

“COGNITIVE IMPAIRMENT AMONG BURN INJURY PATIENT”

By

Twasin Tazin

Session: 2014-2015

BHPI, CRP, Chapain, Savar, Dhaka-1343



Bachelor of Science in Speech and Language Therapy

Bangladesh Health Professions Institute (BHPI)

(The academic institute of CRP)

Faculty of Medicine, Affiliated by

University of Dhaka

[February, 2019]

**“COGNITIVE IMPAIRMENT AMONG BURN INJURY
PATIENT”**

**A research presented to the
Bachelor of Science in Speech and Language Therapy
Bangladesh Health Professions Institute (BHPI)
(The academic institute of CRP)
University of Dhaka**

By

Twasin Tazin

twasinslt@gmail.com

Supervisor

Md. Sazzad Hossain

Assistant Professor

&

Head

Department of Speech & Language Therapy. BHPI

**In partial fulfillment of the requirements for the degree of
B.Sc. in Speech and Language Therapy**

[February, 2019]

APPROVAL

Research Title

“Cognitive Impairment among Burn Injury patient”

Submitted by- Twasin Tazin

B.Sc. in Speech and language Therapy

Signature of Supervisor:

.....

Md. Sazzad Hossain

Assistant Professor

&

Head

Department of Speech & Language Therapy, BHPI

BHPI, CRP, Savar, Dhaka-1343

Declaration

I am Twasin Tazin declaring that the work presented here is my own. All sources used in the study have been cited accordingly. The methods and objectives of the research study ensure the safety of each and every participants. Any mistakes or inaccuracies are my own.

Signature and Date

Twasin Tazin

4th year B.Sc. in Speech and Language Therapy

BHPI, CRP, Chapain, Savar, Dhaka-1343

Bangladesh

Dedication

Dedicated to.....

.....*My Honorable parents*

TABLE OF CONTENTS

<i>Table of Contents</i>	i-ii
<i>List of figures</i>	iii
<i>List of tables</i>	iv
<i>List of Annexure</i>	v
<i>List of Acronyms</i>	vi
<i>Acknowledgement</i>	vii
<i>Executive summery</i>	viii

CHAPTER	Page no
CHAPTER 1: INTRODUCTION.....	1-9
1.1 Introduction.....	1-3
1.2 Significance of the study.....	04
1.3 Objectives	05
1.3.1 General objectives.....	05
1.3.2 Specific objectives.....	05
1.4 Operational definition.....	06
1.4.1 Burn.....	06
1.4.2 Cognitive impairment	06
1.5 Literature review.....	7-9
CHAPTER: 2 METHODOLOGY.....	10-13
2.1 Study design.....	10

2.2 Study Place.....	10
2.3 Sample.....	10-12
2.3.1 Study Population.....	10
2.3.2 Sample Size.....	10
2.3.3 Sampling procedure.....	11
2.3.4 Inclusion Criteria.....	11
2.3.5 Exclusion Criteria.....	11-12
2.4 Data Collection.....	12-13
2.4.1 Data collection instrument.....	12
2.4.2 Data collection Method.....	12
2.4.3 Data collection Procedure.....	12
2.4.4 Data analysis.....	12
2.4.5 Ethical consideration.....	13
CHAPTER 3: RESULTS.....	14-35
3.1 Demographic information.....	14-21
3.2 Patient Concern.....	22-24
3.3 Mini-Mental State Examination (MMSE) Questionnaire response of participants.....	25-30
3.4 Association between variables.....	31-35

CHAPTER 4: DISCUSSION.....	36- 38
CHAPTER 5: CONCLUSION.....	39
CHAPTER 6: LIMITATION & RECOMMENDATION.....	40-41
CHAPTER 7: REFERENCES.....	42-46

List of Figures

<i>S.N</i>	<i>Figure No.</i>	<i>Topic</i>	<i>Page No.</i>
1.	3.1.1	Gender of the participants	14
2.	3.1.2	Age of the participants	15
3.	3.1.3	Education level of the participants	16
4.	3.1.4	Occupational status of the participants	17
5.	3.1.5	Depth of burn	18
6.	3.1.6	Onset of burn	19
7.	3.1.7	Conduct of burn	20
8.	3.1.8	Area of burn	21
9	3.2.1	Burn patients concern about swallowing difficulties	22
10	3.2.2	Burn patients concern about articulation difficulties	23
11	3.2.3	Burn patients concern about voice difficulties	24
12	3.3	MMSE responses of participants	25
13	3.3.1	According to MMSE Status of Orientation	26
14	3.3.2	According to MMSE Status of Registration	27
15	3.3.3	According to MMSE Status of Attention	28
16	3.3.4	According to MMSE Status of Recalling	29
17	3.3.5	According to MMSE Status of Language	30

