलाहकार मनोचिकित्सक

गाइड– डॉ. सरोज, न्यूरोलॉजी के प्रोफेसर, जेएनएमसी

भाग I: सूचना पत्र

प्रस्तावना– I डॉ। सरस्वती एन स्ट्रोक के बाद संज्ञानात्मक और मानसिक दुर्बलता के परिणामस्वरूप पोस्ट स्ट्रोक अपंगों पर शोध कर रही हैं। इस शोध के लिए मैं मानक प्रश्नावली के साथ संज्ञानात्मक और मनोरोग का आकलन करूंगा। हम आपके जीवन की गुणवत्ता, जरूरतों, रणनीतियों का सामना करने और स्ट्रोक प्रभावित व्यक्ति की देखभाल करने के बोझ के बारे में आपके ज्ञान और धारणा को जानना चाहेंगे। मैं आपको जानकारी देने और इस शोध का हिस्सा बनने के लिए आमंत्रित करने जा रहा हूं। कुछ ऐसे शब्द हो सकते हैं जो आपको समझ में न आएं। कृपया मुझे जानकारी के माध्यम से जाने से रोकने के लिए कहें और मुझे समझाने में समय लगेगा।

स्वैच्छिक भागीदारी

इस शोध में आपकी भागीदारी पूरी तरह से स्वैच्छिक है। यह आपकी पसंद है कि भाग लेना है या नहीं। चाहे आप भाग लेना चाहें या नहीं, इस अस्पताल में आपको मिलने वाली सभी सेवाएं जारी रहेंगी और कुछ भी नहीं बदलेगा। यदि आप इस अनुसंधान परियोजना में भाग नहीं लेना चुनते हैं, तो आपको इस अस्पताल में नियमित रूप से पेश किए जाने वाले उपचार की पेशकश की जाएगी।

गोपनीयता

इस शोध परियोजना से हम जो जानकारी एकत्र करते हैं, उसे गोपनीय रखा जाएगा। आपके बारे में जानकारी जो अनुसंधान के दौरान एकत्र की जाएगी और दूर रखी जाएगी, लेकिन शोधकर्ता इसे नहीं देख पाएंगे। आपके बारे में कोई भी जानकारी आपके नाम के बजाय उस पर एक नंबर होगा

मना करने या वापस लेने का अधिकार

यदि आप ऐसा नहीं करना चाहते हैं तो आपको इस शोध में भाग लेने की आवश्यकता नहीं है। आप किसी भी समय आपके द्वारा चुने गए शोध में भाग लेना बंद कर सकते हैं। यह आपकी पसंद है और आपके सभी अधिकारों का अभी भी सम्मान किया जाएगा।

किससे संपर्क करें

यदि आपके पास कोई प्रश्न है जो आप अभी या बाद में पूछ सकते हैं, तो अध्ययन शुरू होने के बाद भी। यदि आप बाद में प्रश्न पूछना चाहते हैं, तो आप निम्नलिखित से संपर्क कर सकते हैं: डॉ। सरस्वती। एन –9844177019

यदि आप चाहें, तो आप मुझे शोध अध्ययन के किसी भी भाग के बारे में कोई भी प्रश्न पूछ सकते हैं। क्या आपका कोई सवाल है?

भाग द्वितीय: सहमति का प्रमाण पत्र

मैंने पूर्वगामी जानकारी पढ़ी है, या इसे मुझे पढ़ा गया है। मुझे इसके बारे में प्रश्न पूछने का अवसर मिला है और जो भी प्रश्न मैंने पूछे हैं उनका उत्तर मेरी संतुष्टि के लिए दिया गया है। मैं स्वेच्छा से इस शोध में एक भागीदार के रूप में भाग लेने के लिए।
प्रतिभागी का नाम_____

प्रतिभागी का हस्ताक्षर _____

दिनांक :
अगर अनपढ़ है
मैंने संभावित प्रतिभागी को सहमति प्रपत्र के सटीक पढ़ने को देखा है, और व्यक्ति को प्रश्न पूछने का अवसर मिला है। मैं पुष्टि करता हूं कि व्यक्ति ने स्वतंत्र रूप से सहमति दे दी है।
गवाह का नाम _____ और प्रतिभागी का थम्ब प्रिंट

गवाह के हस्ताक्षर _____

दिनांक:
सहमति लेने वाले शोधकर्ता / व्यक्ति का कथन
मैंने संभावित प्रतिभागी को सूचना पत्रक को सटीक रूप से पढ़ा है, और मेरी क्षमता के सर्वश्रेष्ठ ने सुनिश्चित किया है कि प्रतिभागी प्रक्रिया को समझता है।
मैं इस बात की पुष्टि करता हूं कि प्रतिभागी को अध्ययन के बारे में सवाल पूछने का मौका दिया गया था, और प्रतिभागी द्वारा पूछे गए सभी सवालों का सही और मेरी सर्वश्रेष्ठ क्षमता के लिए जवाब दिया गया है। मैं इस बात की पुष्टि करता हूं कि व्यक्ति को सहमति देने के लिए बाध्य नहीं किया गया है, और सहमति स्वतंत्र रूप से और स्वेच्छा से दी गई है।
इस सूचनापत्र की एक प्रति प्रतिभागी को प्रदान की गई है।

सहमति लेने वाले शोधकर्ता / व्यक्ति का नाम _____

सहमति लेने वाले शोधकर्ता / व्यक्ति का हस्ताक्षर _____

दिनांक :

ANNEXURE – III - PROFORMA

Determinants and Consequences of Post Stroke Disabilities- A Hospital Based study

Socio- Demographic Data

1. Consent has been read and taken - yes No Handedness:
2. Interview language : kannada/ English/ Marathi Bilingual/Monolingual
3. Name :
4. Age : yrs
5. Sex : male____ female_____
6. Ethnicity:
7. Education 8. Marital Status

1	No formal schooling
2	Primary School
3	Middle school
4	High school
5	Puc
6	Degree

1	Never married
2	Married
3	Separated
4	Divorced
5	Widowed
6	Cohabitating
7	Refused

7	PG Degree
8	Refused

9. Occupation

1	Govt Employee	6	Home maker
2	Non Govt	7	Retired
3	Self employed	8	Unemployed
4	Farmer	9	Refused
5	Student		

10. Socio Economic status

Behavioural Measurement

11. Tobacco Use
    a. Current use of any tobacco Products: yes No
    b. Type –smoking/ snuff by mouth/nose/chewing/betel/others
    c. First started- Age..... Quantity.....
    d. Passive smoking: Yes No
12. Alcohol Consumption: Ever used yes/No
    a. Current use: yes No b. Age when first started:
    b. Frequency ..... Quantity..... Last drink

13. Diet : Vegetarian/ Mixed
    a. In a typical week how many days do you eat fruits?
    b. In a typical week how many days do you eat vegetables?
    c. Do you eat outside in a week?
14. Physical activity
    a. Physical activity at work in a week- time spent
    b. Regular exercise; yes/no
    c. How much time spent in a week –fitness/sports/recreational activities
    d. Sedentary behaviour- how much time spent sitting or reclining in a day?
15. Blood pressure- previously checked- yes no Duration
    a. Normal / Raised Newly detected: Yes/No
    b. Treatment- yes No
    c. Medications
    d. Advise to reduce salt

e. Advise to reduce weight
f. To stop smoking
g. Do exercise
h. Herbal treatment –Ayurveda / Homeopathy
i. Traditional healer

16. Diabetes - previously checked- yes no Duration
    a. Normal/ raised Newly detected: Yes/No
    b. Treatment –Yes No
    c. Medications
    d. Special diet
    e. Exercise
    f. Herbal treatment- Ayurveda / Homeopathy
    g. Traditional healer
17. Family h/o of Stroke/DM/HTN/CVD/ heart diseases/chronic conditions.
18. Past h/o Migraine/ Asthma/ heart diseases/chronic conditions.

Information on Acute Stroke

19. Date of Stroke Duration of symptoms
20. Definitive Stroke- yes No Progressive/ Static/ Improving
21. First stroke- yes No
22. Date of admission to Hospital
23. Where? Intensive Care Unit/ Neurological unit
24. Modified Rankin Scale prior to Stroke

No symptoms at all	0
No significant disability despite symptoms	1
Slight disability	2
Moderate disability but able to walk without assistance	3
Moderate disability but unable to walk without assistance	4
Severe disability	5

25. Which of the following neurological signs were present at first medical examination after hospitalization?
    a. Disturbed consciousness seizures
    b. Weakness/paresis

c. Speech Disturbances

d. Others

26. What subtype of Stroke was diagnosed/ RIGHT/LEFT

a. Ischaemic Stroke

b. Intracerebral Haemorrhage

27. Diagnostic examinations-

ECG/ CTSCAN/MRI/Echo/Carotid dopppler

28. If scanning was performed, what was the timing of the first scan after onset of stroke symptoms

1	Within 24 hrs
2	24hrs-7 days
3	8-14 days
4	More than 14 days
5	Does not apply
6	Unknown

29. Which of the following Vascular Risk factors are noted for the patient

a. Atrial fibrillation IHD

b. Hypertension RHD

c. Hypercholesterolemia Congenital Heart Disease

d. Diabetes mellitus Oral contraceptives in females

e. Current tobacco use

30. Medical treatment/ Secondary Prevention. Did the patient receive one or more of the following medications in the hospital

a. Anticoagulant drugs

b. Antiplatelet drugs

c. Thrombolysis

d. Others

31. Medications at discharge

a. Anticoagulant drugs

b. Antiplatelet drugs
c. Antidiabetic drugs
d. Cholesterol lowering drugs
e. Drugs for hypertension
f. Others

32. Assessment

33. Complications

34. Discharge from hospital –Alive / Death Date of discharge.....Date of Death

35. Cause of death

36. Modified Rankin Scale at discharge

No symptoms at all	0
No significant disability despite symptoms	1
Slight disability	2
Moderate disability but able to walk without assistance	3
Moderate disability but unable to walk without assistance	4
Severe disability	5

37. Follow up : Date ---------- Alive / Death

38. Follow up –

a. Through medical records
b. Physical examination
c. Telephone interview
d. Others

39. Modified Rankin Scale

No symptoms at all	0
No significant disability despite symptoms	1
Slight disability	2
Moderate disability but able to walk without assistance	3
Moderate disability but unable to walk without assistance	4
Severe disability	5

General physical examination

1. Height Pallor/icterus/ Clubbing/ Pedal Edema/ Lymph Nodes

2. Weight — Neurocutaneous markers
3. Waist circumference
4. Temperature — Skin / Bleeding Diathesis
5. Blood pressure
6. Heart rate
7. Blood glucose
8. Blood lipids
9. CT Scan Report
10. MRI
11. Investigations
12. CVS- Heart Sounds — Murmur
13. RS- Breath Sounds — Added sounds
14. PA- Organomegaly
    Tenderness
    Distension

COMPLICATIONS

1. Pneumonia — Seizures
2. Corneal Ulcer — Phlebitis
3. Candidiasis — Hypoproteinemia
4. Pressure sores
5. DVT
6. Systemic infections
7. Fluid electrolyte imbalances
8. Anaemia
9. Delirium
10. Respiratory complications

1. NIH STROKE SCALE SCORING SHEET

SCOTT&WHITE Healthcare

NIH Stroke Scale Scoring Sheet

Notify physician for change in NIHSS >4pts or mNIHSS >2pts

Patient Identification

		Date:											
		Time:											
Shaded areas indicate Modified Scale		**Initials:**											
1a. **Level of Consciousness(LOC)** Arousal Status	Alert (or awakens easily and stays awake) Drowsy (Responds to minor stim. but falls back asleep) Obtunded (Responds only to deep pain or vigorous stim) Comatose (No response)	0 1 2 3											
1b. **LOC**- Questions Month? Age?	Both questions answered correctly One question answered correctly Neither question answered correctly	0 1 2											
1c. **LOC**– Commands Opens/closes eyes Opens/closes hands	Both commands performed correctly One command performed correctly Neither command performed correctly	0 1 2											
2. **Eye Movements:** Horizontal eye movements	Normal Mild gaze paralysis (can bring eyes only over to midline) Complete gaze paralysis (deviated & unable to bring eyes over)	0 1 2											
3. **Visual fields:** Sees objects in Four quadrants	Normal Partial hemianopia (upper OR lower quadrant) Complete hemianopia (upper AND lower quadrants) Bilateral hemianopia (total blindness)	0 1 2 3											
4. **Facial:** Facial movements	Normal Minor paralysis (flattening of nasolabial folds) Partial paralysis (near or total paralysis lower face) Complete paralysis (Of upper and lower face)	0 1 2 3											
5a. **Motor – Left Arm** Hold arm straight out from chest	Normal (No drift at all) Drift (Drifts downward but NOT to bed before 10 sec.) Drifts to bed within 10 sec Movement, but not against gravity Complete paralysis (No movement at all) *Amputation or joint fusion*	0 1 2 3 4 *(N/A)*											
5b. **Motor – Right Arm** Hold arm straight out from chest	Normal (No drift at all) Drift (Drifts downward but NOT to bed before 10 sec.) Drifts to bed within 10 sec Movement, but not against gravity Complete paralysis (No movement at all) *Amputation or joint fusion*	0 1 2 3 4 *(N/A)*											
6a. **Motor – Left leg** Keep leg off bed	Normal (No drift at all) Drift (Drifts downward but NOT to bed before 5 sec.) Drifts to bed within 5 sec Movement, but not against gravity Complete paralysis (No movement at all) *Amputation or joint fusion*	0 1 2 3 4 *(N/A)*											
6b. **Motor – Right leg** Keep leg off bed	Normal (No drift at all) Drift (Drifts downward but NOT to bed before 5 sec.) Drifts to bed within 5 sec Movement, but not against gravity Complete paralysis (No movement at all) *Amputation or joint fusion*	0 1 2 3 4 *(N/A)*											
7. **Limb Ataxia** Finger-Nose Heel-Knee-Shin	Absent (no ataxia, OR pt cannot move arm/leg) Present in one limb Present in two or more limbs (is absent if patient cannot understand or is too weak to do)	0 1 2											
8. **Sensory** Hemisensory loss: (Test on face, arm & thigh)	Normal, no sensory loss Mild to moderate loss Severe to total sensory loss (unaware of being touched)	0 1 2											
9. **Language/Aphasia** Repetition & Comprehension "Today is a bright sunny day"	Normal ability use words and follow commands Mild to Moderate (Repeats / names with some difficulty) Severe Aphasia (very few words correct or understood) Mute (no ability to speak or understand at all)	0 1 2 3											
10. **Dysarthria (slurred)** Speech clarity (slurring)	Normal Mild to moderate slurred speech (some or most) Severe (unintelligible - none understandable) *Intubated or other physical barrier*	0 1 2 *(N/A)*											
11. **Neglect** Ignores touch or vision to one side	No abnormality Mild (either visual or tactile – partial neglect) Profound (Visual and tactile – complete neglect)	0 1 2											
Total Score	**0 = Best, 42 = Worst**												

Initials	**Nurse Signature**	**Initials**	**Nurse Signature**

MR Form U3104-100-SWRR 9/13

All N/A's need to be explained in documentation.

2. MODIFIED RANKIN SCALE (MRS)

MODIFIED RANKIN SCALE (MRS)

Patient Name: _____
Rater Name: _____
Date: _____

Score	Description
0	No symptoms at all
1	No significant disability despite symptoms; able to carry out all usual duties and activities
2	Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
3	Moderate disability; requiring some help, but able to walk without assistance
4	Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
5	Severe disability; bedridden, incontinent and requiring constant nursing care and attention
6	Dead

TOTAL (0–6): _____

References

Rankin J. "Cerebral vascular accidents in patients over the age of 60."
Scott Med J 1957;2:200-15

Bonita R, Beaglehole R. "Modification of Rankin Scale: Recovery of motor function after stroke."
***Stroke* 1988 Dec;19(12):1497-1500**

Van Swieten JC, Koudstaal PJ, Visser MC, Schouten HJ, van Gijn J. "Interobserver agreement for the assessment of handicap in stroke patients."
***Stroke* 1988;19(5):604-7**

Provided by the Internet Stroke Center — www.strokecenter.org

3. ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III

INDIAN ENGLISH

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
Indian English

Name: Date of Birth: Hospital No. or Address: Languages Known: Native Language:	Date of testing: ____/___/___ Tester's name:_____ Age at leaving full-time education:_____ Occupation: _____ Handedness: _____

ATTENTION

➢ Ask: What is the	Day _____	Date _____	Month _____	Year _____	Season _____	**Attention** [Score 0-5] ☐
➢ Ask: Which	No./Floor _____	Street/Hospital _____	City _____	State _____	Country _____	**Attention** [Score 0-5] ☐

ATTENTION

➢ Tell: "I'm going to give you three words and I'd like you to repeat them after me: lemon, key and ball." After subject repeats, say "Try to remember them because I'm going to ask you later".
➢ Score *only* the first trial (repeat 3 times if necessary).
➢ Register number of trials: _____

Attention [Score 0-3] ☐

ATTENTION

➢ Ask the subject: "Could you take 7 away from 100? I'd like you to keep taking 7 away from each new number until I tell you to stop."
➢ If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 - score 4).
➢ Stop after five subtractions (93, 86, 79, 72, 65): ____ ____ ____ ____ ____

Attention [Score 0-5] ☐

MEMORY

➢ Ask: 'Which 3 words did I ask you to repeat and remember?' _____ _____ _____

Memory [Score 0-3] ☐

FLUENCY

➢ **Letters**
Say: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter "C", you could give me words like "cat, cry, clock" and so on. But, you can't give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter "P".

Fluency [Score 0 - 7] ☐

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

➢ **Animals**
Say: "Now can you name as many animals as possible. It can begin with any letter."

