

**UPPER EXTREMITY FUNCTIONAL OUTCOME OF STROKE
SURVIVORS AFTER TAKING OCCUPATIONAL THERAPY**



By

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Statement of Authorship

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The ethical issues of the study has been strictly considered and protected. In case of dissemination the finding of this project for future publication, research supervisor will highly concern and it will be duly acknowledged as undergraduate thesis.

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Abstract

Background: Stroke is a neurological condition that affects person's whole life. Self-care activities of daily living are necessary for stroke survival and include those tasks which all of us undertake every day of our lives in order to maintain our level of care such as eating, dressing, toileting, grooming and bathing. Occupational therapy is an essential element in the rehabilitation of patients after stroke.

Objective: The upper extremity functional outcome of stroke survivors after taking occupational therapy at neurology outpatient unit of CRP, savar.

Methodology: The study conducted through retrospective document (file) review study in cross-sectional design. In the Neurology Unit of occupational therapy department there were 834 files of patients who took therapy from July 2014 to June 2015. Among those files there were 394 files of stroke patients. 55 files of stroke patients were completed according to the inclusion and exclusion criteria. Participants were selected by using purposive sampling. A self-developed structured questionnaire was used to collect data and outcome was measured by Functional Independent Measurement (FIM) scale, hand function was measured by Royal Air Force scale.

Result and Discussion: In this study, the result shows positive changes in all the parametric outcome measure of the outcome area. The mean occupational therapy session was 28.84 and standard deviation was ± 18.06 . The sensation before taking treatment mean score was 15.15, after taking treatment mean score was 19.40 and $p=.000$. The hand function before taking treatment mean score was 3.02, after taking treatment mean score was 14.84 and $p=.018$. Self-care activity before taking treatment mean score was 12.62, after taking treatment mean score was 24.53 and $p=.005$ of the participants.

Conclusion: The results of this study provided more insight into the upper extremity functional outcome of stroke survivors. This information would assist the professional to justify the occupational therapy practice. More research is needed to evaluate the rehabilitation program for these patients.

Key words: *Upper extremity, Functional outcome, Stroke, Occupational therapy.*

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List of Abbreviation

ADL: Activities of Daily Living

BHPI: Bangladesh Health Professions Institute

CRP: Centre for the Rehabilitation of the Paralyzed

CVA: Cerebro Vascular Accident

FIM: Functional Independent Measurement

OT: Occupational Therapy

SPSS: Statistical Package for Social Science

TIA: Transient Ischemic Attack

WHO: World Health Organization

CHAPTER 1 INTRODUCTION

1.1 Introduction

Stroke is one of the main causes of death and disability around the world. Stroke is a life threatening condition which leads to considerable changes in all aspects of the life of an individual. It is necessary to adapt a patient with stroke to different physical, social, emotional and functional problems in their life.

Bangladesh is a developing country situated in South Asia. The population of Bangladesh is nearly 160,000,000. Stroke is the third common cause of death and major cause of disability among Bangladeshi people. Due to stroke, the mortality rate of Bangladesh is 84 in the world. (Islam et al., 2013) argued the incidence of stroke in Bangladesh is 0.3%. Stroke is a major concern and important issue in Bangladesh.

Stroke is a major cause of long-term disability worldwide. Motor impairments of the upper extremity are common and affect approximately 50-70% of patients in the acute and 40% in the chronic phase. A person's ability to perform everyday tasks, to participate in the society and the quality of life can be significantly compromised after stroke (Murphy, Resteghini, Feys & Lamers, 2015).

Personal activities of daily living are necessary for stroke survival and include those tasks which all of us undertake every day of our lives in order to maintain our level of care such as eating, dressing, toileting, grooming and bathing. Occupational therapy is an essential element in the rehabilitation of patients after stroke. Personal activities of daily living are major component of treatment for people who have had a stroke (Leeg et al., 2007).

In developed countries stroke is the third most frequent cause of death (Hossain et al., 2011). Worldwide, yearly 16.3 million people suffer from stroke where 11.2 million events occur in developing countries like Bangladesh and each year approximately 5.8 million people die due to of stroke and two third of which occurs in developing nations (Mondal et al., 2012). In India, among stroke survivors 72.7% rural had severe disability (Ferri et al., 2011).

1.2 Background

Center for the Rehabilitation of the Paralyzed (CRP) is a rehabilitation center in Bangladesh for stroke patient. At Center for the Rehabilitation of the Paralyzed (CRP), patients get occupational therapy, physiotherapy and speech and language therapy treatment for different neurological condition (CRP, 2010). Stroke is one of them. Researcher observed that, during the placement of neurological department and Community Based Rehabilitation (CBR), stroke patient faced difficulties to maintain their daily activities such as- feeding, grooming, bathing, dressing upper body, dressing lower body etc. that create an adverse effect on their quality of life.

Stroke is considered as a precious disease from human, family and community perspectives (Carlo, 2009). Stroke ranks number four among all causes of death after heart disease, cancer and chronic lower respiratory disease in terms of mortality (Legge et al., 2011). Stroke constitutes a substantial health care problem and is characterized by a high burden of disease from health care and public health perspectives in both worldwide and in the United States and the incidence rate of stroke is higher in African American than Caucasian (Sergeev, 2011). It is a second commonest cause of death approximately 9% (Mondal et al., 2012). Stroke is the fourth major cause of disease burden after heart disease, HIV/AIDS and unipolar depression worldwide (Joubert et al., 2008). Stroke is associated with a significant burden of disability and loss of quality-adjusted life years (Mueller-Nordhorn et al., 2006). In China, stroke has been a major public health problem (Zhang et al., 2011).

Worldwide, stroke is a major cause of disability (Mondal et al., 2012). About 2.9% of the adult have had a stroke, of whom nearly a third live with a disability in American (Sergeev, 2011). In Scotland, it is the third commonest cause of death and the most frequent cause of severe adult disability (SIGN, 2010). In every society, stroke is a considerable cause of death and disability which is both a preventable and a treatable disease (Galvin et al., 2012). Stroke considered as a one of the principal causes of morbidity and mortality in elderly (Kalvin & Margaret, 2011) in the developed world and in all industrialized countries and it is the leading cause of disability (Belda-Lois et al., 2011). About 30% of stroke survivors are permanently disabled and require assistance to perform their activities of daily living (ADL) (Kalvin & Margaret, 2011). Activities

of daily living (ADLs) largely depend on arm function particularly for personal activities such as feeding, dressing and grooming (Farmer, 2014).