List of Tables

<i>S.N</i>	<i>Table No.</i>	<i>Topic</i>	<i>Page No.</i>
1.	3.4.1	Association between age and presence of cognitive impairment	31
2.	3.4.2	Association between onset of burn and presence of cognitive impairment	32
3.	3.4.3	Association between conduct of burn and presence of cognitive impairment	33
4.	3.4.4	Association between depth of burn and presence of cognitive impairment	34
5.	3.4.5	Association between area of burn and presence of cognitive impairment	35

List of Annexure

<i>S.N.</i>	<i>Annexure</i>	<i>Topics</i>	<i>Page No.</i>
01	Annexure-1 (A)	Mini-Mental State Examination (MMSE) Questionnaire (English)	47-48
02	Annexure-1 (B)	Mini-Mental State Examination (MMSE) Questionnaire (Bangla)	49-50
03	Annexure- 2	Results (Chi square tests)	51-53
04	Annexure-3 (A)	Consent Form (English)	54
05	Annexure-3 (B)	Consent Form (Bangla)	55
06	Annexure- 4	Permission letter for conducting study	56-58

List of Acronyms

Abbreviation	Elaboration
ASF	Acid Survivors Foundation
BHPI	Bangladesh Health Professions Institute
CRP	Centre for the Rehabilitation of the Paralyzed
DMCH	Dhaka Medical College Hospital
FIM	Functional Independent Measure
IRF	Inpatient Rehabilitation Facilities
MMSE	Mini-Mental State Examination
SLT	Speech and Language Therapy
SPSS	Statistical Package for Social Science
TBSA	Total Body Surface Area

Acknowledgement

I would like to express my sincere gratitude to all those who have contributed in different ways. At first I want to express my gratitude to the Almighty Allah who has given me enough ability, patience and competence for completion of the study successfully in time. I am very much grateful to my honorable supervisor **Md. Sazzad Hossain**, Head of the Speech & Language therapy Department, BHPI, CRP for his excellent guidance, thoughtful suggestions and encouragement the whole research project. I am indebted to express my special thanks to our honorable teacher **Nahid Parvez**, Lecturer of Speech & Language therapy Department, BHPI, CRP, for his valuable advice. And also thanks for Institutional Review Board (IRB) of BHPI for giving me the permission to conduct the research.

Additionally, I give thanks to Madam **Nargis Jahan**, Head of Speech and Language therapy Department, Cleft, National Institute of Burn & Plastic surgery, DMCH for help me to get permission from DMCH. Furthermore, I am very much thankful to elder sister Sadia Farjun & Sanjida Mohua for their valuable information and idea during conducting of my research project. Incredible thanks to my friends Abul Kashem Shihab, Kazi Taiyeba Noor Nahreen & Imran Ahmed for helping me in this study.

Finally, gratified to the most important part of my life “my parents” Also no amount of thanks is enough to acknowledge the role played by the study participant and made my research successful.

EXECUTIVE SUMMERY

Worldwide among the leading causes of death and disability, burn injury is a major one. Approximately 265,000 deaths occur each year due to burns on a global scale. Burn injury keeps a great impact on physical, psychological and social life. Cognitive impairment is an important cause of disability among the burn injury population as there is an association between burn and cognitive impairment. So this study was meant to determine the cognitive impairment after burn injury and severity of cognitive impairment after burn injury. This study was conducted by using cross-sectional prospective survey method in Burn and Plastic Surgery unit of Dhaka Medical College Hospital and Acid Survivors Foundation. Participants were selected by using purposive sampling. Data was collected by using Mini-Mental State Examination (MMSE) questionnaire and analyzed by using descriptive statistical analysis method. Among 72 participants 20.80% (15) participants had definite cognitive decline. Among these participants 19.40% (14) participants had mild cognitive impairment and significant cognitive impairment also had 19.40% (14) participants. And only 1.40% (1) participants had profound cognitive impairment.