Fluency [Score 0 - 7] ☐

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
Indian English

Name: Date of Birth: Hospital No. or Address: Languages Known: Native Language:	Date of testing: ____/___/___ Tester's name:_____ Age at leaving full-time education:_____ Occupation: _____ Handedness: _____

ATTENTION

➢ Ask: What is the	Day _____	Date _____	Month _____	Year _____	Season _____	**Attention** [Score 0-5] ☐
➢ Ask: Which	No./Floor _____	Street/Hospital _____	City _____	State _____	Country _____	**Attention** [Score 0-5] ☐

ATTENTION

➢ Tell: "I'm going to give you three words and I'd like you to repeat them after me: lemon, key and ball." After subject repeats, say "Try to remember them because I'm going to ask you later". ➢ Score *only* the first trial (repeat 3 times if necessary). ➢ Register number of trials: _____	**Attention** [Score 0-3] ☐

ATTENTION

➢ Ask the subject: "Could you take 7 away from 100? I'd like you to keep taking 7 away from each new number until I tell you to stop." ➢ If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 - score 4). ➢ Stop after five subtractions (93, 86, 79, 72, 65): ____ ____ ____ ____ ____	**Attention** [Score 0-5] ☐

MEMORY

➢ Ask: 'Which 3 words did I ask you to repeat and remember?' _____ _____ _____	**Memory** [Score 0-3] ☐

FLUENCY

➢ **Letters** Say: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter "C", you could give me words like "cat, cry, clock" and so on. But, you can't give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter "P".	**Fluency** [Score 0 - 7] ☐

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

➢ **Animals** Say: "Now can you name as many animals as possible. It can begin with any letter."	**Fluency** [Score 0 - 7] ☐

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
Indian English

Name: Date of Birth: Hospital No. or Address: Languages Known: Native Language:	Date of testing: ____/___/___ Tester's name:_____ Age at leaving full-time education:_____ Occupation: _____ Handedness: _____

ATTENTION

➢ Ask: What is the	Day _____	Date _____	Month _____	Year _____	Season _____	**Attention** [Score 0-5] ☐
➢ Ask: Which	No./Floor _____	Street/Hospital _____	City _____	State _____	Country _____	**Attention** [Score 0-5] ☐

ATTENTION

➢ Tell: "I'm going to give you three words and I'd like you to repeat them after me: lemon, key and ball." After subject repeats, say "Try to remember them because I'm going to ask you later".
➢ Score *only* the first trial (repeat 3 times if necessary).
➢ Register number of trials: _____

Attention [Score 0-3] ☐

ATTENTION

➢ Ask the subject: "Could you take 7 away from 100? I'd like you to keep taking 7 away from each new number until I tell you to stop."
➢ If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 - score 4).
➢ Stop after five subtractions (93, 86, 79, 72, 65): ____ ____ ____ ____ ____

Attention [Score 0-5] ☐

MEMORY

➢ Ask: 'Which 3 words did I ask you to repeat and remember?' _____ _____ _____

Memory [Score 0-3] ☐

FLUENCY

➢ **Letters**

Say: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter "C", you could give me words like "cat, cry, clock" and so on. But, you can't give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter "P".

Fluency [Score 0 - 7] ☐

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

➢ **Animals**

Say: "Now can you name as many animals as possible. It can begin with any letter."

Fluency [Score 0 - 7] ☐

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
Indian English

Name:	Date of testing: ____/___/___
Date of Birth:	Tester's name:_____
Hospital No. or Address:	Age at leaving full-time education:_____
Languages Known:	Occupation: _____
Native Language:	Handedness: _____

ATTENTION

➢ Ask: What is the	Day _____	Date _____	Month _____	Year _____	Season _____	**Attention** [Score 0-5] ☐
➢ Ask: Which	No./Floor _____	Street/Hospital _____	City _____	State _____	Country _____	**Attention** [Score 0-5] ☐

ATTENTION

- ➢ Tell: "I'm going to give you three words and I'd like you to repeat them after me: lemon, key and ball." After subject repeats, say "Try to remember them because I'm going to ask you later".
- ➢ Score *only* the first trial (repeat 3 times if necessary).
- ➢ Register number of trials: _____

Attention [Score 0-3] ☐

ATTENTION

- ➢ Ask the subject: "Could you take 7 away from 100? I'd like you to keep taking 7 away from each new number until I tell you to stop."
- ➢ If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 - score 4).
- ➢ Stop after five subtractions (93, 86, 79, 72, 65): ____ ____ ____ ____ ____

Attention [Score 0-5] ☐

MEMORY

- ➢ Ask: 'Which 3 words did I ask you to repeat and remember?' _____ _____ _____

Memory [Score 0-3] ☐

FLUENCY

- ➢ **Letters**

Say: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter "C", you could give me words like "cat, cry, clock" and so on. But, you can't give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter "P".

Fluency [Score 0 - 7] ☐

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

- ➢ **Animals**

Say: "Now can you name as many animals as possible. It can begin with any letter."

Fluency [Score 0 - 7] ☐

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
Indian English

Name:	Date of testing: ____/___/___
Date of Birth:	Tester's name:_____
Hospital No. or Address:	Age at leaving full-time education:_____
Languages Known:	Occupation: _____
Native Language:	Handedness: _____

ATTENTION

➢ Ask: What is the	Day	Date	Month	Year	Season	**Attention** [Score 0-5]
➢ Ask: Which	No./Floor	Street/Hospital	City	State	Country	**Attention** [Score 0-5]

ATTENTION

➢ Tell: "I'm going to give you three words and I'd like you to repeat them after me: lemon, key and ball." After subject repeats, say "Try to remember them because I'm going to ask you later".
➢ Score *only* the first trial (repeat 3 times if necessary).
➢ Register number of trials: _____

Attention [Score 0-3]

ATTENTION

➢ Ask the subject: "Could you take 7 away from 100? I'd like you to keep taking 7 away from each new number until I tell you to stop."
➢ If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 - score 4).
➢ Stop after five subtractions (93, 86, 79, 72, 65): ____ ____ ____ ____ ____

Attention [Score 0-5]

MEMORY

➢ Ask: 'Which 3 words did I ask you to repeat and remember?' _____ _____ _____

Memory [Score 0-3]

FLUENCY

➢ **Letters**
Say: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter "C", you could give me words like "cat, cry, clock" and so on. But, you can't give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter "P".

Fluency [Score 0 - 7]

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

➢ **Animals**
Say: "Now can you name as many animals as possible. It can begin with any letter."

Fluency [Score 0 - 7]

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
Indian English

Name: Date of Birth: Hospital No. or Address: Languages Known: Native Language:	Date of testing: ____/___/___ Tester's name:_____ Age at leaving full-time education:_____ Occupation: _____ Handedness: _____

ATTENTION

➢ Ask: What is the	Day _____	Date _____	Month _____	Year _____	Season _____	**Attention** [Score 0-5] ☐
➢ Ask: Which	No./Floor _____	Street/Hospital _____	City _____	State _____	Country _____	**Attention** [Score 0-5] ☐

ATTENTION

➢ Tell: "I'm going to give you three words and I'd like you to repeat them after me: lemon, key and ball." After subject repeats, say "Try to remember them because I'm going to ask you later". ➢ Score *only* the first trial (repeat 3 times if necessary). ➢ Register number of trials: _____	**Attention** [Score 0-3] ☐

ATTENTION

➢ Ask the subject: "Could you take 7 away from 100? I'd like you to keep taking 7 away from each new number until I tell you to stop." ➢ If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 - score 4). ➢ Stop after five subtractions (93, 86, 79, 72, 65): ____ ____ ____ ____ ____	**Attention** [Score 0-5] ☐

MEMORY

➢ Ask: 'Which 3 words did I ask you to repeat and remember?' _____ _____ _____	**Memory** [Score 0-3] ☐

FLUENCY

➢ **Letters** Say: "I'm going to give you a letter of the alphabet and I'd like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter "C", you could give me words like "cat, cry, clock" and so on. But, you can't give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter "P".	**Fluency** [Score 0 - 7] ☐

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

➢ **Animals** Say: "Now can you name as many animals as possible. It can begin with any letter."	**Fluency** [Score 0 - 7] ☐

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

4. ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III

KANNADA VERSION

ADDENBROOKE'S COGNITIVE EXAMINATION - ACE-III
KANNADA VERSION

___ /___ /___

ೀಗ: _____

ಆದ್ಯತೆ: _____

ಾಹ:

ATTENTION

ಎಂದರೇನು	ದಿನ	ದಿನಾಂಕ	ತಿಂಗಳು	ವರ್ಷ	ಋತು	Attention [Score 0-5]
ಕೇಳಿ: ಯಾವ	ಸಂಖ್ಯೆ/ನೆಲ	ಬೀದಿ/ಆಸ್ಪತ್ರೆ	ದಿನ	ರಾಜ್ಯ	ದೇಶ	Attention [Score 0-5]

ATTENTION

ತ್ತು ಚೆಂಡು.'' ಪ್ರ

ೀನೆ''.

ಮೊದಲ ಪ್ರ ನರಾವರ್ತಿಸಿ)_____

Attention [Score 0-3]

ATTENTION

9, 72, 65):_____

Attention [Score 0-5]

MEMORY

ಕೊಳ್ಳಲು ಹೇಳಿದ್ದೆನು?' _____ _____ _____

Memory [Score 0-3]

FLUENCY

ಆಕ್ಷರಗಳು

ಆಕ್ಷರವು ''ಕ''.

Fluency [Score 0 - 7]

>14	7
11-14	6
8-10	5
6-7	4
3-5	3
2	2
1	1
0	0
Total	Correct

ಪ್ರಾಣಿಗಳು

ಬಹುದು.''

Fluency [Score 0 - 7]

>16	7
14-16	6
11-13	5
8-10	4
6-7	3
3-5	2
1-2	1
0	0
Total	Correct

MEMORY

ತ್ತೇನೆ.''

'ನ್ನು ನೀಡಿ.

Memory
[Score 0 - 7]

	1ನೇ ಪ್ರಯೋಗ	2ನೇ ಪ್ರಯೋಗ	3ನೇ ಪ್ರಯೋಗ
52 ಂಗಳೂರು			

MEMORY

....

Memory
[Score 0 - 4]

LANGUAGE

-
-
- ನನಗೆ ನೀಡಿ''

ಇಡಿ.

Language
[Score 0-3]

LANGUAGE

'ನ್ನು ನೀಡಿ.

Language
[Score 0-2]

LANGUAGE

ರೆ ಂ ಆಂಕ

Language
[Score 0-2]

MEMORY

ತ್ತೇನೆ.''

'ನ್ನು ನೀಡಿ.

Memory
[Score 0 - 7]

	1ನೇ ಪ್ರಯೋಗ	*2ನೇ ಪ್ರಯೋಗ*	*3ನೇ ಪ್ರಯೋಗ*
52 ಂಗಳೂರು	_____ _____ ____ _____ _____ _____ _____	_____ _____ ____ _____ _____ _____ _____	_____ _____ ____ _____ _____ _____ _____

MEMORY

....

Memory
[Score 0 - 4]

LANGUAGE

-
-
-

ನನಗೆ ನೀಡಿ''

ಇಡಿ.

Language
[Score 0-3]

LANGUAGE

'ನ್ನು ನೀಡಿ.

Language
[Score 0-2]

LANGUAGE

ರೆ 0 ಅಂಕ

Language
[Score 0-2]

MEMORY

ತ್ತೇನೆ.''

'ನ್ನು ನೀಡಿ.

Memory
[Score 0 - 7]

	1ನೇ ಪ್ರಯೋಗ	2ನೇ ಪ್ರಯೋಗ	3ನೇ ಪ್ರಯೋಗ
52 ಂಗಳೂರು			

MEMORY

....

Memory
[Score 0 - 4]

LANGUAGE

-
-
- ನನಗೆ ನೀಡಿ''

ಇಡಿ.

Language
[Score 0-3]

LANGUAGE

'ನ್ನು ನೀಡಿ.

Language
[Score 0-2]

LANGUAGE

ರೆ 0 ಅಂಕ

Language
[Score 0-2]

MEMORY

ತ್ತೇನೆ.''

'ನ್ನು ನೀಡಿ.

Memory
[Score 0 - 7]

	1ನೇ ಪ್ರಯೋಗ	2ನೇ ಪ್ರಯೋಗ	3ನೇ ಪ್ರಯೋಗ
52 ಂಗಳೂರು	_____ _____ ____ _____ _____ _____ _____	_____ _____ ____ _____ _____ _____ _____	_____ _____ ____ _____ _____ _____ _____

MEMORY

....

Memory
[Score 0 - 4]

LANGUAGE

-
-
- ನನಗೆ ನೀಡಿ''

ಇಡಿ.

Language
[Score 0-3]

LANGUAGE

'ನ್ನು ನೀಡಿ.

Language
[Score 0-2]

LANGUAGE

ರೆ 0 ಅಂಕ

Language
[Score 0-2]

MEMORY

ತ್ತೇನೆ.''
ನ್ನು ನೀಡಿ.

Memory
[Score 0 - 7]

	1ನೇ ಪ್ರಯೋಗ	*2ನೇ ಪ್ರಯೋಗ*	*3ನೇ ಪ್ರಯೋಗ*
52 ಂಗಳೂರು			

MEMORY

....

Memory
[Score 0 - 4]

LANGUAGE

-
-
- ನನಗೆ ನೀಡಿ''
ಇಡಿ.

Language
[Score 0-3]

LANGUAGE

ನ್ನು ನೀಡಿ.

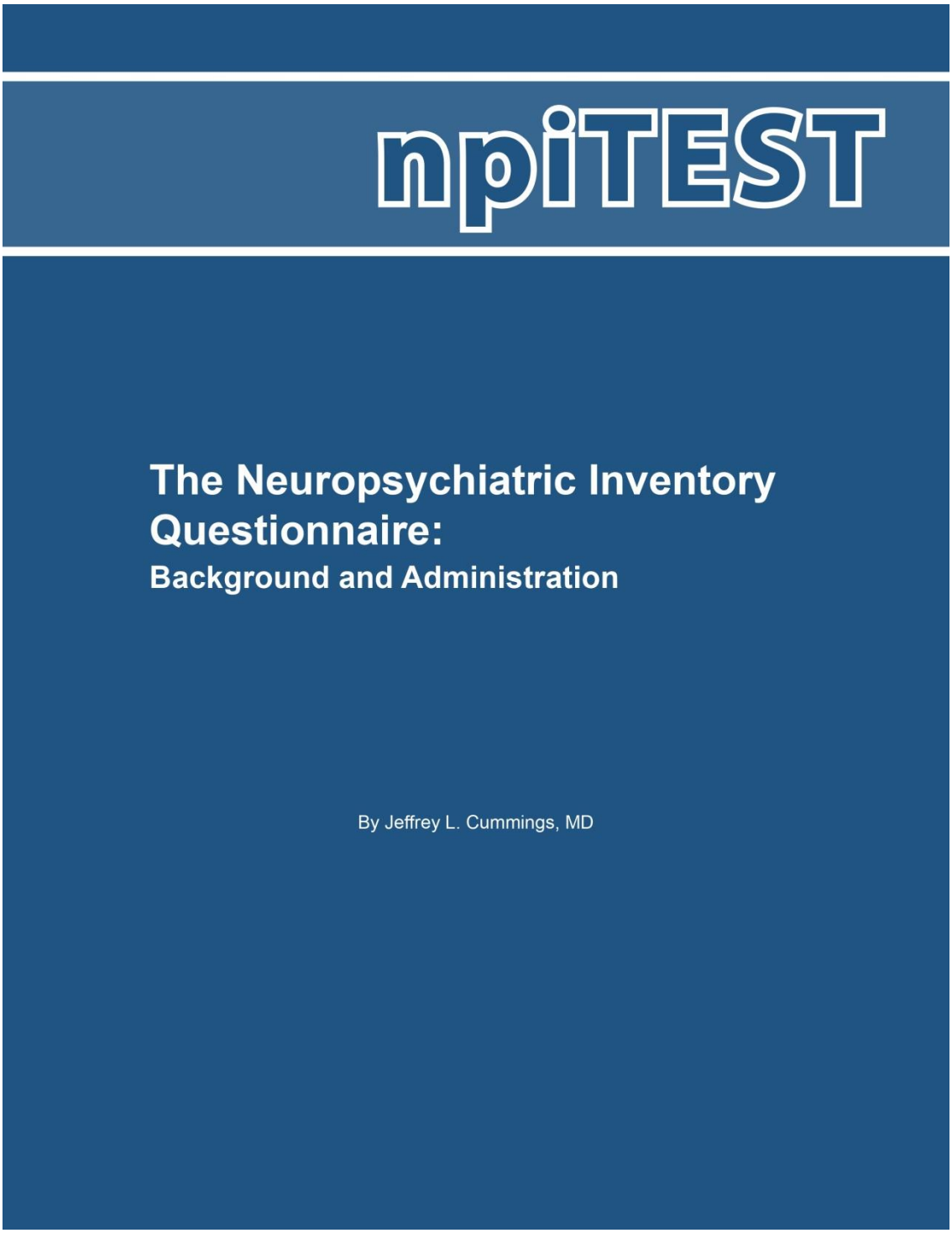
Language
[Score 0-2]

LANGUAGE

ರೆ 0 ಅಂಕ

Language
[Score 0-2]

5. THE NEUROPSYCHIATRIC INVENTORY QUESTIONNAIRE



The Neuropsychiatric Inventory–Questionnaire: Background and Administration

The Neuropsychiatric Inventory–Questionnaire (NPI-Q) was developed and cross-validated with the standard NPI to provide a brief assessment of neuropsychiatric symptomatology in routine clinical practice settings (Kaufer et al, J Neuropsychiatry Clin Neurosci 2000, 12:233-239). The NPI-Q is adapted from the NPI (Cummings et al, Neurology 1994; 44:2308-2314), a validated informant-based interview that assesses neuropsychiatric symptoms over the previous month. The original NPI included 10 neuropsychiatric domains; two others, Nighttime Behavioral Disturbances and Appetite/Eating Changes, have subsequently been added. Another recent modification of the original NPI is the addition of a Caregiver Distress Scale for evaluating the psychological impact of neuropsychiatric symptoms reported to be present (Kaufer et al, JAGS, 1998;46:210-215). The NPI-Q includes both of these additions.

The NPI-Q is designed to be a self-administered questionnaire completed by informants about patients for whom they care. Each of the 12 NPI-Q domains contains a survey question that reflects cardinal symptoms of that domain. Initial responses to each domain question are "Yes" (present) or "No" (absent). If the response to the domain question is "No", the informant goes to the next question. If "Yes", the informant then rates both the Severity of the symptoms present within the last month on a 3-point scale and the associated impact of the symptom manifestations on them (i.e. Caregiver Distress) using a 5-point scale. The NPI-Q provides symptom Severity and Distress ratings for each symptom reported, and total Severity and Distress scores reflecting the sum of individual domain scores.