Stroke is the third most common cause of death and is the main cause of acquired adult disability in high-income countries (Langhorne et al., 2009). In 2005, it is reported that about 5.7 million deaths occur due to stroke, 87% occurred in low and middle income countries where 80% of the population lives in rural areas (Joubert et al., 2008). In low and middle income countries (LMIC) approximately 85% of all stroke deaths are registered which also account for 87% of total losses due to stroke in terms of disability-adjusted life years (DALYs) calculated worldwide in 72 million per year (Carlo, 2009). In Africa, the stroke mortality rate was also higher than in the United Kingdom, Canada and most other high-income countries (Mensah, 2008). Low and middle income countries have the largest burden of stroke accounting for more than 85% of stroke mortality worldwide (O' Donnell et al., 2010).

Stroke occurring rate is the same in men and women but women are more probable to die (Mensah, 2008). Stroke, either ischemic or hemorrhagic is more common in men than in women (Zhang et al., 2011). Stroke incidence was about 30% higher in men than in women in Western Europe (Appelros et al., 2009). Stroke is the third and fourth leading cause of death in women and men in the United States respectively (Sergeev, 2011). In 2002, stroke mortality in black men and women in the United States were 81.7 and 71.8 per 100 000 population respectively (Mensah, 2008). Under the age of 65 years more than half of men and women who have a stroke die within 8 years (Gordon et al., 2004).

In UK, the age adjusted annual death rate from stroke is about 200 per 100,000 in 12% of all death (Mondal et al., 2012). The age-standardized mortality rates for adults aged 30-69 years old in Nigeria and Tanzania are several-fold higher than the rates in Canada, the United Kingdom, Brazil, Pakistan, India, China and these rates are exceeded only by the high stroke mortality in the Russian Federation (Mensah, 2008). Around two thirds of the affected patients are above 65 years a stroke may occur at all ages, even in very young children, and can have many causes (Geurts et al., 2004).

In the United States, Europe and Australia approximately 400/100 000 persons over the age of 45 years have a first stroke each year (Yavuzer, 2006).

After ischemic heart disease stroke ranks as the second cause of death in the world population where the third only if neoplastic diseases are considered as a group (Carlo, 2009). In the United States, stroke causes about one in every 18 deaths, and stroke mortality exceeds 130,000 (Sergeev, 2011). In black Africans, stroke is a significant cause of morbidity and mortality and it accounts for 2.8 – 4.5% of total deaths in the continent (Olaogun et al., 2011). In 48 European countries total number of stroke deaths is currently estimated at 1,239,000 per year (Carlo, 2009). In developed countries stroke is the third most frequent cause of death (Hossain et al., 2011; Lewsey et al., 2009). Worldwide, yearly 16.3 million people suffer from stroke where 11.2 million events occur in developing countries like Bangladesh and each year approximately 5.8 million people die due to of stroke and two third of which occurs in developing nations (Mondal et al., 2012). Bangladesh is a South Asian country and one of the most densely populated country in the world. Stroke is the 3rd leading cause of death in Bangladesh (Haque, 2003). In India, among stroke survivors 72.7% rural had severe disability (Ferri et al., 2011).

1.3 Significance of the study

Stroke is a common neurological condition, mostly seen in developing country. Day by day there is increasing the number of stroke patient, in different areas. In Bangladesh stroke also causes death where health support including rehabilitation is not available. In this condition, only medical management is not enough rather than the therapeutic management which is also essential for people stroke management, stroke rehabilitation mainly completed by multi-disciplinary team. Occupational therapy is a significant part of this multi-disciplinary team. As the occupational therapy profession is newly introduced in Bangladesh, many people are not aware of its purpose. But it is an important part of health care to prevent diseases as well as to improve or maximize independence in people with disabilities. Therefore, occupational therapy can play an absolute role in the management of the people with stroke. Eventually, other professionals as well as general public will become aware about this service and this will be helpful to establish this profession at different institution, hospitals and clinics to fulfill the health care needs of the patient. The individual functional status may be varied according to affected side, as individuals functional uses of upper limbs are different. It is very important to find out the functional outcome of affected upper limb while an occupational therapy management team does work towards the improvement or the recovery of functional status of stroke patient; otherwise the outcome of occupational therapy is not significant. The main aim of occupational therapy treatment is to improve the function especially upper limb, because by upper limb all important functional tasks are performed. Effectiveness of occupational therapy practice is essential to promote functional outcome of stroke patient. So that this research will give ideas about the functional recovery of upper limb after taking an occupational therapy and by this result we make appropriate measures of functional improvement of affected upper limb. This study also helps to play more attention to perform affected upper limb activity by occupational therapist and to provide important platform for occupational therapist.

1.4 Research question: What are the upper extremity functional outcomes of stroke survivors?

1.5 Aim and Objectives:

Aim

- The upper extremity functional outcome of stroke survivors after taking occupational therapy.

Objectives

- To compare the improvement of self-care activity (eating, grooming, bathing, dressing upper body and dressing lower body) before and after taking occupational therapy treatment.
- To compare the improvement of sensation before and after taking occupational therapy treatment.
- To compare the improvement of hand function before and after taking occupational therapy treatment.
- To identify the number of occupational therapy treatment session received by the stroke patient.

CHAPTER 2

LITERATURE REVIEW

This section represented the relevant information of this study. Stroke is a common phenomenon all over the world as well as highly comparative in Bangladesh. In this literature review chapter, the researcher has explained the key terms of this study.

2.1 Stroke

World Health Organization (2015) defines stroke as- *“A stroke or cerebral vascular accident (CVA) is caused by the interruption of the blood supply to the brain, usually because a blood vessel bursts or is blocked by a clot. This cuts off the supply of oxygen and nutrients, causing damage to the brain tissue. The most common symptom of a stroke is sudden weakness or numbness of the face, arm or leg, most often on one side of the body. Other symptoms include: confusion, difficulty speaking or understanding speech; difficulty seeing with one or both eyes; difficulty walking, dizziness, loss of balance or coordination; severe headache with no known cause; fainting or unconsciousness”*.

Stroke is a leading cause of long-term disability which results from brain cell damage due to either an interruption of the blood supply to the brain or hemorrhage into the brain tissue (Eng & Tang, 2007). It is the most frequent clinical manifestation of diseases of the cerebral blood vessels (Boon et al., 1999).

Cerebral vascular accident (CVA) or stroke is the most common neurological disease of adulthood that leads to disability (Pedretti & Zoltan, 2007). Transient Ischemic Attack (TIA) are episodes of stroke symptoms that last only briefly; the standard definition of duration is <24 h, but most TIA last <1 h. TIA requires that all neurologic signs and symptoms resolve within 24 hour regardless of whether there is imaging evidence of new permanent brain injury; stroke has occurred if the neurologic signs and symptoms last for >24 h (Braunwald et al., 2003).

2.2 Types of stroke

There are two forms of stroke: ischemic and hemorrhagic (National institute of neurological disorder and stroke, 2004). Ischemic stroke or cerebral infarct (80% of strokes) occurs due to blockage or a reduction of blood flow in artery that supplies brain. They are caused either by a clot which blocks the blood vessel or by the buildup of plaque often due to cholesterol within the arteries which narrows vessel resulting in a loss of blood flow. Hemorrhagic stroke are due to the rupture of an artery within the brain triggering an intracerebral hemorrhage (15% of strokes) or to the rupture of aneurysm or AVM entailing sub arachnoids hemorrhage (5% of strokes) (Braunwald et al., 2003). Stroke is most common medical emergency. In many developing countries the incidence raises sequent with age due to adopting of less healthy life style (Haslet et al., 1999).

2.3 Risk factors of stroke

The major risk factor for stroke is hypertension. It is usually associated with other risk factors like smoking obesity, previous history of stroke or TIA, angina, atrial fibrillation, myocardial infarction and alcohol intake. History of contraceptive pills used by women is also a risk factor. Due to an ageing population strokes are increasing in number and are largely preventable (Amanullah et al., 2009). The preventable conditions that predispose to stroke are hypertension, cigarette smoking, obesity, physical inactivity, atrial fibrillation, diabetes mellitus, ischemic heart disease, hyper lipidemia, alcohol abuse, asymptomatic carotid stenosis, transient ischemic attack and other cardiac disorders (Almani et al., 2008).

2.4 Upper extremity impairment of stroke survivors

One of the most common motor deficits after a stroke is upper extremity impairment, and 30–60% of stroke sufferers report upper extremity disability and inability to use the paretic arm in their daily lives. Disability in the upper extremity limits overall physical functions, and causes difficulties with daily activities, resulting in a decrease in quality of life (Legg, Drummond & Langhorne, 2006).

The upper is associated with the lateral aspect of the lower portion of the neck. It is suspended from the trunk by muscles and small skeletal articulation between the clavicle and the sternum, the sternocavicular joint (Drake et al., 2005). The upper limb is characterized by its mobility and ability to grasp strike and conduct fine motor skills. Synchronized interplay occurs between the joints of the upper limb to coordinate the intervening segments to perform smooth, efficient motion at the most workable distance for a specific task. (Moore & Dally, 2006). Functional recovery of the arm includes grasping, holding, and manipulating objects, which requires the recruitment and complex integration of muscle activity from shoulder to fingers. Furthermore, secondary complications such as inferior subluxation of the glenohumeral joint, shoulder-hand syndrome, soft tissue lesions, and painful shoulder frequently hinder rehabilitation of the hemiplegic arm. Another actor that might decrease the probability of return of upper limb function is the lack of spontaneous stimulation during functional activities. In performing upper limb activities, the patient may use the non-affected side exclusively (Feys et al., 1998). So treatment of the upper extremity of people with hemiplegia continues to be a challenging and often frustrating experience for clinicians. Investigators in the Copenhagen Stroke Study noted that, recovery of upper extremity function in more than half of patients with stroke having severe upper extremity paresis can be achieved only by compensation using the unaffected upper extremity (Blanton & Wolf, 1999).

The hand is used to discriminate between objects on the basis of touch. The pads on the palmer aspect of the fingers contain a high density of somatic sensory receptors. Also the sensory cortex of the brain developed to interpreting information from the hand, particularly from the thumb, is disproportionately large relative to that for many other region of skin (Drake et al., 2005). Stroke results disturbances touch, pain, temperature, pressure and proprioception, that is so important to the perceptual motor functioning of a person. For that, after stroke patient may disuse the affected extremities, even when motor recovery is apparently good (Pedretti, 1996). As a result of stroke, it produces serious functional impairments, particularly in motor function. Such patients typically have significant weakness in the extremities contra lateral to the brain infraction, which recovers over a period of time ranging from several months to several years (Small et al., 2002).

2.5 Sensory impairment of stroke survivors

A common impairment following stroke is loss of sensation. The acquisition and evaluation of sensory information is a specialized process involving many receptors. Information received through sensory receptors is referred to as somatic sensation. This includes both exteroception and proprioception (Sherwood, 1997). Exteroception is the sensory information about the external environment received from receptors in the skin and subcutaneous tissue (O`Sullivan and Schmitz, 1988). Exteroceptors are responsible for perception of pain, temperature, light touch and pressure. Proprioception is awareness of body position in time and space, through receptors in muscles, tendons, ligaments and fascia (Sherwood, 1997). These specialised peripheral receptors respond to movement of the body. The information derived simultaneously from different receptors is integrated and transmitted to central structures using a neural code. The results are then related to past experience and information from other sensory modalities, such as visual and auditory systems (Hudspeth & Logothetis, 2000). Some aspects of the stimuli that are encoded include modality, intensity, frequency, spatial location, threshold and duration (Berne & Levy, 2000).

Deep pressure: The awareness or perception of pain, pressure, or tension in the deep layers of the skin, muscles, tendons, or joints.

Pain: Pain is an unpleasant feeling that is conveyed to the brain by sensory neurons. The discomfort signals actual or potential injury to the body. Pain is more than a sensation, or the physical awareness of the body it also includes perception, the subjective interpretation of the discomfort. Perception gives information on the pain's location, intensity, and something about its nature.

Temperature: A sensation of warmth or cold mediated respectively by warm spots and cold spots of the skin.

Stereognosis: Identifying objects through proprioception, cognition and sense of touch.

Proprioception: Interpreting stimuli originating in muscles, joints and other internal tissues that give information about the position of one body part in relation to another.

Kinesthesia: Interpreting movement and the direction of joint movement.