Most informants will be able to complete the NPI-Q in 5 minutes or less. It is recommended that responses to the NPI-Q be reviewed for completeness by a clinician and for clarifying uncertainties after each administration. The first time an informant completes the NPI-Q, it may be useful to verbally review the instructions. In some instances, it may be necessary to conduct the NPI-Q in part or entirely as an interview.

The NPI and NPI-Q are both copyright-protected by Jeffrey L. Cummings, MD. The NPI-Q was developed by Daniel Kaufer, MD with permission. **Use of the NPI or NPI-Q in investigational studies sponsored in whole or part by for-profit entities is prohibited without express written consent.**

For inquiries regarding the NPI-Q, contact:

Jeffrey L. Cummings, MD
Mary S. Easton Center for Alzheimer's Disease Research
10911 Weyburn Ave; #200
Los Angeles, CA 90095
jcummings@mednet.ucla.edu

The NPI-Q can be found at:
www.NPItest.net

Please answer the following questions based on changes that have occurred since the patient first began to experience memory problems.

Circle "Yes" only if the symptom(s) has been present in the last month. Otherwise, circle "No". For each item marked "Yes":

a) Rate the SEVERITY of the symptom (how it affects the patient):

1 = Mild (noticeable, but not a significant change)
2 = Moderate (significant, but not a dramatic change)
3 = Severe (very marked or prominent, a dramatic change)

b) Rate the DISTRESS you experience due to that symptom (how it affects you):

0 = Not distressing at all
1 = Minimal (slightly distressing, not a problem to cope with)
2 = Mild (not very distressing, generally easy to cope with)
3 = Moderate (fairly distressing, not always easy to cope with)
4 = Severe (very distressing, difficult to cope with)
5 = Extreme or Very Severe (extremely distressing, unable to cope with)

Please answer each question carefully. Ask for assistance if you have any questions.

Delusions	Does the patient have false beliefs, such as thinking that others are stealing from him/her or planning to harm him/her in some way?
Yes No	**SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**
Hallucinations	Does the patient have hallucinations such as false visions or voices? Does he or she seem to hear or see things that are not present?
Yes No	**SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**
Agitation/Aggression	Is the patient resistive to help from others at times, or hard to handle?
Yes No	**SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Depression/Dysphoria Does the patient seem sad or say that he /she is depressed?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Anxiety Does the patient become upset when separated from you? Doeshe/she have any other signs of nervousness such as shortness of breath, sighing, being unable to relax, or feeling excessively tense?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Elation/Euphoria Does the patient appear to feel too good or act excessively happy?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Apathy/Indifference Does the patient seem less interested in his/her usual activities or in the activities and plans of others?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Disinhibition Does the patient seem to act impulsively, for example, talking to strangers as if he/she knows them, or saying things that may hurt people's feelings?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Irritability/Lability Is the patient impatient and cranky? Does he/she have difficulty coping with delays or waiting for planned activities?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Motor Disturbance Does the patient engage in repetitive activities such as pacing around the house, handling buttons, wrapping string, or doing other things repeatedly?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Nightime Behaviors Does the patient awaken you during the night, rise too early in the morning, or take excessive naps during the day?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Appetite/Eating Has the patient lost or gained weight, or had a change in the type of food he/she likes?

Yes No **SEVERITY: 1 2 3** **DISTRESS: 0 1 2 3 4 5**

Developed by Daniel Kaufer, MD. Final Version 6/99. © JL Cummings, 1994; all rights reserved

NPI-Q SUMMARY

	No	Severity	Caregiver Distress
Delusions	0	1 2 3	0 1 2 3 4 5
Hallucinations	0	1 2 3	0 1 2 3 4 5
Agitation/Aggression	0	1 2 3	0 1 2 3 4 5
Dysphoria/Depression	0	1 2 3	0 1 2 3 4 5
Anxiety	0	1 2 3	0 1 2 3 4 5
Euphoria/Elation	0	1 2 3	0 1 2 3 4 5
Apathy/Indifference	0	1 2 3	0 1 2 3 4 5
Disinhibition	0	1 2 3	0 1 2 3 4 5
Irritability/Lability	0	1 2 3	0 1 2 3 4 5
Aberrant Motor	0	1 2 3	0 1 2 3 4 5
Nighttime Behavior	0	1 2 3	0 1 2 3 4 5
Appetite/Eating	0	1 2 3	0 1 2 3 4 5
TOTAL			

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6. HAMILTON DEPRESSION RATING SCALE (HDRS)

Hamilton Depression Rating Scale (HDRS)

Reference: **Hamilton M. A rating scale for depression. J Neurol Neurosurg Psychiatry 1960; 23:56–62**

Rating Clinician-rated

Administration time 20–30 minutes

Main purpose To assess severity of, and change in, depressive symptoms

Population Adults

Commentary

The HDRS (also known as the Ham-D) is the most widely used clinician-administered depression assessment scale. The original version contains 17 items ($HDRS_{17}$) pertaining to symptoms of depression experienced over the past week. Although the scale was designed for completion after an unstructured clinical interview, there are now semi-structured interview guides available. The HDRS was originally developed for hospital inpatients, thus the emphasis on melancholic and physical symptoms of depression. A later 21-item version ($HDRS_{21}$) included 4 items intended to subtype the depression, but which are sometimes, incorrectly, used to rate severity. A limitation of the HDRS is that atypical symptoms of depression (e.g., hypersomnia, hyperphagia) are not assessed (see SIGH-SAD, page 55).

Scoring

Method for scoring varies by version. For the $HDRS_{17}$, a score of 0–7 is generally accepted to be within the normal range (or in clinical remission), while a score of 20 or higher (indicating at least moderate severity) is usually required for entry into a clinical trial.

Versions

The scale has been translated into a number of languages including French, German, Italian, Thai, and Turkish. As well, there is an Interactive Voice Response version (IVR), a Seasonal Affective Disorder version (SIGH-SAD, see page 55), and a Structured Interview Version (HDS-SIV). Numerous versions with varying lengths include the HDRS17, HDRS21, HDRS29, HDRS8, HDRS6, HDRS24, and HDRS7 (see page 30).

Additional references

Hamilton M. Development of a rating scale for primary depressive illness. Br J Soc Clin Psychol 1967; 6(4):278–96.

Williams JB. A structured interview guide for the Hamilton Depression Rating Scale. Arch Gen Psychiatry 1988; 45(8):742–7.

Address for correspondence

The HDRS is in the public domain.

Hamilton Depression Rating Scale (HDRS)

PLEASE COMPLETE THE SCALE BASED ON A STRUCTURED INTERVIEW

Instructions: for each item select the one "cue" which best characterizes the patient. Be sure to record the answers in the appropriate spaces (positions 0 through 4).

1 DEPRESSED MOOD *(sadness, hopeless, helpless, worthless)*

0 |__| Absent.
1 |__| These feeling states indicated only on questioning.
2 |__| These feeling states spontaneously reported verbally.
3 |__| Communicates feeling states non-verbally, i.e. through facial expression, posture, voice and tendency to weep.
4 |__| Patient reports virtually only these feeling states in his/her spontaneous verbal and non-verbal communication.

2 FEELINGS OF GUILT

0 |__| Absent.
1 |__| Self reproach, feels he/she has let people down.
2 |__| Ideas of guilt or rumination over past errors or sinful deeds.
3 |__| Present illness is a punishment. Delusions of guilt.
4 |__| Hears accusatory or denunciatory voices and/or experiences threatening visual hallucinations.

Hamilton Depression Rating Scale (HDRS)

***Reference:* Hamilton M. A rating scale for depression. J Neurol Neurosurg Psychiatry 1960; 23:56–62**

Rating Clinician-rated

Administration time 20–30 minutes

Main purpose To assess severity of, and change in, depressive symptoms

Population Adults

Commentary

The HDRS (also known as the Ham-D) is the most widely used clinician-administered depression assessment scale. The original version contains 17 items ($HDRS_{17}$) pertaining to symptoms of depression experienced over the past week. Although the scale was designed for completion after an unstructured clinical interview, there are now semi-structured interview guides available. The HDRS was originally developed for hospital inpatients, thus the emphasis on melancholic and physical symptoms of depression. A later 21-item version ($HDRS_{21}$) included 4 items intended to subtype the depression, but which are sometimes, incorrectly, used to rate severity. A limitation of the HDRS is that atypical symptoms of depression (e.g., hypersomnia, hyperphagia) are not assessed (see SIGH-SAD, page 55).

Scoring

Method for scoring varies by version. For the $HDRS_{17}$, a score of 0–7 is generally accepted to be within the normal range (or in clinical remission), while a score of 20 or higher (indicating at least moderate severity) is usually required for entry into a clinical trial.

Versions

The scale has been translated into a number of languages including French, German, Italian, Thai, and Turkish. As well, there is an Interactive Voice Response version (IVR), a Seasonal Affective Disorder version (SIGH-SAD, see page 55), and a Structured Interview Version (HDS-SIV). Numerous versions with varying lengths include the HDRS17, HDRS21, HDRS29, HDRS8, HDRS6, HDRS24, and HDRS7 (see page 30).

Additional references

Hamilton M. Development of a rating scale for primary depressive illness. Br J Soc Clin Psychol 1967; 6(4):278–96.

Williams JB. A structured interview guide for the Hamilton Depression Rating Scale. Arch Gen Psychiatry 1988; 45(8):742–7.

Address for correspondence

The HDRS is in the public domain.

Hamilton Depression Rating Scale (HDRS)

PLEASE COMPLETE THE SCALE BASED ON A STRUCTURED INTERVIEW

Instructions: for each item select the one "cue" which best characterizes the patient. Be sure to record the answers in the appropriate spaces (positions 0 through 4).

1 DEPRESSED MOOD *(sadness, hopeless, helpless, worthless)*

0 |__| Absent.
1 |__| These feeling states indicated only on questioning.
2 |__| These feeling states spontaneously reported verbally.
3 |__| Communicates feeling states non-verbally, i.e. through facial expression, posture, voice and tendency to weep.
4 |__| Patient reports virtually only these feeling states in his/her spontaneous verbal and non-verbal communication.

2 FEELINGS OF GUILT

0 |__| Absent.
1 |__| Self reproach, feels he/she has let people down.
2 |__| Ideas of guilt or rumination over past errors or sinful deeds.
3 |__| Present illness is a punishment. Delusions of guilt.
4 |__| Hears accusatory or denunciatory voices and/or experiences threatening visual hallucinations.

7. THE BARTHEL INDEX

THE BARTHEL INDEX

Patient Name: _____
Rater Name: _____
Date: _____

Activity	Score
FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	_____
BATHING 0 = dependent 5 = independent (or in shower)	_____
GROOMING 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	_____
DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.)	_____
BOWELS 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	_____
BLADDER 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent	_____
TOILET USE 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	_____
TRANSFERS (BED TO CHAIR AND BACK) 0 = unable, no sitting balance 5 = major help (one or two people, physical), can sit 10 = minor help (verbal or physical) 15 = independent	_____
MOBILITY (ON LEVEL SURFACES) 0 = immobile or < 50 yards 5 = wheelchair independent, including corners, > 50 yards 10 = walks with help of one person (verbal or physical) > 50 yards 15 = independent (but may use any aid; for example, stick) > 50 yards	_____
STAIRS 0 = unable 5 = needs help (verbal, physical, carrying aid) 10 = independent	_____
TOTAL (0–100):	_____

Provided by the Internet Stroke Center — www.strokecenter.org

THE BARTHEL INDEX

Patient Name: _____
Rater Name: _____
Date: _____

Activity	Score
FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	_____
BATHING 0 = dependent 5 = independent (or in shower)	_____
GROOMING 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	_____
DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.)	_____
BOWELS 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	_____
BLADDER 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent	_____
TOILET USE 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	_____
TRANSFERS (BED TO CHAIR AND BACK) 0 = unable, no sitting balance 5 = major help (one or two people, physical), can sit 10 = minor help (verbal or physical) 15 = independent	_____
MOBILITY (ON LEVEL SURFACES) 0 = immobile or < 50 yards 5 = wheelchair independent, including corners, > 50 yards 10 = walks with help of one person (verbal or physical) > 50 yards 15 = independent (but may use any aid; for example, stick) > 50 yards	_____
STAIRS 0 = unable 5 = needs help (verbal, physical, carrying aid) 10 = independent	_____
TOTAL (0–100):	_____

Provided by the Internet Stroke Center — www.strokecenter.org

8. ಹೊರೆ ಎಂದೆನಿಸುವ ಕುರಿತು ಸಂದರ್ಶನ

ಸೂಚನೆಗಳು: ಕೆಳಗಿನ ಪಟ್ಟಿಯು, ಇನ್ನೊಬ್ಬ ವ್ಯಕ್ತಿಯ ಕಾಳಜಿ ವಹಿಸುವಾಗ ಕೆಲವೊಮ್ಮೆ ಜನರಿಗೆ ಹೇಗೆ ಅನ್ನಿಸುತ್ತದೆ ಎಂಬುದನ್ನು ಪ್ರತಿಬಿಂಬಿಸುವ ಹೇಳಿಕೆಗಳದ್ದಾಗಿದೆ. ಪ್ರತಿ ಹೇಳಿಕೆಯ ಬಳಿಕ, ನಿಮಗೆ ಎಷ್ಟು ಪದೇಪದೇ ಹಾಗೆ ಅನಿಸಿದೆ ಎಂಬುದನ್ನು ಸೂಚಿಸಿ; ಎಂದಿಗೂ ಇಲ್ಲ, ಅಪರೂಪವಾಗಿ, ಕೆಲವೊಮ್ಮೆ, ಆಗಾಗ, ಅಥವಾ ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ. ಇಲ್ಲಿ ಯಾವುದೂ ಸರಿ ಅಥವಾ ತಪ್ಪು ಉತ್ತರಗಳು ಎಂದಿಲ್ಲ.

1. ನಿಮ್ಮ ಸಂಬಂಧಿಯು ಅವನಿಗೆ/ಅವಳಿಗೆ ಅಗತ್ಯವಿರುವುದಕ್ಕಿಂತ ಹೆಚ್ಚಿನ ಸಹಾಯವನ್ನು ಕೇಳುತ್ತಾರೆ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

2. ನಿಮ್ಮ ಸಂಬಂಧಿಯೊಂದಿಗೆ ನೀವು ಸಮಯ ಕಳೆಯುವುದರಿಂದ ನಿಮಗಾಗಿ ನಿಮ್ಮ ಬಳಿ ಸಾಕಷ್ಟು ಸಮಯವಿಲ್ಲವೆಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

3. ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿ ವಹಿಸುವುದು ಹಾಗೂ ನಿಮ್ಮ ಕುಟುಂಬ ಅಥವಾ ಕೆಲಸಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಇತರ ಜವಾಬ್ದಾರಿಗಳನ್ನು ಪೂರೈಸಲು ಪ್ರಯತ್ನಿಸುವುದರ ಕುರಿತು ನೀವು ಮಾನಸಿಕ ಒತ್ತಡ ಅನುಭವಿಸಿದಿರಾ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

4. ನಿಮ್ಮ ಸಂಬಂಧಿಯ ವರ್ತನೆಯಿಂದಾಗಿ ನಿಮಗೆ ಮುಜುಗರ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

5. ನೀವು ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಸಮೀಪದಲ್ಲಿರುವಾಗ ನಿಮಗೆ ಸಿಟ್ಟು ಬರುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

6. ಕುಟುಂಬದ ಇತರ ಸದಸ್ಯರು, ಅಥವಾ ಸ್ನೇಹಿತರೊಂದಿಗಿನ ನಿಮ್ಮ ಸಂಬಂಧದ ಮೇಲೆ ಈಗ ನಿಮ್ಮ ಸಂಬಂಧಿಯು ನಕಾರಾತ್ಮಕ ಪರಿಣಾಮವನ್ನು ಮಾಡುತ್ತಿದ್ದಾರೆ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

7. ನಿಮ್ಮ ಸಂಬಂಧಿಗೆ ಭವಿಷ್ಯದಲ್ಲಿ ಏನು ಕಾದಿದೆ ಎಂದು ನಿಮಗೆ ಭಯವಾಗುತ್ತಿದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

8. ನಿಮ್ಮ ಸಂಬಂಧಿ ನಿಮ್ಮ ಮೇಲೆ ಅವಲಂಬಿತನಾಗಿದ್ದಾನೆ/ಆಗಿದ್ದಾಳೆ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

9. ನೀವು ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಸಮೀಪದಲ್ಲಿರುವಾಗ ಮಾನಸಿಕವಾಗಿ ದಣಿದಂತೆ ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

10. ನಿಮ್ಮ ಸಂಬಂಧಿಯೊಂದಿಗಿನ ಒಡನಾಟದಿಂದಾಗಿ ನಿಮ್ಮ ಆರೋಗ್ಯದ ಮೇಲೆ ಕೆಟ್ಟ ಪರಿಣಾಮವಾಗಿದೆ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

11. ನಿಮ್ಮ ಸಂಬಂಧಿಯಿಂದಾಗಿ, ನೀವು ಬಯಸಿದಷ್ಟು ಖಾಸಗಿತನ ನಿಮಗಿಲ್ಲ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

12. ನೀವು ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿ ವಹಿಸುತ್ತಿರುವುದರಿಂದ ನಿಮ್ಮ ಸಾಮಾಜಿಕ ಜೀವನಕ್ಕೆ ಧಕ್ಕೆ ಉಂಟಾಗಿದೆ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

13. ನಿಮ್ಮ ಸಂಬಂಧಿಯಿಂದಾಗಿ, ನಿಮ್ಮ ಜೊತೆ ಸ್ನೇಹಿತರಿರುವುದು ನಿಮಗೆ ಅನನುಕೂಲ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

14. ನಿಮ್ಮ ಸಂಬಂಧಿಗೆ, ಅವರು ಅವಲಂಬಿಸಬಹುದಾದವರು ನೀವು ಮಾತ್ರ ಎಂಬಂತೆ ನೀವು ಅವರ ಕಾಳಜಿ ವಹಿಸಬೇಕೆಂದು ನಿರೀಕ್ಷಿಸುವಂತೆ ತೋರುತ್ತದೆ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

15. ನಿಮ್ಮ ಉಳಿದ ಖರ್ಚುಗಳ ಜೊತೆಗೆ, ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿ ವಹಿಸಲು ನಿಮ್ಮಲ್ಲಿ ಸಾಕಷ್ಟು ಹಣ ಇಲ್ಲ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

16. ಬಹಳ ಸಮಯದವರೆಗೆ ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿ ವಹಿಸಲು ನಿಮ್ಮಿಂದ ಸಾಧ್ಯವಿಲ್ಲ ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

17. ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಯಿಲೆಯ ಆರಂಭದಿಂದ ತೊಡಗಿ ನಿಮ್ಮ ಜೀವನದ ಮೇಲೆ ನೀವು ಹಿಡಿತವನ್ನು ಕಳೆದುಕೊಂಡಿದ್ದೀರೆಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

18. ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿಯನ್ನು ಬೇರೆ ಯಾರಿಗಾದರೂ ವಹಿಸಿಕೊಡುವಂತಿದ್ದರೆ ಚೆನ್ನಾಗಿತ್ತು ಎಂದು ನೀವು ಬಯಸುವಿರಾ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

19. ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕುರಿತು ಏನು ಮಾಡಬೇಕು ಎಂದು ನಿಮಗೆ ಗೊಂದಲ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

20. ನಿಮ್ಮ ಸಂಬಂಧಿಗಾಗಿ ಇನ್ನೂ ಹೆಚ್ಚಿನದನ್ನು ಮಾಡಬೇಕು ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

21. ಇನ್ನೂ ಚೆನ್ನಾಗಿ ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿ ವಹಿಸಬಹುದು ಎಂದು ನಿಮಗೆ ಅನ್ನಿಸುತ್ತದೆಯೆ?