2.6 Functional Implications of Sensory Impairment

The somatosensory system is important not only for allowing co-ordinated movement, but also for allowing communication and interaction with our surroundings (Gaubert & Mockett, 2000). It allows us to explore our environment, alerting us to danger, and providing a means of communication with others. It is also a vital component of body image. It alerts us when a position becomes uncomfortable and potentially damaging, preventing pressure sores and frictional abrasions. Somatosensory deficits can therefore be detrimental to personal care, safety, work, leisure and sexual activities (Carey, 1995). They influence the ability to complete activities of daily living and can result in patients being unsafe in their domestic environment (Carey et al., 1997), therefore impacting on a persons` quality of life.

2.7 Functional outcome

Loss of functional movement is a common consequence of stroke for which a wide range of interventions has been developed. Some treatment helps to improve motor recovery, particularly those that have focused on high-intensity and repetitive task specific practice (Langhorne et al., 2009). The value of specific rehabilitation therapies aimed at assisting adaptation to impairment and designed to restore function by minimizing impairment (Ward & Cohen, 2004). The degree of upper limb recovery after stroke varies widely and is directly related to the degree of initial severity and the interval from stroke to initiation of voluntary movement. During this period, motor recovery is believed to be enhanced by various techniques such as the neurodevelopmental technique, sensorimotor integration, proprioceptive neuromuscular facilitation, and functional utilization of evolving synergies. Both basic and clinical studies suggest that post stroke motor recovery or motor relearning of the paretic limb may be maximized by the active repetitive use of the affected limb (Chae et al., 1998).

2.8 Occupational therapy role in stroke

Occupational therapy focuses on a variety of physical and functional impairments. One main components of OT intervention is upper-body strengthening. In conjunction with traditional

weighted exercises, occupational therapists also use therapeutic activities to improve your muscles strength and endurance. These activities can also target additional issues such as problem solving, safety, balance and direction following. By understanding the purpose of the tasks your occupational therapist provides, you can appreciate the functional outcome associated with the otherwise non-functional tasks (American Occupational Therapy Association, 2014).

After stroke, occupational therapists work to facilitate and improve motor control and hand function in the stroke-affected upper limb to maximize the person's ability to undertake his or her own personal self-care tasks and domestic tasks to help the patient learn strategies to manage the cognitive, perceptual, and behavioral changes associated with stroke and to prepare the home and work environment for the patients return (Legg , Drummond & Langhorne, 2006).

Occupational therapy is a major component of rehabilitation for stroke patients and has been shown to have a statistically positive effect on outcome (Davidson and Waters, 2000). Recoveries of upper limb in hemiparetic stroke patients are correlated to neurophysiological measures and the spasticity measure (Naghdi et al., 2010). The functional ability and prevent secondary complications to enable the patient to resume all aspects of life in his or her own environment. In patients who regain consciousness within 24 hours, the first 3 months are a critical period when greatest recovery is thought to occur, although potential for improvement may exist for many months. Occupational therapy during this initial period should aim to maximise all aspect of recovery in order to limit residual disability and reduce handicap (Strokes, 2000). Functional outcome enhanced when patient participate in multidisciplinary rehabilitation activity (Volpe et al., 2000). With the multidisciplinary team of health care professional, the main role of occupational therapist includes ability to perform daily activities, resulting increase in a quality of life. (Strokes, 2000).

CHAPTER 3

METHODOLOGY

3.1 Study design

Researchers used retrospective document (file) review study in cross-sectional design. In retrospective quantitative method, researcher collected data by using a specific questionnaire and a particular way (Shaughnessy & Zechmeister, 2003). A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study. Researcher used this method to fulfill the aim and objectives of the study. The aim of the study is to find out the upper extremity functional outcome of stroke survivors after taking occupational therapy.

A retrospective document (file) review cross-sectional design was chosen because in retrospective study both involve past and current issue. In a retrospective study, the outcome of interest has already occurred at the time the study is initiated (NEDARC, 2010).

The retrospective quantitative methods were best suited method for this study. The retrospective cross-sectional designs allow describing different characteristics of participant and comparing among them (Shaughnessy & Zechmeister, 2003). It is non-experimental cross-sectional study. Researcher used this method to fulfill the aim and objectives of the study. Retrospective cross-sectional study was selected because in this way it is possible to identifying a snapshot of a particular group of people a single point of time (Cherry, 2015). In this study design researcher collect information about the upper extremity functional outcome of stroke survivors after taking occupational therapy.

3.2 Study setting

CRP is a Non-government Organisation (NGO) and work for rehabilitation in Bangladesh. Patients with stroke got proper treatment and rehabilitation service from CRP. In CRP-Savar there has an Occupational Therapy outpatient unit and stroke rehabilitation unit which deliver treatment for stroke survivors (CRP, 2014). The study conducted in occupational therapy outpatient unit of CRP- Savar.

3.3 Study population

A population is the total group or set of events or totality of the observation on which a research is carried out. The target population was stroke patients who took therapy from the Neurology Unit of occupational therapy department at CRP, from July 2014 to June 2015.

3.4 Sampling procedure

Sampling:

Sampling is approached more systematically in relation to the specific aims and purposes of the research. Sampling design is part of the decision making process in research (French, Reynolds & Swain, 2001). Sampling is an important part of a research. The population was stroke patients who were receiving treatment from CRP. Researcher was choosing purposive sampling as a tool of data collection in this study. The researcher was selected 55 stroke survivors as sample of study by using purposive sampling. Purposive sampling is a non-random sampling technique. The purposive sampling is more appropriate than random sampling. Researcher used purposive sampling to get more accurate data from participant. Researcher collected data from patients with stroke on the base of inclusion and exclusion criteria (Tango, 2007). Researcher collected data from only stroke survivor and have no other condition as a result other condition was not interpret result. For this reason researcher select purposive sampling.

Sample size: 55

3.5 Data collection methods and tools

Data collection method was questionnaire and tools were pen, papers, and clip board for write down the note and outcome was measured by Functional Independent Measurement scale (FIM), Royal air force scale and Sensation Scale.

Functional Independence Measure

The Functional Independence Measure (FIM) scale assesses physical and cognitive disability. This scale focuses on the burden of care that is, the level of disability indicating the burden of

caring for them. Items are scored on the level of assistance required for an individual to perform activities of daily living.