0. ಎಂದಿಗೂ ಇಲ್ಲ 1. ಅಪರೂಪವಾಗಿ 2. ಕೆಲವೊಮ್ಮೆ 3. ಆಗಾಗ 4. ಹೆಚ್ಚುಕಡಿಮೆ ಯಾವಾಗಲೂ

22. ಒಟ್ಟಾರೆಯಾಗಿ, ನಿಮ್ಮ ಸಂಬಂಧಿಯ ಕಾಳಜಿ ವಹಿಸುವುದು ನಿಮಗೆ ಎಷ್ಟು ಹೊರೆ ಅನ್ನಿಸಿದೆ?

0. ಇಲ್ಲವೇ ಇಲ್ಲ 1. ಸ್ವಲ್ಪ 2. ಮಧ್ಯಮ 3. ಸಾಕಷ್ಟು 4. ತೀವ್ರವಾಗಿ

ಹಕ್ಕುಸ್ವಾಮ್ಯ 1983, 1990, ಸ್ಟೀವನ್ ಹೆಚ್. ಝಾರಿಟ್ ಮತ್ತು ಜೂಡಿ ಎಂ. ಝಾರಿಟ್

9. THE ZARIT BURDEN INTERVIEW

The Zarit Burden Interview

0 : NEVER
1 : RARELY
2 : SOMETIMES
3 : QUITE FREQUENTLY
4 : NEARLY ALWAYS

Please circle the response the best describes how you feel.

Question	Score
1 Do you feel that your relative asks for more help than he/she needs?	0 1 2 3 4
2 Do you feel that because of the time you spend with your relative that you don't have enough time for yourself?	0 1 2 3 4
3 Do you feel stressed between caring for your relative and trying to meet other responsibilities for your family or work?	0 1 2 3 4
4 Do you feel embarrassed over your relative's behaviour?	0 1 2 3 4
5 Do you feel angry when you are around your relative?	0 1 2 3 4
6 Do you feel that your relative currently affects our relationships with other family members or friends in a negative way?	0 1 2 3 4
7 Are you afraid what the future holds for your relative?	0 1 2 3 4
8 Do you feel your relative is dependent on you?	0 1 2 3 4
9 Do you feel strained when you are around your relative?	0 1 2 3 4
10 Do you feel your health has suffered because of your involvement with your relative?	0 1 2 3 4
11 Do you feel that you don't have as much privacy as you would like because of your relative?	0 1 2 3 4
12 Do you feel that your social life has suffered because you are caring for your relative?	0 1 2 3 4

The Zarit Burden Interview

0 : NEVER
1 : RARELY
2 : SOMETIMES
3 : QUITE FREQUENTLY
4 : NEARLY ALWAYS

Please circle the response the best describes how you feel.

Question	Score
1 Do you feel that your relative asks for more help than he/she needs?	0 1 2 3 4
2 Do you feel that because of the time you spend with your relative that you don't have enough time for yourself?	0 1 2 3 4
3 Do you feel stressed between caring for your relative and trying to meet other responsibilities for your family or work?	0 1 2 3 4
4 Do you feel embarrassed over your relative's behaviour?	0 1 2 3 4
5 Do you feel angry when you are around your relative?	0 1 2 3 4
6 Do you feel that your relative currently affects our relationships with other family members or friends in a negative way?	0 1 2 3 4
7 Are you afraid what the future holds for your relative?	0 1 2 3 4
8 Do you feel your relative is dependent on you?	0 1 2 3 4
9 Do you feel strained when you are around your relative?	0 1 2 3 4
10 Do you feel your health has suffered because of your involvement with your relative?	0 1 2 3 4
11 Do you feel that you don't have as much privacy as you would like because of your relative?	0 1 2 3 4
12 Do you feel that your social life has suffered because you are caring for your relative?	0 1 2 3 4

10.COPING CHECKLIST BY RAO AND PRABHU SUBBAKRISHNA

Coping checklist by Rao and Prabhu Subbakrishna. (1989)

Below is a 70-item checklist. The purpose of the checklist is to find out how people handle difficult situations. The list indicates, in italics, some commonly used methods. Please read each item in the list carefully and tick:

"Yes" if you use the method often or frequently

"No" if you use the method infrequently or not at all please do not omit any item.

1. You go over the problem again and again in your mind, to try and understand it. Yes | No.

2. Accept it, since nothing can be done. Yes | No

3. Talk to a family member who can do something concrete about the problem. Yes | No

4. Get away from things for a while, get some rest or take a vacation. Yes | No

5. Compare yourself with others and feel that you are better off. Yes | No

6. Wish that you can change what has happened. Yes | No

7. Seek reassurance and emotional support from family members. Yes | No

8. Try to make yourself feel better by taking mood-elevating drugs. Yes | No

9. Visit places of worship or go on a pilgrimage. Yes | No

10. Go on a shopping spree. Yes | No

11. Engage in vigorous physical exercise. Yes | No

12. Anticipate probable outcomes and mentally rehearse them. Yes | No

13. Console yourself that things are not all that bad and could be worse. Yes | No

14. Try your luck at games of chance, e.g. horse racing, the lottery or cards. Yes | No

15. Seek reassurance and support from friends. Yes | No

16. Retreat to a quiet, favorite spot to think things over. Yes | No

17. Try to make yourself feel better by having a drink or two of alcohol. Yes | No

18. Accept the next best thing to what you wanted. Yes | No

19. Think about fantastic or unreal things to make yourself feel better. Yes | No

20. Try to look on the bright side of things. Yes | No

21. Attend bhajan groups. Yes | No

22. Go for long walks. Yes | No

23. Blame your fate and tell yourself that sometimes one just has bad luck. Yes | No

24. Make yourself feel better by smoking. Yes | No

25. Wear a lucky charm or amulet . Yes | No

26. Talk to a friend who can do something about the problem. Yes | No

27. Pray to God . Yes | No

28. Make light of the situation or refused to get too serious about it. Yes | No

29. Listen to music for comfort . Yes | No

30. Come up with a couple of different solutions to the problem. Yes | No

31. Try to forget about the whole thing. Yes | No

32. Avoid being with people and seek complete isolation. Yes | No

33. Consult a faith healer. Yes | No

34. Self-medicate by swallowing analgesics or minor tranquilizers. Yes | No

35. Refuse to believe that it happened. Yes | No

36. Attend religious/philosophical discourses and talks. Yes | No

37. Start or practice yoga/meditation. Yes | No

38. Hope a miracle will happen. Yes | No

39. Consult an astrologer. Yes | No

40. Help others in trouble or distress. Yes | No

41. Feel that time will remedy things and that the only thing to do is wait. Yes | No

42. Write letters to significant others. Yes | No

43. Prepare yourself for the worst to come. Yes | No

44. Pace up and down, thinking about the problem. Yes | No

45. Turn to work/studies to take your mind off things. Yes | No

46 Seek sexual comfort. Yes | No

47. Find a purpose or meaning in your suffering. Yes | No

48. Spend time in the company of children. Yes | No

49. View the future as bleak and hopeless. Yes | No

50. Write short stories, poetry, etc. Yes | No

51. Blame yourself. Yes | No

52. You know what has to be done, so you double your efforts and try harder to make things work. Yes | No

53. Analyze the problem and solve it bit by bit. Yes | No

54. Make a plan of action and follow it . Yes | No

55. Read popular guidebooks for answers to your problems. Yes | No

56. Draw on your past experience of similar situations. Yes | No

57. Take up or indulge in a hobby (music, art, etc). Yes | No

58. Sleep more than usual to avoid the problem. Yes | No

59. Read novels, magazines, etc much more than usual . Yes | No

60. Try to feel better by eating/nibbling on food. Yes | No

61. Keep your feelings to yourself . Yes | No

62. Make special offerings or perform special puja.Yes | No

63. Become a member of a group, club or organisation or, if already a member, attend group activities. Yes | No

64. See more movies than usual. Yes | No

65. Seek professional help and do as they recommend . Yes | No

66. Read books on philosophy or religion. Yes | No

67. Compare yourself with others and feel that you are worse off . Yes | No

68. Feel that other people are responsible for what has happened . Yes | No

69. Take a big chance and do something very risky. Yes | No

70. Write to ‘question-answer’ columns in various magazines. Yes | No

11. FNQ

1	Staff respects patient's needs/wishes	Not important (1).	Slightly important (2),	Important (3	Very important (4)'
2	Informed about changes in medical status				
3	Patient receiving best medical care				
4	Clear explanations about medical issues				
5	Questions answered honestly				
6	Information about patient's medical care				
7	Information about patient's physical problems				
8	Information about patient's thinking problems				
9	Information about patient's drug/alcohol problems				
10	Informed about rehabilitation progress				
11	Spouse understands how difficult it				
12	Family understands how difficult it is				
13	Discuss feelings with other caregivers				
14	Have negative feelings validated				
15	Help getting over doubts, fears				
16	Help remaining hopeful				
17	Help preparing for the worst				
18	Encouraged to ask others for help				
19	Help keeping the house				
20	Family members help care for patient				
21	Get enough rest/sleep				
22	Get a break from my responsibilities				
23	Spend time with friends				
24	Pay attention to own needs, interests				
25	Information about chronicity of problems				
26	Trained in managing inappropriate behaviour				
27	Advice about patient's autonomy/safety				
28	Enough resources for patient				
29	Enough resources for myself and family				
30	Family understands patient's problems				
31	Friends understand patient's problems				
32	Employer understands patient's problems				
33	Discuss feelings with friends/family				
34	Professional advice/service is availabe				
35	My opinions used in treatment planning				
36	Informed daily about patient's care				
37	My opinions are considered by staff				

12. KANNADA_ WHOQOL-BREF-

WHOQOL-BREF

Field Trial Version
December 1996

PROGRAMME ON MENTAL HEALTH
WORLD HEALTH ORGANIZATION
GENEVA

For office use only

	Equations for computing domain scores	Raw score	Transformed scores*	
			4-20	0-100
Domain 1	(6-Q3) + (6-Q4) + Q10 + Q15 + Q16 + Q17 + Q18 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	=		
Domain 2	Q5 + Q6 + Q7 + Q11 + Q19 + (6-Q26) ☐ + ☐ + ☐ + ☐ + ☐ + ☐	=		
Domain 3	Q20 + Q21 + Q22 ☐ + ☐ + ☐	=		
Domain 4	Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	=		

* Please see Table 4 on page 10 of the manual, for converting raw scores to transformed scores.

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Page 2

I.D. number

ABOUT YOU

Before you begin we would like to ask you to answer a few general questions about yourself: by circling the correct answer or by filling in the space provided.

What is your **gender?** Male Female

What is you **date of birth?** _____ / _____ / _____
Day / Month / Year

What is the highest **education** you received?
None at all
Primary school
Secondary school
Tertiary

What is your **marital status?**
Single Separated
Married Divorced
Living as married Widowed

Are you currently **ill?** Yes No

If something is wrong with your health what do you think it is?_____illness/ problem

Instructions

This assessment asks how you feel about your quality of life, health, or other areas of your life. **Please answer all the questions.** If you are unsure about which response to give to a question, **please choose the one** that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last two weeks.** For example, thinking about the last two weeks, a question might ask:

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You should circle the number that best fits how much support you got from others over the last two weeks. So you would circle the number 4 if you got a great deal of support from others as follows.

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	(4)	5

You would circle number 1 if you did not get any of the support that you needed from others in the last two weeks.

Please read each question, assess your feelings, and circle the number on the scale for each question that gives the best answer for you.

		Very poor	Poor	Neither poor nor good	Good	Very good
1(G1)	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
2 (G4)	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last two weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
3 (F1.4)	To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
4(F11.3)	How much do you need any medical treatment to function in your daily life?	1	2	3	4	5
5(F4.1)	How much do you enjoy life?	1	2	3	4	5
6(F24.2)	To what extent do you feel your life to be meaningful?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
7(F5.3)	How well are you able to concentrate?	1	2	3	4	5
8 (F16.1)	How safe do you feel in your daily life?	1	2	3	4	5
9 (F22.1)	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about **how completely** you experience or were able to do certain things in the last two weeks.

		Not at all	A little	Moderately	Mostly	Completely
10 (F2.1)	Do you have enough energy for everyday life?	1	2	3	4	5
11 (F7.1)	Are you able to accept your bodily appearance?	1	2	3	4	5
12 (F18.1)	Have you enough money to meet your needs?	1	2	3	4	5
13 (F20.1)	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14 (F21.1)	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

WHOQOL-BREF
Page 4

		Very poor	Poor	Neither poor nor good	Good	Very good
15 (F9.1)	How well are you able to get around?	1	2	3	4	5

The following questions ask you to say how **good or satisfied** you have felt about various aspects of your life over the last two weeks.

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16 (F3.3)	How satisfied are you with your sleep?	1	2	3	4	5
17 (F10.3)	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18(F12.4)	How satisfied are you with your capacity for work?	1	2	3	4	5
19 (F6.3)	How satisfied are you with yourself?	1	2	3	4	5
20(F13.3)	How satisfied are you with your personal relationships?	1	2	3	4	5
21(F15.3)	How satisfied are you with your sex life?	1	2	3	4	5
22(F14.4)	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23(F17.3)	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24(F19.3)	How satisfied are you with your access to health services?	1	2	3	4	5
25(F23.3)	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to **how often** you have felt or experienced certain things in the last two weeks.

		Never	Seldom	Quite often	Very often	Always
26 (F8.1)	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	1	2	3	4	5

Did someone help you to fill out this form?.....

How long did it take to fill this form out?.....

Do you have any comments about the assessment?

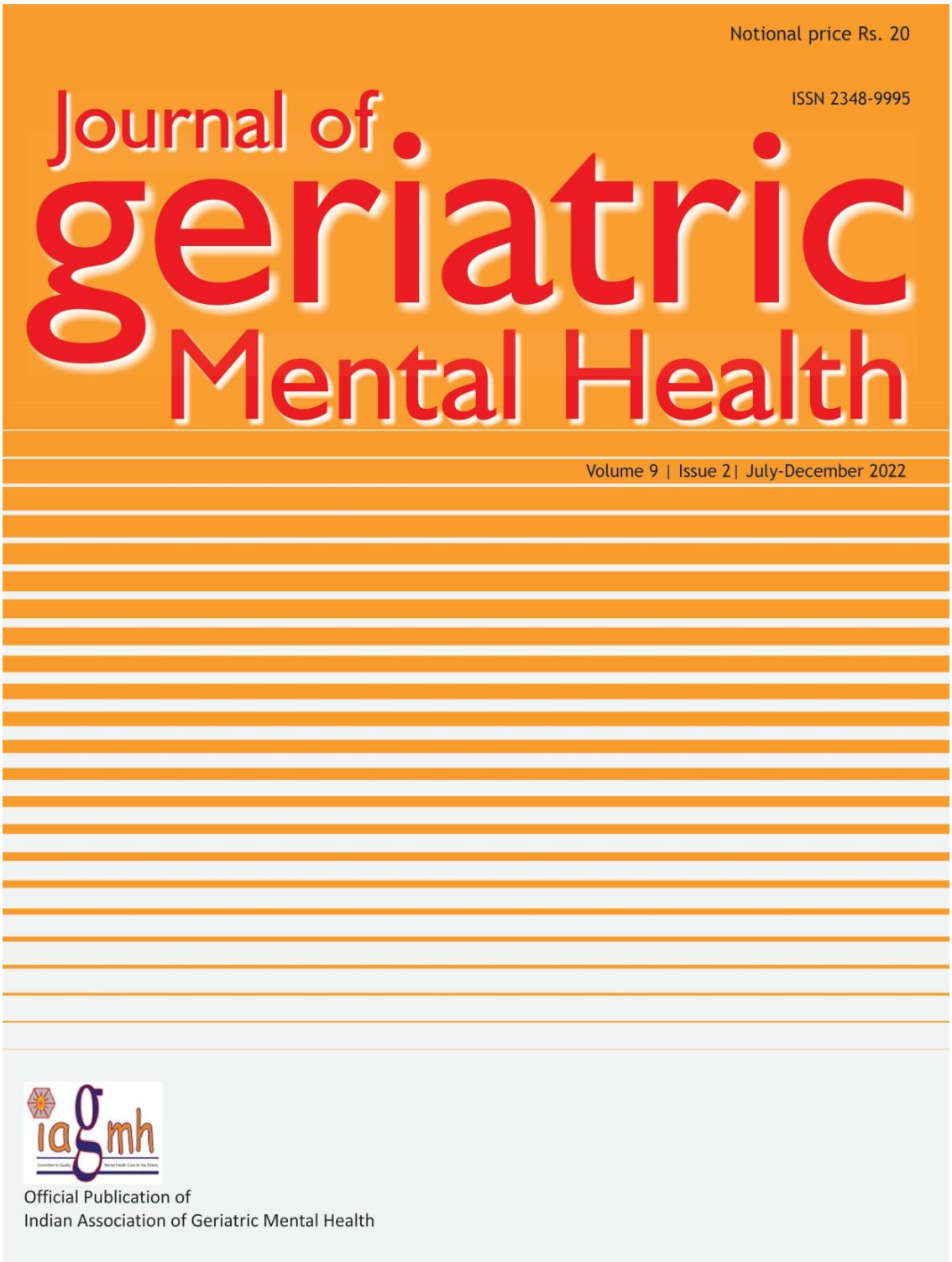
.....

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THANK YOU FOR YOUR HELP

m\..misce\Nwhoqol\bref

ANNEXURE – IV - PUBLICATIONS



ORIGINAL ARTICLE

Relationship between disability, caregiver burden and coping with depression in stroke survivors: A cross-sectional study in South India

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ABSTRACT

Background: Post-stroke depression (PSD) is seen in up to 35% of stroke survivors, contributing to morbidity and caregiver burden, that could deter the acute and rehabilitation treatment. Depression in stroke contributes to more disability and caregiver burden. Understanding coping methods of caregivers in PSD results in better caregiving, reduces stress and improves family relationships. There is paucity of studies examining PSD and its determinants in Indian context. **Objectives:** The objective is to study the association of PSD with disability, with caregiver burden, and coping methods adopted by the caregivers. **Methods:** Consenting participants (and their caregivers) attending Neurology outpatients with the first episode of Stroke (N=226) in a tertiary care center in a tier 2 city in South India, with 56% participants from rural background, were evaluated between three and six months of stroke. Two groups namely PSD (n = 67) and post-stroke without depression (PSwD, n = 159) based on cutoff score of 9/10 on a valid Hamilton Depression Rating Scale were compared for their demographics, social, physical, and functional factors. Barthel Disability Index (BDI) for disability, Zarit Burden Interview (ZBI) for caregiver burden and coping checklist (CCL) by Rao *et al*. on caregivers particularly prepared for studying in the Indian context were also administered. **Results:** The rate of PSD was found to be 29.6%. PSD group were older and had relatively more common in females ($p < 0.001$). The type of stroke and site of vascular lesion were not associated with PSD ($p = 0.68$ and $p = 0.24$). Stroke severity scores were higher in PSD group ($p < 0.001$). Disability as per BDI scores was greater in PSD group against PSwD group ($p < 0.001$). ZBI scores show greater caregiver burden in PSD group than PSwD ($p < 0.001$). Measures were significantly higher in all CCL sub-categories in caregivers of PSD group compared with PSwD. **Conclusion:** PSD prevalence of close to one third in stroke survivors, with female gender, older age, stroke severity, and functional disability as its key determinants. Furthermore, the PSD was significantly associated with caregiver burden and study also found preferred coping methods were adopted by caregivers of PSD group. Early identification and treatment of PSD is of utmost important to minimize disability, reduce caregiver burden and improvise coping methods.

Key words: Caregiver burden, coping strategies, disability, post-stroke depression, stroke severity

INTRODUCTION

Stroke is associated with neurological, psychiatric, cognitive, functional consequences of which depression generally referred to as post-stroke depression (PSD) has been reported in up to 35% of the stoke survivors.[1,2] The Diagnostic and Statistical manual (DSM) 5 has described PSD as the mood disorder super-imposed on medical condition, i.e., stroke with features of depression, mania or mixed symptoms.[3] As per the Global burden of disease 2017 report, the double burden of stroke with depression

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Table 1: Comparison of post-stroke depression with poststroke without depression

	PSD ($n=67$)	PSwD ($n=159$)	χ^2	P
Age (years)				
Mean ± SD	62.28 ± 13.30	57.57 ± 13.22	2.44‡	0.02*
Median (IQR)	64 (52-72)	59 (48-67)		
Gender				
Male: female	39:28	130:29	13.84	<0.001***
Marital status				
Married	55	144	4.47	0.22
Widow/er	11	12		
Others	1	3		
Education				
<10 (till primary)	39	60	5.52	0.36
10th (secondary)	9	21		
+2 (preuniversity)	6	20		
Degree and PG	13	48		
Occupation				
Unemployed/retired	10	29	19.02	0.004**
Housewife	27	23		
Farmer	15	45		
Other job	15	62		
Socioeconomic status				
Lower	7	8	3.32	0.34
Lower middle	24	72		
Upper lower	33	71		
Upper middle	3	8		
Rural	35	92	0.61	0.44
Hypertension	53	107	3.18	0.08
Diabetes mellitus	20	56	0.61	0.44
Dyslipidemia	12	31	0.08	0.78
Ischemic heart disease	5	24	2.45	0.12
Tobacco use	25	79	2.91	0.09
Alcohol use	30	94	3.92	0.05
Type of stroke				
Ischemic	51	125	0.17	0.68
Hemorrhagic	16	34		
Site of lesion				
Right	39	76	2.59	0.27
Left	23	73		
Bilateral	5	10		
NIHSS	13.79 ± 4.65	8.92 ± 5.48	6.81‡	<0.001***
Disability (BDI)	55.75 ± 20.44	79.56 ± 24.55	−7.52‡	<0.001***
Disability (BDI)				
Total	1	9	68.29	<0.001***
Severe	25	15		
Moderate	39	44		
Mild	2	70		

***P very significant at <0.001, **P significant at <0.005, *P significant at 0.05, ‡t-test, SD: Standard deviation, IQR: Interquartile range, NIHSS: National Institutes of Health Stroke Severity, BDI: Barthel disability index, PSwD: Post-stroke without depression, PSD: Post-stroke depression

is one of the leading causes of disability adjusted life years.[4]

Diagnosing PSD is complex as somatic symptoms and cognitive deficits overlap. PSD is often under-diagnosed and therefore under-treated, to the extent its influence on stroke outcome is ignored and underestimated.[5]

PSD is one of the major causes of functional disability, due to inability of the stroke survivors to cope with daily stressors and to function independently in their activities. Stroke survivors with a functional disability will have different levels of depression.[6] PSD can hamper rehabilitation management and can prolong the treatment, causing more distress to the caregivers, thus affecting the outcome.[7] There is an overlap of clinical features related to functional disability, insult to the brain area, or apathy.[2] It has been found that up to 80% of depression is seen in the first 3 months of stroke.[8] Identification of PSD in the presence of other co-morbidities and complications is a challenge.[7] A meta-analysis found that the PSD had significantly associated with measures of disability, stroke severity and stroke involving left hemisphere. Other risk factors found in another meta-analysis were female gender, age <70 and lack of social support.[9,10]

Caregiving family members play a key role in stroke management, sometimes requiring months of ongoing treatment, while there is a need for frequent visits to

Table 2: Comparison between post-stroke depression and post-stroke without depression: Caregiver burden and coping checklist (N = 226)

	Mean ± SD		*t*	*P*
	PSD (*n* = 67)	PSwD (*n* = 159)		
ZBI				
Total	51.18 ± 13.89	28.77 ± 20.52	9.53	<0.001
Burden	14.03 ± 3.927	7.72 ± 5.615	9.63	<0.001
Emotional	15.70 ± 4.47	8.84 ± 6.49	9.15	<0.001
Social	9.37 ± 2.44	5.05 ± 3.87	10.19	<0.001
Loss of control	9.84 ± 2.68	5.79 ± 3.94	8.96	<0.001
Finances	2.24 ± 0.68	1.38 ± 0.97	7.65	<0.001
Personal strain	27.84 ± 7.85	15.30 ± 11.51	9.47	<0.001
Role strain	13.66 ± 3.65	7.45 ± 5.58	9.88	<0.001
CCL				
Problem focused				
Problem-solving	3.73 ± 1.70	1.33 ± 1.60	9.87	<0.001
Emotion focused				
Distraction positive	3.39 ± 1.59	1.77 ± 1.48	7.16	<0.001
Distraction negative	2.24 ± 1.50	0.92 ± 1.51	6.03	<0.001
Acceptance	4.55 ± 1.57	3.13 ± 1.61	6.19	<0.001
Denial/blame	3.58 ± 2.24	1.72 ± 2.02	5.87	<0.001
Religion/faith	5.15 ± 1.63	2.44 ± 2.20	10.25	<0.001
Problem and emotion focused				
Social support	3.51 ± 1.71	1.19 ± 1.73	9.25	<0.001

P value significant at < 0.05. SD: Standard deviation, ZBI: Zarit Burden interview, CCL: Coping checklist, PSwD: Post-stroke without depression, PSD: Post-stroke depression

Table 3: Bivariate correlation with depression

	ρ	*P*
Age	−0.16	0.02
Gender	−0.25	<0.001
Type of stroke	−0.03	0.68
Site of lesion	0.08	0.22
Stroke severity	−0.38	<0.001
Disability	0.51	<0.001
Caregiver burden	−0.49	<0.001
ZBI		
Emotional	−0.49	<0.001
Social	−0.49	<0.001
Loss of control	−0.49	<0.001
Finances	−0.43	<0.001
Personal strain	−0.49	<0.001
Role strain	−0.50	<0.001
CCL		
Problem focused		
Problem-solving	−0.55	<0.001
Emotion focused		
Distraction positive	−0.45	<0.001
Distraction negative	−0.45	<0.001
Acceptance	−0.39	<0.001
Denial/blame	−0.39	<0.001
Religion/faith	−0.53	<0.001
Problem and emotion focused		
Social support	−0.51	<0.001

P-value significant at < 0.05. ZBI: Zarit burden interview, CCL: Coping checklist

hospitals or rehabilitation centers. Caregiver is a person usually related and caring the patient with a chronic illness. There are also professionally trained caregivers who are paid and not related. Caregivers assist in survivors' activities of daily living, ensuring hygiene, adequate nutrition, where required assistance in eating and assist in mobility also. In general, stroke management includes acute management followed by rehabilitation. In some countries, there is early supportive discharge and multi-disciplinary continuing care is provided in the community to reduce dependency on hospital-based care and also brings down the cost of care.[10,11] In India, patients depend on their caregiving family members to travel to the nearest tertiary care stroke rehabilitation unit to receive treatment. PSD is known to be associated with caregiver burden.[12,13]

The negative impact in the form of physical, emotional, social, financial, and spiritual well-being on the caregiver is termed caregiver burden and has been studied in rural Indian context also.[14,15] Some of the PSD symptoms such as irritability, loss of energy, low motivation, withdrawn behavior, and hopelessness can put resistance to the family members caring effort, thus leading to increasing burden. This in turn can impact the relationships and sometimes need for residential care may arise. Caregiver burden also can involve taking time off from work to care, can have economic impact on the families. Caregiving a person with PSD could be more challenging than managing other consequences of stroke.[13] Caregiver burden can lead to poorer treatment adherence, follow-ups and may have socioeconomic consequences.

Coping strategies are the cognitive and behavioral responses that people adopt to minimize the impact of stressful events.[16] Lazarus and Folkman have divided the coping methods into task focused, emotion focused and problem oriented/avoidance focused.[16] Coping methods to overcome the stress of caregiving due to the negative consequences of stroke and its accompanied severity of stroke and functional disability that can lead to physical strain, and PSD features can impact emotionally, that can hinder the treatment process. Hence, it was planned to study the attribution of depression on functional disability and the difference in burden and coping among the

Table 4: Logistic regression analysis with depression as dependent variable

	B	SE	Wald chi-sq	*P*	Exp (B)
Age	−0.03	0.01	4.31	0.04	0.97
Gender	−1.41	0.39	13.33	<0.001	0.24
Stroke severity	−0.12	0.04	8.70	0.003	0.89
Disability	0.02	0.01	11.09	0.001	1.03

P: Significance at <0.05. *B*: Unstandardized beta, Wald chi-sq: Wald Chi-squared test, SE: Standard error, Exp (B): Adjusted odds ratio

Table 5: Linear regression analysis with caregiver burden as a dependent variable

Model	Unstandardized coefficients		Standardized coefficients	*t*	*P*
	B	SE	Beta		
Depression	−4.30	1.30	−0.09	−3.31	0.001
Disability	−0.68	0.03	−0.82	−25.93	<0.001
Stroke severity	0.39	0.12	0.10	3.30	0.001

P: Significance at <0.05. *B*: Unstandardised beta, SE: Standard error

caregivers in Post-stroke survivors with depression and without depression.

There is a paucity of literature on PSD in the Indian context. There is a need to examine the PSD, its associated factors, and impact on caregivers in urban and rural Indian population. Therefore, the study was done with the following objectives (a) whether PSD is an independent contributing factor to the functional disability (b) whether there are differences in the caregiver burden in stroke survivors with depression and without depression (c) to explore the different coping strategies used by caregivers with depression and without depression.

METHODS

A cross-sectional observational study design was adopted. This study was carried out at the Department of Neurology in KLE Hospital, a tertiary care center, in Belagavi in South India for 1 year. The study had the necessary Institutional Ethical Committee approval before commencement. Informed consent was taken from the patients and their caregivers.

All the persons with first episode of stroke and their caregivers at 3–6 months post stroke were contacted to take part in the study. Of them, 226 stroke survivors became the study participants after following inclusion and exclusion criteria. The inclusion criteria were first episode stroke patients. A history of recurrent strokes, cerebral venous thrombosis, vascular malformations, subarachnoid hemorrhages, serious medical condition, any severe psychiatric disorder were the exclusion criteria for this study. Furthermore, previous history of cognitive decline and survivors with aphasia were excluded.

The definition of caregivers for the purpose of this study includes any relative of patient who spent a significant amount of time caring the patient, who was able to provide clinically relevant information about the patient. If there were more than one, then whoever spent more time with the patient was considered. Structured standardized tools were used in the study namely the National Institutes of Health Stroke Scale (NIHSS), Barthel Disability Index (BDI), Hamilton Depression Rating Scale (Ham-D), Zarit Burden Interview (ZBI), and coping checklist (CCL).

For the purpose of this study, a cut-off score of 9/10 (ie, 10 or more) on Hamilton Depression rating scale (Ham-D) was used to diagnose depression. Following the administration of the Ham-D and based on the scores, two groups namely PSD (n = 67) and post-stroke without depression (PSwD, n = 159) were formed. Baseline information including socio-demographic profile features, risk factor profile for all the study participants.

Tools used

Hamilton Depression Rating Scale

This clinician-rated scale for depression was devised in 1960 by Max Hamilton.[17] It takes about 20 min. There are 17 items, rated on either 3-or 5-point Likert scale. In general, the higher the score severe is the depression. A score of 10–13 indicates mild, 14–17 indicates moderate and >17 indicates moderate to severe depression.[18] In this study, this scale was administered once.

National Institutes of Health Stroke Scale

Stroke deficit rating scale in 1980s was formed to use in treatment trials, which got iterated into NIHSS. By 1995, NIHSS became a standard clinical deficit rating instrument in stroke trials. It evaluates the neurological deficits in the early periods after a stroke and can be done easily at bedside. The domains include level of consciousness, gaze, visual fields, facial weakness, motor performance of the extremities, sensory deficit, ataxia, aphasia, dysarthria, and hemi-neglect. Score of 0 denotes normal in all domains and higher score indicates more the neurological deficit with overall maximum score of 42.[19] It is found to be valid and reliable, also when administered by non-neurologists and non-physicians.[19]

Barthel Disability Index

Barthel Disability Index (BDI) is a simple tool that can be administered by any health professional.[20] It has 10 items and is designed to measure the level of functional independence in the basic activities of daily living. The maximum score is 100. Anything <100 suggests disability. This has also been used previously in rural and elderly population in India.[21]

Zarit Burden Interview

It is designed by Steven H Zarit, that assesses the stress experienced by caregivers of patients with disability.[22] It is scored on a 5-point rating scale ranging from never (0), to nearly always.[4] The burden score was categorized into four categories; no burden (0–21), mild-to-moderate burden (22–40), moderate-to-severe burden (41–60), and severe burden (61–80). Higher score indicates greater burden.

Coping checklist

The CCL is an easy to administer tool.[23] It has comprehensive list of 70 items which has been grouped under 3 broad categories: *problem-focused* (problem solving 10 items), *emotion-focused* (distraction positive 14

items, distraction negative 9 items, acceptance 11 items, religion/faith 9 items, denial/blame 11 items, and finally both the *problem and emotion-focused* (social support 6 items). It seems ideal to use in Indian settings, has been used previously.[24]

Statistical analysis

Anonymized data gathered were collated and analyzed using the SPSS version 23 of Statistical Package for Social Sciences (SPSS)[25]. Descriptive and more detailed analyses such as independent *t*-test, Chi-Square test, and Regression analysis were performed. Two tailed tests were used during comparisons. A $p < 0.05$ was considered as statistically significant.

RESULTS

Two groups were formed on the basis of Ham-D cut-off score of 9/10, showed 67 (29.6%) out of 226 (N) participants had depression. PSD group was significantly older (mean age in years = 62.28 ± 13.30) compared with the PSwD group (mean age in years = 57.57 ± 13.22) ($p = 0.02$). PSD rates were 23% in males compared to 49% in females, suggesting the rates are higher in females ($p < 0.001$). The two groups were also similar on marital status ($p = 0.22$), education ($p = 0.36$), rural residents ($p = 0.44$), and socioeconomic status ($p = 0.34$). Homemakers were more in PSD group compared with the PSwD group.

The analysis of various risk factors showed both groups PSD and PSwD were similar in rates of hypertension ($p = 0.08$), diabetes mellitus ($p = 0.44$), dyslipidemia ($p = 0.78$), ischemic heart disease ($p = 0.12$), tobacco use ($p = 0.09$) and use of alcohol ($p = 0.05$). The type of stroke either the hemorrhagic or ischemic and site of lesion namely left, right or bilateral were not significantly associated with PSD respectively ($p = 0.68$ and $p = 0.24$) [Table 1].

The stroke severity based on the NIHSS measures was higher in PSD group (13.79 ± 4.65) compared with PSwD group (8.92 ± 5.48) with $p < 0.001$. BDI scores were lower in PSD group (55.75 ± 20.43) suggestive of higher level of disability in the PSD group, on comparison with the PSwD group (79.56 ± 24.54) with $p < 0.001$. In addition, the caregiver burden scores as measured on the ZBI showed higher burden in PSD group than PSwD group ($p < 0.001$) [Table 1].