The scale includes 18 items. Each item is scored from 1 to 7 based on level of independence, where 1 represents total dependence and 7 indicates complete independence. The scale can be administered by a physician, nurse and therapist. It takes 1 hour to train a rater to use the FIM scale, and 30 minutes to score the scale for each patient.

Seven levels for each item

7= complete independent (timely, safely)

6= modified independence (extra time, device)

5= supervision (cuing, coaxing, prompting)

4= minimal assist (perform 75% or more of task)

3= moderate assistance (perform 50% to 74% of task)

2= maximum assistance (perform 25% to 49% of task)

1= total assistance (perform less than 25% of work)

Royal air force scale

Hand function Activities measured by Royal air force scale. The Royal air force is a generic calculation of disability applicable to many different patient populations and is the most widely adopted functional status measure. The Royal air force scale used to trace such changes and analyses the outcomes. It is most useful in rehabilitation, but it was also use in acute care.

The Royal air force scale is exceptionally well validating in international trails. It is reliable, valid and responsively in all these settings. Significant trading and certification are requiring standardizing assessment. The Royal air force scale can be used in isolation, but as an indicator of activity limitations Each item scored on a 5-point scale indicative of the amount of assistance required to perform each item (0=impossible, 4=normal).

Royal air force Score - Ability to perform tasks.

0-Impossible

1- With much assistance

2- With little assistance

3- Manage with min difficulty

4- normal

3.6 Selection Criteria

Inclusion criteria:

- Both male and female were selected who had stroke.
- Subjects were selected from Centre for the Rehabilitation of the paralyzed (CRP) at Savar, Dhaka.
- Stroke patients had been selected who took therapy from July 2014 to June 2015.
- All age group were selected.
- Patients file were completed.

Exclusion criteria:

- Stroke survivors with others neurological condition exclude from study.
- Patients who were taking therapy from outside of CRP.

3.7 Variable identification

Dependent variable: The dependent variables were sensation, hand function and occupational performance on self-care activity (eating, grooming, bathing, dressing upper body and dressing lower body).

Independent variable: The independent variable of this questionnaire was: age, sex, occupation, residential area and affected body part.

3.8 Data collection procedure

During the collection of data researcher had taken permission from the Head of department of Occupational Therapy and participants had selected according to inclusion and exclusion criteria.

3.9 Data collection Process

At first the researcher took permission from the head of the Department of Occupational Therapy in CRP-Savar to collect data from Outpatient unit. In the Neurology Unit of occupational therapy department there were 834 files of patients who took therapy from July 2014 to June 2015. Among those files there were 55 complete files of stroke patients, and 95 files of stroke with others condition. Others 345 files were patients with others condition and 344 files were incomplete. So, the researcher selected 55 samples for the study according to the inclusion and exclusion criteria.

3.10 Data analysis

Data was analysed through descriptive statistical analysis (percentage) and it presented by using table, figure, bar and pie chart. Data entry and analysis performed by using version 20 of statistical package for social science (SPSS) the percentage of data organised in SPSS in Microsoft Office word all data were input within the variable of SPSS and analysed data in SPSS Microsoft word excel used to present data by using table column and pie chart.

3.11 Informed consent

- Participants were selected for this study according to selection criteria.
- Participants' confidentiality was maintained.

3.12 Ethical consideration

The researcher was maintained some ethical considerations like:

- Researcher was started this study after getting the permission from the academic institute.
- All kinds of confidentiality were highly maintained.
- The researcher was eligible to do the study after knowing the academic and clinical rules of doing the study about what should be done and what should not.

3.13 Rigor

During the data collection and data analysis the author was always tried not to influence the process by his own perspectives, values and biases. No leading questions were asked and judgments were avoided. When conduct the study the researcher was taken help from the supervisor when needed. The other researchers could use the results in their related area.

CHAPTER 4

RESULT

This section provides statistical analysis in a systematic way and interpretation of analysed findings with the aim and objectives of the study. The purpose of the study is to find out the upper extremity functional outcome of stroke survivors after taking occupational therapy at neurology outpatient unit of CRP and to achieve this goal the result need to calculate and analysis in a systematic way and the result or analyzed data represent by table.

4.1 Socio-demographic characteristics of the participants

The demographic data of stroke survivors listed in table-1. The table shows that among 55 participants with stroke, the highest age was 70 years old and the lowest age was 30 years old. Mean age of the participants was 50.05 years. The maximum 30.9% (17) participants were 41-50 years old. Others participants, 27.3% (15) were 30-40 years old, 27.3% (15) were 51-60 years old, 14.5% (n=8) were 61-70 years old.

In this study, the male participants were 56.4% (31) and female participants were 43.6% (24).

In respect with stroke survivors previous occupation, 5.5% (3) were farmer, 3.6% (2) were day labor, 1.8% (1) were rickshaw puller, 20% (11) were businessman, 1.8% (1) were teacher, 25.5% (14) were service holder and 41.8% (23) were house wife.

Study shows that majority of participants 63.6% (35) were lived in rural area, 5.5% (3) were lived in semi-urban area and 30.9% (17) were lived in urban area.

It is evidence from table-1 that from total participants, 41.8% (22) were right side affected and 68.2% (33) were left side affected.

Characteristics	Frequency (n=55) and Percentage (%)
Age range	
30-40years	15 (27.3%)
41-50years	17 (30.9%)
51-60years	15 (27.3%)
61-70years	8 (14.5%)
Sex	
Male	31 (56.4%)
Female	24 (43.6%)
Previous occupation	
Farmer	3 (5.5%)
Day labor	2 (3.6%)
Rickshaw puller	1 (1.8%)
Businessman	11 (20%)
Teacher	1 (1.8%)
Service holder	14 (25.5%)
House wife	23 (41.8%)
Living area	
Rural	35 (63.6%)
Urban	17 (5.5%)
Semi-urban	3 (30.9%)
Affected body part	
Right	22 (41.8%)
Left	33 (58.2%)

Table-1: demographic characteristics of the participants

4.2 Past medical history and personal habit of the participants

In this study, the percentage of past medical history where 20.8% (12) participant were diabetes mellitus, 61.2% (32) participant were hypertension, 6.8% (4) participant were heart disease and 11.2% (7) participant were no specific medical history mention.

The percentage of personal habit where 16.8% (9) participant were smoking, 37.2% (20) participant were betel leaf, 2% (1) participant were drug abuse, 2% (1) participant were alcohol and 42% (24) participant were no specific personal habit mention.