The caregiver burden was found to be significantly higher in the PSD group (51.18 ± 13.89) compared to the PSwD group (28.77 ± 20.52) ($p < 0.001$). Measures in all the sub-categories of the caregiver burden as per ZBI measures was found to be significantly higher in the PSD group ($p < 0.001$). Similarly, the CCL measures in all its sub-categories were also found to be significantly higher in PSD group compared with the PSwD group [Table 2].

There was a significant correlation with the age, gender, stroke severity, disability, and burden with the PSD. All the ZBI subcategories as well the CCL sub-categories correlate significantly with the PSD [Table 2].

Stroke severity correlated inversely with a disability on BDI scores ($r = -0.64$; $p < 0.001$) and also with caregiver burden on ZBI scores ($r = -0.63$; $p < 0.001$). In other words, higher the severity of stroke, higher are the level of disability and caregiver burden. Functional disability on BDI correlated inversely with caregiver burden on ZBI scores ($r = -0.92$; $p < 0.001$). This means, higher the level of disability, higher is the caregiver burden [Table 3].

Problem-solving, emotion-focused coping including religion, distraction and mix of both problem and emotion-focused coping methods were found to be higher in stroke survivors with depression and these methods were found to be higher in PSD group compared to the PSwD group [Table 3].

A logistic regression analysis was carried out to identify key determinants, with depression as the dependent variable. It showed age, female gender, stroke severity, and level of disability were the significant variables, contributing respectively by 6%, 14%, 35%, and 40% influencing the depression. Therefore, stroke severity and level of disability together influenced the PSD by about 75% [Table 4].

Caregiver burden as measured on ZBI correlated inversely with Stroke severity on NIHSS, Functional disability on BDI and PSD ($r = -0.49$; $p < 0.001$). From caregiver's perspective, burden was associated with stroke severity, disability and PSD. Linear regression model with caregiver burden as the dependent variable showed stroke severity, disability, and depression significantly influenced the caregiver burden [Table 5].

DISCUSSION

The key findings from the study were that the PSD was associated with age, female gender, level of disability and severity of stroke, and these four factors were the key determinants for the PSD. PSD was common, as the rates were nearly 30% in this study. The type of stroke and site of lesion were not associated with the PSD. The PSD contributes significantly to the level of functional disability as well as caregiver burden. The study also found that coping strategies used by caregivers were influenced by the presence of depression.

A meta-analysis has concluded the prevalence of the PSD has been around 33%.[26] In this study, rates were found to be 29.6%. The median age of the sample was 60 years and many participants were male. There was no significant difference between the PSD and PSwD groups in terms of educational level and socioeconomic status. But a few previous studies had found that the PSD was related to lower educational and lower socioeconomic status.[2]

This study found a significant association of PSD with older age and female gender. Non-employed women seem to be at a higher risk for PSD as per this study. Several studies have consistently found that female gender is associated with depression.[10] Many previous studies suggested that age is not a risk factor or determinant for PSD.[27] In contrast to previous findings, this study found that the PSD is associated with older age compared to the PSwD group. This could be attributed to this study population, which is typical of the Indian population

as study had more participants residing in rural areas compared to those from urban areas.

Risk factors such as smoking, alcohol use, ischemic heart disease, dyslipidemia, diabetes, and hypertension were not found to be associated to the PSD, which is similar to many other studies. In our study, all the risk factor variables used in the study were equally distributed in the PSD and PSwD groups. Although alcohol use seemed higher in PSD group, there was no significance as the $p = 0.05$ from other tests also. Smoking was found to be risk factor in one study.[2] A study examined the inconsistencies and suggested there was more literature found on female gender, stroke severity, functional disability and support as risk factor for PSD.[28]

Other key findings in line with previous studies, were that type of stroke and site of the vascular lesion were not significantly related to the PSD in this study.[8,9,29] However there have been few studies that found left hemispheric lesion correlated with PSD.[9,30]

On comparison of the two groups by independent *t*-test and correlation analysis supported the previous findings of the Stroke severity and also the level of functional disability was associated with PSD, which is similar to many previous studies.[10,28] The disability correlated with caregiver burden in this study. Measures of caregiver burden scores were higher in the PSD group, suggesting the association between PSD and burden, as supported by correlation analysis. Functional disability also was found to be associated with the burden. Depression, functional disability and the Stroke severity were the main determinants for the caregiver burden in this study, which is also found in other studies.[8,31]

This study is unique in terms of examining the coping mechanisms adopted by the caregivers in stroke survivors with depression. This study used the instrument developed by Rao *et al*. devised particularly for the Indian context.[23] The result highlights that high caregiver burden is associated with more of emotion-focused coping strategies like problem-solving, emotion focused and both problem focused and emotion-focused coping methods were significantly adopted in stroke survivors with depression and this is the preferred coping method. Also particularly, seeking social support, and problem-solving were also noted. These results are similar to study from India by Kumar *et al*. and in Iran by Kazemi *et al*.[32,33] It is essential to assist families to cope with consequences, engage them to reduce negative impact on families, ensure harmonious family relationships and the need to ask for help when needed.[34] Similar to another study on burden and coping done in North India, the burden was associated with higher coping levels, however our study examined in the context of PSD rather than stroke itself.[32]

This study seems to be first of its kind especially early during acute stroke management and on PSD till date, that was conducted in tier two city, in India, with a relatively larger representative sample from rural community. This study focused on examining the key determinants that are associated with the PSD. Studying the coping mechanism adopted by the caregivers along with the caregiver burden also makes it unique. There was one similar study from a tertiary institute in South India and that was on persons with chronic stroke attending Neurorehabilitation Centre.[35] Similarly, a study on coping strategies was done on stroke and not particularly on PSD.[32]

Limitations

Depression diagnosis was based on Ham-D scores with cut-off score of 9/10 in this study. Sample size calculation was not done. Personal factors, family circumstances, past occurrence of depression as well as past occurrence of stroke were not studied, which are known to be contribute to PSD. Caregivers' characteristics were also not studied, that was needed for better understanding. Coping strategies though studied, lacked psychosocial and financial factors contributing to methods adopted by the caregivers.

Directions for future and recommendations

In this study, Ham-D is used which is simple to use. In view of the importance of the PSD, many researchers have tried to devise tools to be used specifically also. There is 17-item SS- Geriatric Depression scale (GDS) Rasch measure to screen for PSD and its magnitude, need to be studied and validated.[36] GDS was felt to be not adequate to screen PSD as per some authors.[37] A 30-item GDS has been found to be useful in detecting minor depression after stroke.[38] PSD rates were lower in those who were receiving SSRIs.[39] A more structured integrative approach involving the educational, physical, and mental health support in addition to antidepressants required in managing the PSD.[40] Future study design should be a longitudinal follow-up of the natural course that could compare the outcome in those where depression was identified and treated compared with where intervention was not available, to shed more light on the importance of managing PSD.

CONCLUSION

This study first of its kind in a tier two city, with a larger sample of participants residing in rural area, in India that examined the coping strategies of the caregivers also, found rates of depression to be 29.6%. The factors associated with the PSD included older age, female gender, stroke severity, and disability. PSD was found to be significantly associated with the caregiver burden and one of the significant contributors for caregiver burden. Coping strategies adopted by caregivers highlighted that it was the preferred kind of coping, and this also provides addition to the current understanding in the Indian setting. Training of caregivers for home-based rehabilitation, and adopting better-coping styles to reduce stress should be organized at community levels. This in turn helps improving stroke care, fostering positive relationships and reduces caregiver stress. The study supports the need for more holistic approach in the stroke management, especially in the acute phase. Early identification of PSD and management could likely reduce the burden on caregivers. Improved motivation from the treatment of depression, could also improve the activeness in the engagement with the various specialists such as speech therapists, and physiotherapists, thus enhancing the recovery and reduce the morbidity.

Early remission of PSD is likely to reduce the long-term disability and burden to the caregivers. Addressing the PSD in addition to supporting the caregivers, is likely to improve the outcome. These determining factors in addition to the trained clinician administering Ham-D scale may assist in identifying PSD and initiating therapy particularly in areas of a paucity of specialist psychiatrists.

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Ethics committee
Approval obtained from the KLE Academy of Higher Education and Research Institutional Ethics Committee, letter with Reference number KAHER/EC/19-20/2906199001, dated 28 June 2019.

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Conflicts of interest
There are no conflicts of interest.

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ORIGINAL ARTICLE

Predictors of disability and quality of life in rural and urban stroke survivors

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Abstract

Background: Stroke is a common neurological disorder associated with long term morbidity and/or dependency of patient on family members leading to consequent disturbances in the life of caregivers. *Aim and Objectives:* A hospital based cross-sectional study was aimed to compare the disability and Quality of Life (QOL) between the rural and urban population at 3 months after stroke in North Karnataka. *Material and Methods*: Patients were assessed with National Institutes of Health Stroke scale (NIHSS), modified Rankin scale (mRS), modified Barthel index (MBI), World health organization quality of life-BREF (WHOQOL-BREF) questionnaire. Socio-demographic, vascular risk factors and stroke characteristics were compared in both the groups. *Results*: Ischaemic type was predominant with higher number of patients with moderate severity were observed in rural (52.4%) than urban (42.2%). Tobacco use (50.35%) was high in rural patients whereas past history of stroke (47.71%) was high in urban patients. QOL was poor (score <60) in both rural and urban patients at 3 months. Age, duration of stay, complications, stroke severity, and disability at the time of discharge had significant effect on QOL of both urban and rural patients. This is the first report from north Karnataka comparing the risk factors, severity, disability, QOL in rural and urban stroke patients. *Conclusion*: Interdisciplinary approach is required to improve the QOL and overcome any disabilities among rural and urban stroke patients.

Keywords: Functional Independence, Quality of life, Rankin Score, Stroke severity

Introduction

Stroke or cerebro-vascular accident has multitude of negative consequences on an individual life such as loss of independence, immobility, cognitive impairment, and communication difficulties. This requires a major adjustment in the social function and psychology of stroke survivors. Stroke is known for its distressing and disabling sequalae with associated poor Quality of Life (QOL) [1]. Prevalence rate of stroke as reported from an Indian study for urban population was 45 to 487/100000 and for rural population 55 to 388.4/100000 [2].

According to the World Health Organisation, QOL is defined as individual's perception of their life in the context of their culture and value systems in which they live and in relation to their goals, expectations, standards and concerns [3]. QOL should not be confused with the concept of standard of living, which is based primarily on income. Instead, standard indicators of the QOL include not only wealth and employment but also the environment, physical and mental health, education, recreation and leisure time, and social belonging. Stroke has a detrimental effect, both on short term and long term QOL [4-6]. Compromised function demands adjustments, support and caregiving from the members of family [7].

Stroke leads to shorter- and longer-term decline in QOL in majority of survivors. India like other developing countries is in the midst of a stroke epidemic. There is a huge burden of stroke with significant regional variations. Stroke units, thrombolysis, and rehabilitation are predominantly available in urban areas, particularly in private sector hospitals. Rural population in India in comparison with its urban population has always thought to have lower level of health care accessibility and must travel to nearest bigger city for treatment [8]. Many Indian studies have reported poor QOL of stroke survivors [7-11].

Short term functional outcome, disability and the determinants of QOL in rural and urban stroke survivors are lesser-known fact. Normally, post-stroke physical, psychological, social and environmental expectations of patients who live in different areas, with different socio-economic status and different environments might have differences [12,13]. The assessment of QOL among these stroke survivors can be helpful in developing more comprehensive interventions for strategizing rehabilitative services in both rural and urban.

Hence, this study aimed to compare the outcome parameters particularly the disability and QOL between the rural and urban population at 3 months after stroke. Also, comparing the factors contributing to the disability and QOL in both rural and urban population. Based on previous studies, it is hypothesised that the outcome in rural would be poorer when compared to the urban.

Material and Methods

A hospital based cross-sectional study was undertaken in the Department of Neurology of a tertiary care teaching hospital situated in North Karnataka, India, from July 2019 to June 2020. Study had the necessary approval from the Institutional Ethics Committee (KAHER/EC/19-20/290619001). Adult patients with acute stroke who attended the Neurology Department and willing to participate by giving written informed consent were enrolled.

A total of 250 participants were allocated into rural area (n=141) and urban area (n=109) depending on the place of residence. All the individuals of acute stroke (ischaemic and haemorrhagic strokes) patients who are admitted in the Department of Neurology were included in the study. The participants with recurrent strokes, cerebrovenous thromboses, vascular malformations, subarachnoid haemorrhages, serious medical condition, severe psychiatric disorder, and National Institutes of Health Stroke Scale (NIHSS) score more than 24 were excluded. Sample size was calculated based on the fallowing equation and previous report on prevalence (46.3%) [14].

$$n = \frac{p\,(100 - p)Z^2}{E^2}$$

Minimum sample size was found to be 206, at 85 % confidence with the absolute precision of 5 %. Further to increase the accuracy of the test sample size was rounded off to 250. Detailed socio-demographic data and clinical history was collected from the participants. Information about the onset of symptoms, duration of stay at the hospital, lifestyle of the patients like alcohol and tobacco consumption, cardio vascular risk factors like hypertension, diabetes, past and family history of cardiovascular disorders were enquired. Validated instruments such as NIHSS, modified

Rankin Scale (mRS), Modified Barthel Index (MBI) of activities of daily living (ADLs) and World Health Organization Quality of Life-Biomedical Research and Education Facility (WHOQOL-BREF) questionnaire were used to evaluate the participants.

The severity of stroke was assessed using the NIHSS scale [15]. Severity score was obtained by the addition of each of the 12 elements comprising of level of consciousness to questions and commands, gaze, visual, facial palsy, motor arm, motor leg, limb ataxia, sensory, best language, dysarthria, and extinction/inattention). A score of 0 indicates no stroke symptoms, 1-4 as minor, 5-15 as moderate, 16-20 as moderate to severe and >20 as severe.

The clinical outcome that is disability after stroke was measured using the mRS at the time of discharge [16]. The mRS score of 0-1 was considered as favourable and 2-5 as unfavourable outcome. At 3 months post stroke, all the participants were further evaluated for functional status using MBI [17,18]. It is used as a measure of physical disability, used widely to assess behaviour relating to activities of daily living for stroke patient. The MBI score is obtained using 10 categories comprising of feeding, dressing, personal hygiene, bathing, toileting, bowel and bladder controls, mobility and stair climbing that are related to ADLs, the outcome is assessed by totaling the points bestowed to each category. High score indicated high functional independence.

WHOQOL-BREF, a 26-item questionnaire developed by WHO was utilized to assess QOL [3,19]. Two questions assess the domains on perception of QOL and perception of health of the patients; and the rest of the 24 questions were categorized into another 4 domains: physical health with 7 items; psychological health with 6 items; social relationship with 3 items; and environmental health with 8 items. All questions were scored by Likert scale of 5-points. The total score of each domain was calculated according to the scores tables guidelines provided by WHO in the original WHOQOL-BREF. A higher score means a higher QOL.

Statistical analysis

Data were analyzed using SPSS. version 26.0 statistical software and Microsoft Excel. Categorical variables were given in the form of frequency tables. Continuous variables were given as Mean ± SD / Median (Min, Max). Chi square test is used check the association between categorical variables. Continuous variables were analyzed using t test/ Mann Whitney u test. Correlational analysis was done depending on the data. Value of p less than or equal to 0.05 indicates statistical significance.

Results

Socio-demographic factors and stroke characteristics were compared between rural and urban participants using chi-square test (Table 1). A significant association was observed for education (p=0.000), employment (p=0.01) and socio-economic status (p=0.000). Infarction was the most common pathology in the stroke type, which was similar in both the groups. But the percentage of hemorrhagic type was more frequent in rural group (61.5%). Right side of the brain was affected more in both the groups. Moderate stroke severity was noted more among the rural group than urban group. However no significant association observed among stroke characteristics between rural and urban population.

Table 1: Comparison of socio-demographic factors and stroke characteristics among rural and urban population

Socio-demographic factors		Rural n=141 (56.4%)	Urban n=109 (43.6%)	*p*
Gender	Male	108 (57.8%)	79 (42.2%)	0.457
	Female	33 (52.4%)	30 (47.6%)	
Education	Illiterates	26 (81.3%)18	6 (18.8%)5	0.000*
	High school	56 (65.9%)39	29 (34.1%)26	
	Grade 10	18 (54.5%)12	15 (45.5%)13	
	Grade 12	16 (57.1%)11	12 (42.9%)11	
	Graduation	24 (36.9%)17	41 (63.1%)37	
	Post-graduation	1 (14.3%)0.7	6 (85.7%)5	
Employment	Unemployed	6 (42.9%)	8 (57.1%)	0.010*
	Housewife	29 (52.7%)	26 (47.3%)	
	Farmer	61 (93.8%)	4 (6.2%)	
	Retired	7 (25.0%)	21 (75.0%)	
	Private	20 (45.5%)	24 (54.5%)	
	Govt	7 (31.8%)	15 (68.2%)	
	Business	11 (50.0%)	11 (50.0%)	
Socio-economic status	Lower ses	13 (81.3)%	3 (18.8)%	0.000*
	Lower middle	49 (47.1)%	55 (52.9)%	
	Upper lower	77 (65.8)%	40 (34.2)%	
	Upper middle	2 (15.4)%	11 (84.6)%	
Stroke characteristics				
Subtype	Ischaemic type	109 (55.1%)	89 (44.9%)	0.248
	Haemorrhagic type	32 (61.5%)	20 (38.5%)	
Side of lesion in brain	Right	67 (54.0%)	57 (46.0%)	0.755
	Left	64 (58.7%)	45 (41.3%)	
	Bilateral	10 (58.8%)	7 (41.2%)	
Stroke severity (NIHSS)	Minor	34 (47.9%)	37 (52.1%)	0.178
	Moderate	74 (61.7%)	46 (38.3%)	
	Severe	33 (55.9%)	26 (44.1%)	

**Statistically significant with p value< 0.05*

The common vascular risk factors were hypertension, diabetes mellitus, dyslipidemia and presence of ischaemic heart disease (Table 2). The tobacco and alcohol consumption were found to be higher in rural group (63.4%, 60.3%) than urban group (36.6%, 39.7%) respectively. There is not much significant difference in vitamin B12 deficiency and hyper-homocystinemia. A significant association was observed for tobacco use (p=0.03) and past history of stroke (p=0.008) amongst rural and urban participants.

Table 2: Comparison of vascular risk factors between rural and urban participants

Variables		Rural n (%)	Urban n (%)	*p*
Hypertension	Present	42 (54.5%)	35 (45.5%)	0.693
	Absent	99 (57.2%)	74 (42.8%)	
Diabetes Mellitus	Present	41 (50.0%)	41(50.0%)	0.093
	Absent	100 (59.5%)	68 (40.5%)	
Dyslipidemia	Present	23 (46.9%)	26 (53.1%)	0.092
	Absent	118 (58.7%)	83 (41.3%)	
Ischemic Heart Disease	Present	17 (53.1%)	15 (46.9%)	0.415
	Absent	124 (56.9%)	94 (43.1%)	
Tobacco use	Present	71(63.4%)	41(36.6%)	0.030*
	Absent	70 (50.7%)	68 (49.3%)	
Alcohol use	Present	82 (60.3%)	54 (39.7%)	0.110
	Absent	59 (51.8%)	55 (48.2%)	
Past History of Stroke	Present	45(46.4%)	52 (53.6%)	0.008*
	Absent	96 (62.7%)	57 (37.3%)	
Family history of Stroke	Present	61(58.7%)	43(41.3%)	0.317
	Absent	80(54.8%)	66 (45.2%)	
Vitamin B_{12} levels	Normal	112 (57.1%)	84 (42.9%)	0.382
	Deficiency	29 (53.7%)	25 (46.3%)	
Homocysteine levels	Normal	94(56.3%)	73 (43.7%)	0.916
	Increased	47(56.6%)	36 (43.3%)	

**Statistically significant with p value< 0.05*

The mean duration of stay in the hospital is similar in both the groups. (rural= 7.13 ± 4.02 and urban = 7.6 ± 5.01 days) with no significance (p = 0.750). There was no statistically significant difference in the blood pressure level (p = 0.655, p = 0.842), vitamin B12 (p = 0.925), homocysteine (p = 0.202) and cholesterol levels (p = 0.972) during admission (Table 3).

Table 3: Sociodemographic, clinical characteristics, disability score and WHOQOL-BREF score among the rural and urban group

Variables	Rural (n=141)	Urban (n=109)	*p*
Age (years)	57.82 ± 13.84 (57.82-55.57)	59.93 ± 13.57 (57.35-62.25)	0.17
Duration of stay (days)	7.13 ± 4.02 (6.46-7.8)	7.6 ± 5.011 (6.64-8.55)	0.750
Systolic blood pressure	147.51 ± 25.45 (143.24-151.78)	148.20 ± 26.56 (143.16-153.25)	0.655
Diastolic blood pressure	86.26 ± 11.43 (84.34-88.18)	86.55 ± 13.51 (83.99-89.12)	0.842
Random blood sugar	152.81 ± 75.52 (140.42-165.75)	153.17 ± 61.52 (141.48-164.85)	0.38
Cholesterol	121.68 ± 74.58 (109.17-134.19)	126.70 ± 73.37 (112.77-140.63)	0.972
Severity of stroke	10.01 ± 5.42 (9.10-10.92)	9.83 ± 5.96 (8.69-10.96)	0.754
Disability	73.56 ± 25.217 (69.32-77.8)	75.87± 25.08 (69.32-77.8)	0.405
Physical domain of QOL	13.52 ± 3.67 (12.9-14.13)	13.51 ± 3.66 (12.81-14.21)	0.702
Psychological domain of QOL	12.58 ± 3.29 (12.03-13.14)	12.66 ± 3.25 (12.04-13.27)	0.854
Social domain of QOL	14.07 ± 1.41 (13.83-14.3)	14.09 ± 1.35 (13.83-14.34)	0.793
Environmental domain of QOL	13.82 ± 1.52 (13.57-14.08)	13.84 ± 1.53 (13.54-14.13)	0.903
Total QOL	53.90 ± 9.25 (52.36- 55.44)	54.10 ± 9.19 (52.36-55.85)	0.943

Data represented as mean ±standard deviation (95% Confidence interval), Mann whitney U test used for comparison

The comparison of disability with other variables showed that duration of stay (p <0.001), complications (p = 0.003, p = 0.001), severity of stroke (p <0.001) and mRS score (p <0.001) are significantly correlated in both the groups (Table 4). However, age and tobacco consumption was significant only in urban group. A significant correlation was observed among age (p = 0.002, p <0.001), duration of stay (p <0.001), complications (p = 0.013, p < 0.001), and mRS score (p <0.001) with QOL (Table 4). The Barthel index score measured at 3 months post discharge, for rural population was 73.56 ± 25.21 and 71.11 ± 25.08 for urban population. Frequency and mean value of disability in rural stroke survivors is higher compared to urban stroke survivors though statistically not significance between the two groups.

However, forced linear regression analysis between the dependent variable quality of life and the various factors were done separately for rural and urban population with some difference in the factors influencing quality of life. subtype of stroke and side of the brain involved in stroke and vitamin B_{12} deficiency are found to be the factors responsible for poor quality of life in rural population whereas tobacco consumption in urban population. The common factors for both the groups include duration of stay in the hospital, presence of complications, stroke severity and MRs score at the time of discharge are contributing factors for poor quality of life in both the population.

Table 4: Correlation of disability and quality of life

Variables	Disability (p)		Quality of life (p)	
	Rural	Urban	Rural	Urban
Age	0.424	<0.001*	0.002*	<0.001*
Past History of stroke	0.019*	0.258	-	-
Education	-	-	0.013*	0.254
Dyslipidemia	0.405	0.054	-	-
Tobacco consumption	0.326	0.020*	0.427	0.010*
Duration of stay	<0.001*	<0.001*	0.001*	<0.001*
complications	0.003*	0.001*	0.013*	<0.001*
Severity of stroke	<0.001*	<0.001	<0.001	0.001*
Subtype	0.001*	0.449	0.080	0.413
Side involved	-	-	0.050	0.311
Vitamin B_{12} deficiency	0.057	0.209	0.014*	0.088
mRS score at the time of discharge	<0.001*	<0.001*	<0.001*	<0.001*

Discussion

India is a vast country with diverse socio-cultural practices across regions influencing the after care and rehabilitation services. Rural and urban differences have been noted in studies from India with respect to risk factors and type of stroke [7-9, 12, 20]. But the contributing factors for disability and quality of life with rural urban differentiation have not been studied earlier. This is the first study aimed to examine the differences in predictors of quality of life of stroke survivors at three months between rural and urban population from north Karnataka.

More than 70% of stroke patients were males, both in urban and rural population, no significant difference observed. Similar observation is reported by various studies from Mumbai, Bangalore, Trivandrum and rural areas of Karnataka [7, 10-11]. Education level may contribute to understanding of the disease and expectations. In this study, significant differences in the level of education were noted amongst rural and urban stroke patients. The ischaemic type of stroke was predominantly seen compared to hemorrhagic type in both rural and urban population. However, difference was insignificant, similar to other published literature [6-7, 9, 13, 20-21]. Severity of the stroke was observed to be similar among rural and urban patients. However, slightly a higher number of patients with moderate severity were observed in rural (52.4%) than urban (42.2%), comparable with Poland study [5].

Among the vascular risk factors, tobacco usage and history of stroke significantly affected the rural and urban patients. Tobacco use was high in rural patients whereas past history of stroke was high in urban patients. Among the other factors, hypertension, diabetes mellitus, dyslipidemia, heart disease, vitamin B_{12} deficiency were slightly increased in urban patients. Alcohol use, family history of stroke was observed in rural patients. This observation can be attributed to the lifestyle, eating habits, socio-demographic changes and physical activity of urban and rural patients. However, vascular risk factors were statistically insignificant. This comparison provides substantial reassurance that these risk factors are public health problem in both rural and urban population [5-9, 12-13, 20-22].

Overall QOL was poor (score <60) in both rural and urban patients at 3 months. Though there were differences in sociodemographic, clinical risk factors, stroke severity among rural and urban patients, none of these factors showed different effect on QOL of urban and rural patients at 3 months. However, individually age, duration of stay, complications, stroke severity, and disability at the time of discharge had effect on QOL of both urban and rural patients. In a study from rural areas of North Kerala, persistent disability is shown to have impact on QOL [9]. A study from Jaipur reported better QOL among rural compared to urban areas [8]. A 3 year study from Canadian hospital has reported that initial improvements in QOL followed by decline in QOL overtime [4].

The launch of National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS) program by Government of India has supported the screening of the vascular risk factors and providing treatment at primary health care level, yet acute management of stroke is opulence in rural areas [20]. Irrespective of urban and rural area Pucciarelli *et*

al. showed that 50 % survivors had no significant moderating effects of mutuality for QOL over time [23]. In another study from India which included both stroke survivors and their caregivers showed that stroke has a considerably negative impact on the QOL of patients and their caregivers. Authors also highlighted requirement of target based interventions at both stroke survivors and caregivers to improve their QOL [24].

The present study would have been more inferential if comparison could have been done before and after the interventions. Additional research is needed to understand and address factors like variations in care, rehabilitation services and socio-cultural determinants of stroke recovery which may contribute to disability and quality of life.

Conclusion

This is the first report from North Karnataka comparing the risk factors, severity, disability, QOL in rural and urban stroke patients. Though the vascular risk factors were comparable in rural and urban patients, it is less likely to be controlled in rural than urban areas. This study suggests that interdisciplinary approach is required to improve the QOL and overcome any disabilities among rural and urban stroke patients. There is also a need to determine a basis for developing rural and urban care models for stroke survivors to improve their QOL. It is imperative to develop specific programs for recovery and develop policies aiming to control risk factors for stroke patients. Disability can be minimized and QOL can be improved by providing services at rehabilitation centres.

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Original Article

Awareness of stroke in a teaching hospital in North Karnataka: A cross-sectional study

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Abstract:

CONTEXT: The 2018 consensus statement of the Indian Stroke Association ranks stroke as the second leading cause of death in India, thus making it a public health challenge. The associated stigma and inadequate knowledge stand as a hurdle in early detection of the disease, which delays treatment leading to disabilities.

AIMS: To assess the awareness of risk factors, warning symptoms, and treatment of stroke and its consequences.

METHODOLOGY: This was a hospital-based cross-sectional study conducted between July 2019 and January 2020. Relatives of patients who came to the outpatient and inpatient departments of psychiatry in a tertiary care teaching hospital in North Karnataka were invited to participate in this study and interviewed one to one and the responses were noted in the questionnaire.

RESULTS: Among the 403 people who were interviewed, 97.5% had heard about stroke, 86.1% knew the signs and symptoms of stroke, and 81.8% knew the various risk factors associated with stroke. Almost all responded that the stroke-affected person should be taken to the hospital. Seventy percent felt that it affected daily living, while around half responded that stroke was a preventable disease but were unwilling to make lifestyle changes or modify the risk factors. The respondents agreed that health-care professionals were the best source of information about stroke in the community.

CONCLUSIONS: The knowledge about the warning symptoms and risk factors seems to be better in people attending the teaching hospital, but a lack of knowledge when it comes to treatment, stroke outcome, and prevention of stroke is evident. Health awareness activities should focus on treatment-seeking behavior, rehabilitation, and primary preventive aspects.

Keywords:

Awareness, consequences of stroke, prevention, risk factors, stroke, warning symptoms

Introduction

Stroke is the second leading cause of death and the third leading cause of disability in the World Health Organization.[1] The estimated adjusted prevalence rates of stroke in India are between 84 and 262 strokes/100,000 population in rural areas and between 334 and 424 strokes/100,000 population in urban areas.[2] The incidence of stroke varies from 116 to 163/100,000 population.[3] The previous decade has seen an increase in the number of stroke cases by 17.5% in India.[4]

In India, it is the second leading cause of death as per the 2018 consensus statement of the Indian Stroke Association[5] and the fourth leading cause as per the 2016 report by the Indian Council of Medical Research.[3] Studies show that the stroke-related mortality rate has increased by 7.8% from 1998 to 2004 in India.[4] The age of stroke onset in India ranges from between 55 and 65 years, while the average life expectancy at birth is 69.4 (males: 67.9 and females: 70.9) as per the Sample Registration System Bulletin 2010.

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More number of people are surviving beyond the risk of stroke (age: 55–65) likely to increase incidence of stroke, making it a public health challenge.[5,6]

Stroke as a neurological condition leads to wide range of residual disabilities in stroke survivors. These disabilities both physical and cognitive makes the stroke survivor dependent on family members increasing the care giver burden. Having said that, it is not so that the treatment options are not available for a person with stroke. Over the past years, the science of stroke care has undergone a lot of medical advancements.[7]

Previous studies from India claim that though there is awareness of stroke warning signs and few risk factors, the knowledge about the etiology and available treatment is lacking in community.[8,9] Adequate knowledge about stroke can result in early identification of stroke and timely treatment. Without public knowledge and practices, stroke burden cannot be reduced. For instance, it is important to know about the therapeutic opportunities in stroke which is limited. Lack of awareness about stroke symptoms and the need for immediate treatment among the public can delay the treatment seeking behaviour even though the services are available. This delayed hospitalization contributes to high mortality and morbidity in stroke.[10]

The National program for Prevention and control of Cancer, cardiovascular diseases and Stroke was implemented in India in 2010 and guidelines have been issued for the management of stroke at various levels of health care. One of the major achievements of this program is primary prevention through awareness activities being conducted at primary health center. Understanding the gaps in primary prevention of stroke is of utmost importance in formulation of population wide strategies.[3] Knowledge is considered the general information about stroke including signs, symptoms, and risk factors.[11] This study was undertaken to evaluate the knowledge and practices of public regarding risk factors, warning symptoms for stroke, and treatment and consequences of stroke. Adequate stroke knowledge in public is crucial to develop effectively targeted and appropriate health promotion campaigns to prevent stroke.

Methodology

This was a prospective hospital-based cross-sectional study conducted from July 2019 to Jan 2020. Relatives of patients who came to the outpatient as well as inpatients in the department of psychiatry in the government-run teaching hospital formed the study subjects.

The institutional research/ethics committee approval was obtained for the study. The subjects with age above 18 years who consented were interviewed one to one and questionnaires were filled during the interview. There was no attempt to prompt the response by suggestion.

Questionnaire

The survey questionnaire consisted of two sections. In the first section, sociodemographic information was collected which included age, education, address, and occupation. The second section focused on knowledge regarding the warning symptoms, risk factors, and treatment of stroke. The questionnaire also included the consequences of stroke and strategies for prevention of stroke. The questionnaire was adapted from previous studies[8,9,11] and modified for local social and cultural practices. The survey instrument was pretested on a sample of 30 volunteers that showed it was valid, and minor modifications were done with consensus agreement between senior investigators. The questionnaires were administered to the all the consenting participants.

Sample size was calculated as below:

$N = z^2\,pq/d^2$

Where z value for alpha error (95%); $P = 62.2$ prevalence of most common warning symptom in a stroke as described by respondents from the article by Pandian *et al.*[8] $q = 100–p$

D = absolute error 5%

$1.96 \times 1.96 \times 62.2 \times 37.8/25 = 361$

Statistical analysis

Data analysis was done using Microsoft Excel. Descriptive statistics including percentages, mean, and standard deviation were used to describe sociodemographic variables, knowledge, attitude, and health-seeking behavior of the participants.

Ethical clearance

Ethical approval was obtained from the Institutional Ethics Committee of Belagavi Institute of Medical Sciences, No. BIMS-IEC/133/2021-22 dated 8-4-2021.

Results

A total of 403 participants consented, out of 410 participants that were approached and took part in the study and completed the study questionnaire.

Sociodemographic characteristics [Table 1]

AQ1

Subjects in the age group range of 18-30 years (55.4 %) formed the majority. The mean age of the study group was 31.5 ± 8.5 years. The number of female participants (264; 65.5%) was more than the males (139; 34.5%). The education level of the study group analyzed showed that

Table 1: Study participants' sociodemographic characteristics

Sociodemographic Characteristics	Frequency (%) *n*=403
Age groups (years)	
18-30	224 (55.5)
31-45	110 (27.3)
46-60	53 (13.2)
>61	16 (3.9)
Average age (Mean±SD)	31.5±8.5 years
Gender	
Males	139 (34.5)
Females	264 (65.5)
Place of stay	
Rural	199 (49.4)
Urban	204 (50.6)
Religion	
Hindu	371 (92)
Muslim	29 (7.2)
Christian	3 (0.7)
Marital status	
Married	187 (46.4)
Unmarried	210 (52.1)
Widow	6 (1.5)
Education	
Illiterate	23 (5.7)
Up to SSLC	71 (17.6)
PUC	235 (58.4)
Under graduation	59 (14.6)
Post-graduation	15 (3.7)
Occupation	
Unemployed	44 (10.9)
Government Sector	73 (18.1)
Private	56 (13.9)
Farmer	11 (2.7)
Laborer	29 (7.2)
Students	190 (47.1)
Income (Rs.)	
>10,000 INR	157 (38.9)
<10,000 INR	246 (61.1)

up to 12th grade were 235 (58.3%), those with no literacy were 23 (5.7%), up to 10th grade 71 (17.6%), and 15 (3.7%) had completed postgraduation. The marital status of the subjects showed that 187 (46.5%) were married and unmarried were 210 (52.1%). Students constituted majority of the subjects 190 (47.1%). The representation from rural 199 (49.4%) and urban 204 (50.6%) are almost equal.

General information about stroke [Table 2]

The subjects were asked whether they have heard about the disease called stroke or LAKVA or PARALYSIS and 393(97.5%) of the participants responded affirmatively and only 10(2.4%) said they have not heard. Seventy-five percent (n = 301) had known someone with stroke compared to 102 (25.3%). A total of 121 (30%) participants claimed that they have witnessed an episode of stroke. Furthermore, 163 (40.4%) did not know that stroke runs in families. As many as 199 (49.3%) reported that they believed it is not a familial disease. 254 (63%) said that it is not an infectious disease and 138 (34.2%) said they do not know whether it spreads from person to person and 11 (2.7%) claimed that stroke can be infectious. When questioned about the age and onset of stroke, 195 (48.3%) said that stroke affects both young and old. Whereas, 152 (37.7%) said that they do not know and 53 (13%) claimed it is a disease of old age.