Characteristics	Frequency (n=55) and Percentage (%)
Past medical history	
Diabetes mellitus	12 (20.8%)
Hypertension	32 (61.2%)
Heart disease	4 (6.8%)
No specific medical history mention	7 (11.2%)
Personal habit	
Smoking	9 (16.8%)
Betel leaf	20 (37.2%)
Drug abuse	1 (2%)
Alcohol	1(2%)
No specific personal habit mention	24 (42%)

Table 2: Past medical history and personal habit of the participants

4.3 Number of occupational therapy treatment session of the participants

The mean occupational therapy session was 28.84 and standard deviation was ± 18.06 . The maximum 26 (46%) participant therapy session was 10-20, 8 (16%) participant therapy session was 21-30, 5 (10%) participant therapy session was 31-40, 7 (12%) participant therapy session was 41-50, 6 (10%) participant therapy session was 51-60 and minimum 3 (6%) participant therapy session was 61-70.

Therapy Session	Frequency (n=55) and Percentage (%)
10-20	26 (45%)
21-30	8 (16%)
31-40	5 (10%)
41-50	7 (12%)
51-60	6 (11%)
61-70	3 (6%)

Table 3: Number of occupational therapy treatment session

4.4 Sensation of the participants

The total findings of the outcome measures represent that, the initial and discharge mean score of the participants (data is presented in table 4). The overall sensation findings in the area of light touch, deep pressure, pain, temperature, stereognosis, proprioception and kinesthesia represent that, the participants before and after taking treatment. The overall finding is showing in table 4.

Therefore the participants in the area of light touch, deep pressure, pain, temperature, stereognosis, proprioception and kinesthesia improved after taking treatment. The study showed that the score was better after taking treatment than before.

Initial mean score	Discharge mean score	Mean difference	'P' Value
15.15	19.40	4.25	.000

Table 4: The mean compare of sensation in initial and discharge score.

4.5 Hand function of the participants

In this study, the overall hand function findings in the area of hook grip, light pinch, heavy pinch, lateral pinch, light grip, heavy grip and opposition represent that, the mean score of participants before taking treatment and after taking treatment. The overall finding is showing in table 5.

Therefore the mean score of participants in the area of hook grip, light pinch, heavy pinch, lateral pinch, light grip, heavy grip and opposition improved after taking treatment. The study showed that the average or mean score was better after taking treatment than before.

Initial mean score	Discharge mean score	Mean difference	'p' value
3.02	14.84	11.82	.018

Table 5: The mean compare of hand function in initial and discharge score.

4.6 Self-care activity of the participants

In this study, the self-care activity in the area of eating, grooming, bathing, dressing upper body and dressing lower body represent that, the mean score of participants before taking treatment and after taking treatment. The overall finding is showing in table 6.

Therefore the mean score of participants in the area of eating, grooming, bathing, dressing upper body and dressing lower body improved after taking treatment. The study showed that the mean score were better after taking treatment than before taking treatment of the participants.

Initial mean score	Discharge mean score	Mean difference	'P' Value
12.62	24.53	11.91	.005

Table 6: The mean compare of self-care activity in initial and discharge score.

CHAPTER 5

DISCUSSION

5.1 Socio-demographic characteristics of the participants

Age was one of variable in this study. The highest age was 70 years old and the lowest age was 30 years old. Mean age of the participants was 50.05 years. The maximum 30.9% (17) participants were 41-50 years old. Others participants, 27.3% (15) were 30-40 years old, 27.3% (15) were 51-60 years old, 14.5% (8) were 61-70 years old. In a study in Taiwan showed that the mean age was 55.33 years (Chen et al., 2002). Other study in France mean age was 53.3 years (Pradon et al., 2013). In Brazil showed that mean age was 53.2 (Sousa et al., 2011). In Canada mean age was 58 with 11.8 (Eng & Chu, 2002).

In this study, the male participants were 56.4% (31) and female participants were 43.6% (24). In Bangladesh, another study showed that, male was 74% and female were 25% (Hossain et al., 2011). In Sweden, study showed that male 76% and female 24% (Flansbjer et al., 2005), in Netherland male 77.78% and female 22.22% (Wevers et al., 2011), in Brazil male participants were 71.42% and female 28.57% (Nascioment et al., 2011), in Taiwan male were 75% and female were 25% (Yang et al., 2005), in Italy male 66.07% and female 33.93% (Pizzi et al., 2007).

In respect with stroke survivors previous occupation, 5.5% (3) were farmer, 3.6% (2) were day labor, 1.8% (1) were rickshaw puller, 20% (11) were businessman, 1.8% (1) were teacher, 25.5% (14) were service holder and 41.8% (23) were house wife. In Bangladesh, another study showed that, Service holder 28%, businessman 17%, housewife 16%, retired 21%, agriculture 9%, others 9% (Hossain et al., 2011). In India, 2% were students, 34% were housewife, and 32% were farmer / laborer, 16.5% were retired, 15.5% were service holder and businessmen (Dev & Joshi, 2012).

Study shows that majority of participants 63.6% (35) were lived in rural area, 5.5% (3) were lived in semi-urban area and 30.9% (17) were lived in urban area.

Other study shows in Bangladesh, 54% participants lived in urban area and 46% participant lived in rural area (Hossain et al, 2011).

Another study (Sergeev, 2011) 85.6% were from urban and 14.4% were from rural, in this study also reported that rural stroke increased with age.

In this study, the total participants, 41.8% (22) were right side affected and 68.2% (33) were left side affected. In Taiwan another study showed that 36% left hemiparesis and 64% right hemiparesis (Yang et al., 2005). In Netherland, 12 were left sided hemiplegia, 13 were right sided hemiplegia and 2 were bilateral stroke (Wevers et al., 2011). Other study in America (Salbachet al., 2006) shows 56% right sided hemiplegia and 43% left sided hemiplegia and 1% bilateral stroke. In Brazil, side of hemiparesis, right 43% and left 57% (Nascimento et al., 2011). In a study showed that 62% participant was right sided hemiplegic and 38% participant was left sided hemiplegic (Patterson et al., 2008).

5.2 Past medical history and personal habit of the participants

In this study, past medical history where 20.8% (12) stroke participant were diabetes mellitus, 61.2% (32) participant were hypertension, 6.8% (4) participant were heart disease and 11.2% (7) participant were no specific medical history mention. Another study showed that 63% of the stroke patients were suffering from hypertension, 24% had heart disease and 21% diabetes militias (Hossain et al., 2011). Others study showed diabetes in 14% patients (Hossain, 2013).