Knowledge of symptoms [Table 3]

Out of 403 subjects, 86.1% were able to identify at least one of the stroke symptoms. Moreover, 13.9% were not aware of any symptom of stroke. 79.4% responded that paralysis of any part of body or one side of body is the major symptom of stroke, followed by difficulty in speaking (53.5%). The other symptoms recognized include loss of consciousness (41.9%), Dizziness, vertigo or unsteadiness of gait (38.7%) and visual disturbances like blurring of vision, double vision, or loss of vision in one or both eyes (33.9%). The sudden onset of headache was not considered to be a symptom of stroke by 61.5%. Among the participants 63.2% report that Numbness, tingling sensations at any part of body or one side of body and chest tightness were not considered as symptoms of stroke.

Knowledge about risk factors [Table 3]

When the study subjects were enquired about the risk factors of stroke, 81.8% were aware of risk factors, whereas 8.1% were not aware of any risk factors. The most common risk factor identified was stress (60.5%), followed by elevated blood pressure (60.2%), diabetes mellitus (43.1%), and history of cardiovascular diseases was present in 24.8%. The lifestyle related factors like elevated cholesterol level and smoking were considered risk factors by 50% of the participants. Less than 25% considered Regular Alcohol consumption, obesity and lack of exercise/sedentary life style and unhealthy diet as other risk factors of stroke. Family history of stroke was considered a risk factor in 14.3% of subjects.

Practice

The study subjects were enquired what action they will take whenever they see any person is having any episode of stroke; 97.7% responded that they will take the person to the hospital immediately. 28.5% of people responded that stroke should be preferably treated by neurologist. Moreover, 3.4% responded that they will buy medicine from the medical shop before going to hospital.

Knowledge of treatment of stroke [Table 4]

The awareness about the treatment modalities available was also assessed in the group. 88.8% of people were aware that treatment is available, whereas 11.1% did not knew about the treatment options. Controlling the blood

Table 2: General information about stroke

Questions	Yes [*n* (%)]	No [*n* (%)]	Don't know [*n* (%)]
Have you ever heard or read about a disease called stroke?	393 (97.5)	10 (2.5)	0 (0)
Did you ever know anyone who had a stroke?	301 (74.7)	102 (25.3)	0 (0)
Have you ever witnessed a cerebral attack or stroke?	121 (30)	279 (69.2)	3 (0.7)
Is stroke a familial disease?	41 (10.2)	199 (49.4)	163 (40.4)
Is stroke an infectious disease?	11 (2.7)	254 (63)	138 (34.2)
Is stroke a disease of			
Old age	53 (13.2)	0 (0)	152 (37.7)
Young age	3 (0.7)		
Both	195 (48.4)		

Table 3: knowledge regarding symptoms and risk factors of stroke

Stroke symptoms and risk factors	Yes [*n* (%)]	No [*n* (%)]
Do you know the signs and symptoms of a stroke?	347 (86.1)	56 (13.9)
Paralysis (complete) of any part of the body or one side of body or face	320 (79.4)	30 (7.4)
Visual disturbances: Blurring of vision, double vision, or loss of vision in one or both eyes.	137 (33.9)	210 (52.1)
Slurred speech or difficulty in understanding or speaking, swallowing.	216 (53.5)	131 (32.5)
Sudden onset headache or head pain	99 (24.5)	248 (61.5)
Dizziness, vertigo or unsteadiness of gait.	156 (38.7)	191 (47.3)
Numbness, tingling sensations, dead sensations at any part of the body or one side of the body	92 (22.8)	255 (63.2)
Chest pain/chest tightness	51 (12.6)	296 (73.4)
Loss of consciousness	169 (41.9)	178 (44.1)
Stroke Risk Factors	Yes [*n*(%)]	No [*n*(%)]
Do you know the risk factors for stroke?	330 (81.8)	73 (18.2)
High blood pressure	243 (60.2)	88 (21.8)
Diabetes mellitus	174 (43.1)	157 (38.9)
Smoking	188 (46.6)	143 (35.4)
Obesity	140 (34.7)	191 (47.3)
High cholesterol level	202 (50.1)	129 (32)
Alcohol	114 (28.2)	217 (53.8)
Stress	244 (60.5)	87 (21.5)
Lack of exercise/sedentary lifestyle	98 (24.3)	233 (57.8)
Heart diseases	100 (24.8)	231 (57.3)
Family history of stroke	58 (14.3)	273 (67.7)
Unhealthy diet	99 (24.5)	232 (57.2)

pressure was considered the foremost in the treatment by 55.3%, followed by oil massaging the affected part by 52.6%. Many subjects considered that Ayurveda (44.1%) and homeopathy (21%) offered better chances of recovery. Many subjects did not consider that the blood thinning agents (17.1%) in the golden period would offer the better chances of reversal and recovery in patients with stroke. Tablet such as aspirin was considered an option of treatment by 29.5%. Many respondents feel that Faith healing (4.9%), Magician (1.7%) and Witchcraft (1.2%) can also help in recovering from stroke. Rural patients preferred oil massaging and Ayurveda to be the main treatment for stroke.

Fifty-two percent reported that stroke is an emergency requiring immediate attention like heart attack. Whereas, 40% did not know that it is an emergency. Sixty-four percent were aware that a person affected by stroke can have stroke again. 70.4% of people felt that stroke affects activities of daily living. If young persons are affected by stroke, 44% felt that it affects marriage and child bearing in females. 49.8% felt that they do not know whether people with stroke can be reemployed. Moreover, 40.9% felt that they should be reemployed only if the disability is not affecting their work. Regarding the disability in stroke survivors, the subjects concluded that it causes physical disability and mental disability and sometimes both. Recovery is very difficult and stroke can result in death. Regarding whether stroke is a preventable disease, 46.9%reported that stroke is a preventable disease and 41.7% did not know that whether it is preventable or not 11.4% felt that stroke cannot be prevented. When asked whether any time in their life they thought about stroke, 70.9% said that they have never thought about stroke and only 23% thought about stroke. Moreover, 66.7% felt that they do not have any chance of getting stroke in future. This clearly indicates that people are not worried about the lifestyle changes and other risk factors about

Table 4: Knowledge regarding actions to be taken, treatment and consequences of stroke

Stroke Management	Yes [*n* (%)]		No [*n* (%)]
Actions to be taken in the event of a stroke			
Do you know what actions are to be taken in the event of a stroke?	394 (97.8)		9 (2.2)
Take him to the hospital	355 (88)		44 (10.9)
Call an MBBS doctor	44 (10.9)		355 (88)
Show to a neurologist/Brain doctor	115 (28.5)		284 (70.4)
Call any MD doctor	27 (6.6)		372 (92.3)
Buy medicine from a shop	14 (3.4)		385 (95.5)
Treatment/Management of stroke			
Do you think there is treatment for stroke	358 (88.8)		45 (11.2)
Control BP	223 (55.3)		135 (33.4)
Oil massage	212 (52.6)		146 (36.2)
Blood thinning agents	69 (17.1)		289 (71.7)
Aspirin	119 (29.5)		239 (59.3)
Surgery	36 (8.9)		322 (79.9)
Ayurvedic treatment	178 (44.1)		180 (44.6)
Homoeopathic treatment	85 (21)		273 (67.7)
Faith healing	20 (4.9)		338 (83.8)
Magician	7 (1.7)		351 (87)
Witchcraft	5 (1.2)		354 (87.8)
Consequences of stroke			
	Yes [*n* (%)]		Don't know [*n* (%)]
Do you know the consequences of stroke?	365 (90.5)		38 (9.5)
How early should medical treatment be sought?	Immediately	<24 h	>24 h
	326 (80.9)	66 (16.4)	11 (2.7)
	Yes [*n* (%)]	No [*n* (%)]	Don't know [*n* (%)]
Is cerebral stroke an emergency requiring medical management like cardiac/heart attack?	210 (52.1)	31 (7.7)	162 (40.2)
Can a person have a stroke more than once?	258 (64.1)	19 (4.7)	126 (31.2)
Do you think stroke will affect the activities of daily living?	284 (70.5)	24 (5.9)	95 (23.6)
If a young person has a stroke, do you think it will impact her marriage and ability to bear children?	178 (44.2)	88 (21.9)	137 (33.9)
Do you think people with stroke can be reemployed in their job?	165 (40.9)	37 (9.2)	201 (49.9)
Can stroke be prevented	189 (46.9)	46 (11.4)	168 (41.7)
Have you thought about stroke as a personally potential relevant disorder?	101 (25.2)	286 (70.9)	16 (3.9)

AQ12 **Table 5: Consequences of stroke**

	Yes (%)	No (%)	Don't know (%)
Is cerebral stroke an emergency requiring medical management like cardiac/heart attack	210 (52.1)	31 (7.6)	162 (40.1)
Can a person have stroke more than once	258 (64)	19 (4.7)	126 (31.2)
Do you think stroke will affect the activities of daily living	284 (70.4)	24 (5.9)	95 (23.5)
If young person has stroke, do you think do you think it will affect marriage and child bearing	178 (44.1)	88 (21.8)	137 (33.9)
Do you think people with stroke can be reemployed in their job?	165 (40.9)	37 (9.2)	201 (49.8)
Can stroke be prevented	189 (46.9)	46 (11.4)	168 (41.7)
Stroke as a personally potential relevant disorder- have you thought about stroke before	101 (25.1)	286 (70.9)	16 (3.9)

stroke. The study subjects opined that the best source of information about stroke to community is through the health care professionals and internet.

Discussion

To the best of our knowledge, this study is the first of its kind in South India. Though studies have been undertaken previously, our study also focused on the consequences of stroke. The questionnaire has broader areas of the warning symptoms, risk factors, treatment, consequences and practices.

As the people seeking health care are able to recognize health issues earlier than those people who do not, the chances of accurate response are more resulting in bias.[8] In our study of 403 participants, 97% had heard about stroke and that it affects brain which is better than the previous studies. In the study by Adusumilli D 12, who reported that only 12.6% knew that brain is the affected

organ. Pandian *et al*.[8] and Lakshmi K[13] *et al*. reported about 30.8% and 69% respectively were aware of the term stroke. In a study by Sulena *et al*.,[14] about 52.4% of patients were aware that brain as the affected organ. Enhanced Information, Education and Communication (IEC) activities in the community and could explain the higher level of knowledge in the study population.

In our study, 86.1% had knowledge about symptoms of stroke and the most common symptom identified as weakness of one part of the body by 79.4% respondents which is better compared to earlier studies. In the study by Lakshmi K *et al*.[13] 63% were able to list some common symptoms of stroke. Sulena S *et al*.[14] reported that the motor weakness as the major symptom of stroke was reported by 68.4% of the study subjects. In a study in Saudi Arabia in 2017, 63.8% of the respondents had inadequate knowledge about the symptoms.[15] Headache, vomiting, and sensory symptoms which are not associated with other neurological signs and symptoms may not be considered stroke and mistaken for migraine. Epilepsy is a common condition in India and presence of seizures may not be considered an associated feature in stroke. In our study 14% were not aware of any of the stroke symptoms, where as in studies conducted in Brazil by Campos-Sousa *et al*.[16] reported about 41.1% and in Australia by Yoon *et al*.[17] reported that 23.8% had inadequate knowledge about the stroke symptoms. In the study by Adisumilli and Syed.,[12] 14.75% of respondents had no or incorrect knowledge about the stroke symptoms. The present study shows better knowledge of symptoms of stroke in the study population.

In the present study, awareness of risk factors was noted in 81.8% of the study subjects which is better than previous Indian studies. The most common risk factor identified in our study includes stress (60.5%), high blood pressure (60.2%) and Diabetes mellitus (43.1%). In the study by Adisumilli *et al*.[12] about 61.15% of study participants had identified one risk factor of stroke. Studies in different countries have shown variable response about the stroke risk factors. Lakshmi *et al*.[13] reported that 58% knew that diabetes, smoking, and hypertension are risk factors for stroke. In the study by Sulena *et al*.,[14] the most commonly recognized risk factors by patients were older age (61.5%), hypertension (38%), and diabetes (34.4%). One possible explanation for better awareness is the ongoing community outreach activities and health awareness activities by the NPCDCS programme.

Question was put to the study population about what action to be taken whenever any person is having an episode of stroke and the response given is better than the previous studies in India by Pandian *et al*.[8] Adisumilli *et al*.[12] and across the globe in Australia by Neau *et al*.[18] and in US by Schneider et al.19 and in South korea by Kim JS.[20]

When it comes to treatment of stroke, though 88.8% people were aware that treatment is available but were not aware of what treatment options are available especially thrombolytic treatment. Controlling Blood Pressure (55.3%), oil massaging the affected part (52.6%) were considered as main treatment. Many patients considered that Ayurveda (44.1%) and homeopathy (21%) offered better chances of recovery, especially among the rural population. This is likely to be sociocultural practice, which is common in rural population.

In the study by Adisumilli and Syed,[12] 24.82% of participants replied that they would use traditional methods/medicines. In the study by Pandian *et al*.[8] where about 3% of subjects believed in witchcraft, faith healing while in our study 5 % believed in indigenous treatment modalities like faith healing, magic and witchcraft. Ayurveda, homeopathy, and other native systems are deeply rooted in Indian culture. Herbal medicine and other traditional methods of treatment were preferred for treatment of stroke in Korea as depicted in the study by Kim and Yoon.[17,20]

The present study is different from previous studies as knowledge about future consequences of stroke. Sixty-four percent were of the opinion that a person affected by stroke can have stroke again and 70.4% opined that stroke affects activities of daily living. In the present study, 44% of the respondents were of the opinion that if a young person is affected by stroke, it affects marriage and child bearing especially in females. Regarding reemployment, 41 % feel that stroke survivors should be reemployed only if the disability is not affecting their work.

Regarding the consequences of stroke and the disability caused, the subjects concluded that it causes both physical and mental disability. Recovery is very difficult and stroke can result in death. In the current study, 46.9% reported that stroke is a preventable disease. This indicates that public can be encouraged to adopt appropriate preventive strategies at community level to prevent stroke. Primary prevention of stroke targeting the young population can be achieved by modifying lifestyle risk factors. The general practitioners and physicians need to be educated about referring patients to tertiary care centers at the earliest. The study subjects were also asked about the survey, 81% reported that through survey they were able to get knowledge about the stroke and they will focus on controlling of risk factors and life style modification which is the best strategy to prevent stroke.

Dissemination of knowledge about stroke in the community can be achieved through health care workers. Knowledge about stroke risk factors in the public is important in designing the prevention strategies. The prevention of stroke is practicable and effective. Approximately 80% of strokes can be prevented, when appropriate precautions and actions are taken that are derived from knowledge of the risk factors.[21] Prevention of stroke is highly influenced by the level of awareness of individuals and the community regarding the identification of stroke risk factors and subsequent management of stroke symptoms. If done timely, the primary preventive measures and medical attention could be lifesaving.

Limitations

This is a cross-sectional, quantitative study using mainly descriptive statistical analysis. Study participants are hospital attendees and hence it could be argued that they have relatively better knowledge compared to those residents not attending hospitals. Furthermore, though this may be indicative for need for awareness creation, the study findings are not be generalizable to the public at large due to sample of the study. Furthermore, the knowledge about stroke may be different in people with stroke-affected family members than those not affected.

Authors' recommendations

Structured educational program on stroke in the community using mass media to reach out at large is needed. There is a need to create awareness about the modifiable risk factors, lifestyle modifications to the community through community health workers, as part of primary prevention strategies. Collaborations with the Department of Community Medicine and the Primary Care Physicians are also needed. There is a need to create a local/ Stroke CVD prediction algorithm. Screening the public for vascular risk factors, addressing socio cultural practices which influences treatment seeking behavior needs attention.

Conclusions

India is relatively more diverse when compared to Western developed countries, specifically when it comes to culture, belief systems, and traditional practices. It is estimated that there is only one neurologist for every 3 million people. Lack of knowledge and health-seeking behavior of the public adds to this burden to its public health aspect. The study indicates the need for educating general public about stroke and its consequences.

The knowledge about warning symptoms and risk factors seems to be better in the community, but there is lack of knowledge when it comes to mode of treatment, managing the sequelae as well as prevention. Health education activities should focus on the rehabilitation services available to the community. The study warrants the need for expanding it with a focus on larger sample size involving general public. Furthermore, future studies should have qualitative study method to get in-depth understanding for lack of awareness and to developing structured activities through different media to reach the public at large, especially rural areas, to ensure lifestyle modifications, early detection, and treatment. Involving local volunteers and ASHA workers in creating awareness can also reach far.

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Conflicts of interest

There are no conflicts of interest.

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ANNEXURE – V - CERTIFICATES



IPSOCON 2022

55th Annual Conference of Indian Psychiatric Society, South Zonal Branch

C E R T I F I C A T E

This is to certify that

Saraswathi N.

has participated as **DELEGATE** and presented a **FREE PAPER** on

RELATIONSHIP BETWEEN DISABILITY, CAREGIVER BURDEN AND COPING WITH DEPRESSION IN STROKE SURVIVORS

in the IPSOCON 2022 - 55th Annual Conference

of the Indian Psychiatric Society South Zonal Branch organised by Venad Guild of Psychiatrists held at

Uday Samudra Beach Resort, Samudra Beach, Kovalam, Thiruvananthapuram on 14th-16th October, 2022.

Dr. Ramanan Earat	Dr. G. Suresh Kumar	Dr. Vidhukumar	Dr. Sheena G. Soman
President	Secretary	Organising Chairperson	Organising Secretary
IPS SZ Branch	IPS SZ Branch	IPSOCON 2022	IPSOCON 2022

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Venad Guild of Psychiatrists

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Certificate of Completion

Saraswathi Tenagi

Has successfully completed

AA01.10- NIHSS-English Group A-V3 - 1st Certification

This NIH Stroke Scale International (NIHSSI) Test contains 6 sections, each containing a single patient interview. You must score all 6 patients at >84 out of 90 items correct to achieve certification. As of June 19, 2018 – certification is VALID FOR UP TO ONE -1- YEAR FROM THE DATE OF COMPLETION when used in clinical research or, more than one year, time line controlled by the local SOP requirements of your organization - recommended 2 years when used for healthcare purposes - © 2013-Present AI

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