In this study, personal habit where 16.8% (9) stroke participant were smoker, 37.2% (20) participant were betel leaf, 2% (1) participant were drug abuse, 2% (1) participant were alcohol and 42% (24) participant were no specific personal habit mention. In a study of Bangladesh 57% of the stroke patients were smoker (Hossain, 2013). Another study showed that 53% participants were smoker (Hossain et al., 2011). In a study (Singh et al, 2012) maximum number of participants personal habit were smoker (42%) and betel leaf (18%).

5.3 Number of occupational therapy treatment session of the participants

The mean occupational therapy session was 28.84 and standard deviation was ± 18.06 . The maximum 26 (46%) participant therapy session was 10-20, 8 (16%) participant therapy session was 21-30, 5 (10%) participant therapy session was 31-40, 7 (12%) participant therapy session was 41-50, 6 (10%) participant therapy session was 51-60 and minimum 3 (6%) participant therapy session was 61-70. Another study conducted by Leeg et al., (2007) showed that among stroke patient received occupational therapy session on average 13.6 and average time of per session was 38.1 minutes.

5.4 Sensation of the participants

In this study, the overall sensation findings in the area of light touch, deep pressure, pain, temperature, stereognosis, proprioception and kinesthesia of the participants before taking treatment mean score was 15.15, after taking treatment mean score was 19.40 and $p=.000$. The study showed that the score was better after taking treatment than before. A study conducted by (Louise Anne Connell, 2007) among with stroke patient. Analyze the result through comparing the sensation score of before and after treatment and got a significant result after completing treatment session of stroke patients. Another study conducted by (Salter et al. 2013) among with stroke patient. Analyze the result through comparing the sensation score of before and after treatment and got a significant result after completing treatment session of stroke patients.

5.5 Hand function of the participants

In this study, the overall hand function findings in the area of hook grip, light pinch, heavy pinch, lateral pinch, light grip, heavy grip and opposition of the participants before taking treatment mean score was 3.02, after taking treatment mean score was 14.84 and $p=.018$. The study showed that the average or mean score was better after taking treatment than before. Hand function of all participants was measured by using the royal air force scale. A study conducted by (Mullbacher et al., 2002) among 27 with stroke patients. Analyze the result through comparing the hand function score of before and after treatment session. After completing treatment session $p=.001$ and they found significant result of stroke patients.

Another study conducted by (Salter et al., 2013) among with stroke patient. Analyze the result through comparing the hand function score of before and after treatment and got a significant result after completing treatment session of stroke patients. Another study conducted by (Chumney et al., 2010) among with stroke patient. Analyze the result through comparing the hand function score of before and after treatment and got a significant result after completing treatment session of stroke patients.

5.6 Self-care activity of the participants

In this study, the self-care activity in the area of eating, grooming, bathing, dressing upper body and dressing lower body represent that, the participants before taking treatment mean score was 12.62, after taking treatment mean score was 24.53 and $p=.005$. The study showed that the mean score was better after taking treatment than before. Occupational performance of self-care activity all participants was measured by using the Functional Independence Measure (FIM) scale. In Australia, other study showed that, 153 patients with stroke. Analyze the result through Occupational performance of self-care activity all participants was measured by using the Functional Independence Measure (FIM) scale and they found a significant result after completing treatment session of stroke patients (Williams, Galea & Winter, 2001). Another study conducted by (Leeg et al., 2007) among 1258 with stroke patients analyze the result through personal activities of daily living of all participants was measured by using the Functional Independence Measure (FIM) scale and they found a significant result after completing occupational therapy treatment session of stroke patients. Another study conducted by (Salter et al. 2013) among with stroke patient. Analyze the result through Occupational performance of all participants was measured by using the Functional Independence Measure (FIM) scale and they found a significant result after completing treatment session of stroke patients. Another study conducted by (Chumney et al., 2010) among with stroke patient. Analyze the result through Occupational performance of self-care activity all participants was measured by using the Functional Independence Measure (FIM) scale and they found a significant result after completing treatment session of stroke patients.

CHAPTER 6

LIMITATION

Some issues regarding the study which impacted negatively on the validity, reliability and usefulness of findings were identified. These include:

- This study is a retrospective quantitative study. Researcher selected purposive sampling in this study.
- The study was conducted by small sample size.
- As the study was conducted at center for the rehabilitation of the paralysed (CRP –Saver) which may not represent the whole country.
- Small sample size is not representing all population of a country. So the data is not generalised to all people with stroke.

CHAPTER 7

RECOMENDATION

The aim of this study was to find out upper extremity functional outcome of stroke survivors after receiving occupational therapy at neurology outpatient unit of CRP and the result which found from the study has fulfilled the aim of this research project. The following recommendations are-

- Should take more samples for generating the result and make more valid and reliable.
- Sample should collect from different hospital, clinic, institute and organization in different district of Bangladesh to generalize the result.

This is an undergraduate study and doing the same study at graduate level will give more precise output. There were some limitation of this study mentioned at the relevant section; it is recommended to overcome those limitations during further study. So for further study it is strongly recommended to increase sample size with adequate time to generalize the result in all of the upper extremity stroke patients in Bangladesh for better results and perspectives.

CHAPTER 8

CONCLUSION

Stroke is one of the leading causes of morbidity, mortality and a socioeconomic challenge. This is particularly true for developing countries like Bangladesh, where health support system including the rehabilitation system is not within the reach of ordinary people. Bangladesh is a developing country with low socio-economic condition where people are not enough concerned about health. Health services are not sufficient in the Government and non-government sector. So, most people are suffering from lack of proper treatment. Now a day's different private clinics and hospital are trying to bring latest medical facilities in our country. But there is nothing to be mentioned about occupational therapy services. In Bangladesh the occupational therapy started after liberation war. But the people along with other health care professional are still confused about the effectiveness of occupational therapy for the recovery of stroke in Bangladesh. Most of the people are not enough familiar about occupational therapy. They consider it only as exercise. To make a bright future of occupational therapy it is essential to increase awareness about occupational therapy and effectiveness of early occupational therapy interventions for patient. In Bangladesh occupational therapy is a developing professions which is dominated by other health professionals due to lack of standard manpower. For this reason it is important to develop local evidence based practice. Evidence based practice is significant to find out the absolute reason of achieving the treatment goals and improvement. Last of all, this research has tried to represent strong evidence on upper extremity functional outcome of stroke survivors after receiving occupational therapy.

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Appendix 1

Questionnaire

Part 1: Patient's Identification

Registration number:	Date of Incidence:
Patients Name:	Date of Assessment:
Address:	Diagnosis:

Part 2: Patient's socio-demographic Information:

QN	Question	Responses
2.1	Age (in year)	-----Year
2.2	Sex	1=Male 2=Female
2.3	Marital Status	1=Married 2=Unmarried
2.4	Occupation	1=Farmer 2=Day labor 3=Rickshaw Puller 4=Driver 5=Business 6=Factory/Garments Worker 7=Student 8=Teacher 9=Service Holder 10=Housewife 11=Unemployed
2.5	Residential Area	1=Rural 2=Semi-urban 3=Urban

Part 3: Occupational Therapy related information

QN	Question	Responses
3.1	Affected side of the body	1=Right 2=Left
3.2	Past medical history	1=Diabetes Mellitus 2=Hypertension 3=Heart Disease 4=Others
3.3	Personal Habit	1=Smoking 2=Betel Leaf 3=Drug Abuse 4=Alcohol 5=Others

Part 4: Sensation Scale (Scale: 1= Absent, 2= Impaired, 3= Normal). What are the scores of affected upper limb stroke patient by using Sensation Scale? Please write down on the Sensation Scale score (1/2/3)

Question	Initial Score		Discharge Score	
	Right	Left	Right	Left
Light touch				
Deep pressure				
Pain				
Temperature				
Stereognosis				
Proprioception				
Kinesthesia				

Part 5: Hand Function (Royal air force scale) (Scale: Impossible-0, with much assistance-1, with little assistance-2, can manage with minimal difficulties-3, Normal-4). What are the scores of affected upper limb stroke patient by using hand function scale? Please write down on the hand function scale score (0/1/2/3/4)

Question	Initial Score		Discharge Score	
	Right	Left	Right	Left
Hook grip: carrying bag				
Light pinch: pickup pencil				
Heavy pinch: zipper				
Lateral pinch: key				
Light grip: glass				
Heavy grip: full grip				
Opposition: scissor, buttons				

Part 6: Occupational Performance: According to Functional Independence Measure (FIM) Scale.

7= complete independent (timely, safely)

6= modified independence (extra time, device)

5= supervision (cuing, coaxing, prompting)

4= minimal assist (perform 75% or more of task)

3= moderate assistance (perform 50% to 74% of task)

2= maximum assistance (perform 25% to 49% of task)

1= total assistance (perform less than 25% of work)

What are the scores of affected upper limb stroke patient by using FIM scale? Please write down on the FIM scale score (1/2/3/4/5/6/7)

Self-care activity	Initial Score	Discharge Score
Feeding		
Grooming		
Bathing		
Dressing Upper Body		
Dressing Lower Body		

Part 7. Numbers of received occupational therapy session:

Appendix 2

Permission letter for conducting study

Permission letter from BHPI Ethical Committee

26 October 2015
The Head of the Department
Department of Occupational Therapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Subject: Prayer for seeking permission to conduct the research project.

Sir,
With due respect and humble submission to state that I am a student of 4th year B.Sc. in Occupational Therapy of Bangladesh Health Professions Institute, the academic institute of Centre for the Rehabilitation of the Paralysed (CRP). I am sincerely seeking permission to conduct my research project as the part of fulfillment of the requirements of degree of B.Sc. in Occupational Therapy. The title of my research is, "Upper extremity functional outcome of stroke survivors after receiving occupational therapy". The aim of the study is "To find out the upper extremity functional outcome of stroke survivors after receiving occupational therapy".

So, I therefore hope that you would be kind enough to grant me by giving the permission of conducting the research and will help me to complete a successful study as a part of my course.

Sincerely,
Most. Nurzahan Khatun
Most. Nurzahan Khatun
4th year, B.Sc. in Occupational Therapy,
Bangladesh Health Professions Institute (BHPI)
CRP-Chapain, Savar, Dhaka-1343

Approved by	Signature and Comments
Head of the Department Nazmun Nahar Assistant professor & Head of the department, Department of Occupational Therapy (BHPI) CRP-Chapain, Savar, Dhaka-1343	<i>As per supervisor's comment she may allow to conduct the study.</i> <i>Nazmun Nahar</i> 20.10.15
Research supervisor Md. Julker Nayan Assistant Professor and Head Department of Occupational Therapy (BHPI) Centre for the Rehabilitation of the Paralysed (CRP)	<i>She may allowed to conduct the study.</i> <i>Nayan</i> 20.10.15

Appendix 3

Information Sheet

I am, a 4th year student of the Bachelor of Science in Occupational Therapy of Bangladesh Health Professions Institute (BHPI), the academic institute of Centre for the Rehabilitation of the Paralyzed (CRP), Chapain, Savar, Dhaka-1343. For the fulfillment of requirements for the Bachelor Degree, it is compulsory to conduct a research project in 4th year. I would like to invite you to take part in my study. The research title is **“Upper extremity functional outcome of stroke survivors after taking occupational therapy”**. The aim is to find out the upper extremity functional outcome of stroke survivors after taking occupational therapy.

Your participation in this study is voluntary. You are not forced to participate at all. If you want to withdraw from the study, you may do that at any time without any hesitation. You will not be harmed/injured or disadvantaged by the study.

Only your personal details and answers of the questionnaire will be documented and used for the study purpose. Without investigator and study supervisor nobody will permit to know the data associated with study. The investigator will be maintained confidentiality of all proceedings. Without your permission, the data provided by you will never be used.

Appendix 4
Consent Form

I am a participant of this research study and I know about the aim and objectives of the study clearly. I have a right to drop out from the study at any time and for that reason I am not responsible to answer any question to any more. The research would be given safe and will not cause any harm. In present and future, the research is not responsible for any medical intervention.

I definitely know that confidentiality of all records will be highly maintained and will not be identified in any publication that may result from the study. The information will be showed by the investigator, supervisor and by another occupational therapy student who will aid in selecting relevant portion of the document by helping the investigator for taking the information.

I give my consent by knowing all those information clearly.

Investigator's Signature: _____ Date: _____

Participant's Signature: _____ Date: _____