Keywords: Cognitive impairment, Burn injury

1.1 Introduction

In recent times, it has been seen that burn injuries are one of the most leading causes of death and also a major cause of disability in global perspective. It has become really painful and threatens a person physically, socially and psychologically. The incidence rate is relatively higher in developing countries in comparison with the developed countries (Horridge, Cohen, & Gaskell, 2010).

The deaths cause by burning is quite high in the developing and middle-income countries. According to World Health Organization (2018), every year 180,000 deaths are caused by burns in low- and middle-income countries. In Bangladesh the situation is getting worse. According to a study, burn injury is the 5th leading cause of childhood illness and nearly 173,000 children are moderately or severely burnt every year in Bangladesh (Mashreky et al., 2017). In Southeast Asian region 57% of the deaths result from burn injury.

The problem has taken a severe toll on every country. In India burn injury is noted as the second largest group of injuries after road accidents and the incidence rate is approximately 6-7 million every year (Gupta, Makhija, & Bajaj, 2010). The survival rate of the patients with burns in India is approximately 50% of the total burned victims whereas burns involving less than 40% of the total body surface area (Bhansali, Gandhi, Sahastrabudhe, & Panse, 2017). There is no factual report about the incidence of burn injury in Nepal but according to Nepal government there were 55,000 burn cases and 2100 deaths in 2008 (Tripathy, & Basnet, 2017).

In United States approximately 1.1 million burn injury patient are in desperate need of medical attention and approximately 50,000 require immediate hospitalization. Among the total number those who has suffered major burn injuries their number is staggeringly high, it is approximately 20,000, if we make a ratio then within these 20,000; 25 percent are a case of total body surface area burn and also approximately 4,500 lose their lives due to burn. In Sweden the yearly number of burn patients is around 1100 (American Academy of Physical Medicine and Rehabilitation, 2018). Another research found that, 486,000 number burn injury patients received medical treatment and approximately 40,000 hospitalizations are done for acute care hospitals (Bajorek et al., 2017).

In terms of severity burn is classified in three sectors; which is first, second, and third-degree burn. The severity is measured by multiple factors. For example, damage to the skin, amount of tissue injured, if any blisters are present. First-degree means the most minor burn and third-degree means the most severe burn. In first degree burns, damage to the skin is limited to the outer layer (epidermis). The skin appears to be pink or red in color, it becomes really warm or too hot to touch and is really painful. Swelling and small blisters may be present in this type of burn. In second degree burn, the damage in the skin includes both the outer layer and penetrates to the middle layer of tissue (dermis). The wound seems rather moist/wet and red, there is sign of swelling and there may be blisters of the skin. It is painful as well. The most severe and does most damage is the third degree burn. In third –degree burn, all three layers of the skin (epidermis, dermis, and hypodermis/subcutaneous tissue) are damaged; the injury can include deep penetration into muscles, organs and bones. The affected area is dry, leathery and may present in many colors like whitish, charred or tan-colored. Due to nerve destruction, full-thickness areas are suffer (i.e., have loss of feeling/sensation) (Fisher, Helm, Williams & Wilkins, 1994).

Burn injury may be a cause of thermal energy, electrical, chemical and radiation energy (World Health Organization, 2014). There are multiple factors that contribute to burn injuries among those most common cause of burn injury is thermal injury and it is caused by heat exposure like hot fluids, fire, or direct contact with some other heat source. Electrical burns generally occurs if a person comes in contact with any component that shows sign of high electrical voltage. Chemical burns may be a result of the skin coming into contact with strong acid and alkalis. The effects of chemical burns are extremely severe and can result in permanent damage to the skin and tissue area (Alocane, 2016). According to Watson et al. (2018), the severity of burn highly depends on the amount of area burnt in the entire body surface or the calculation of the percentage of the Total Body Surface Area (TBSA) burned and the depth of the burn. The depth of the burn depends on the extent to which the layers of the skin are damaged. It is commonly described as epidermal, dermal, deep dermal, or full-thickness.

Adults with burn injury are likely to have worse cognitive Functional Independence Measure (FIM) scores than other rehabilitation populations (Purohit et al., 2013). Severe burns injuries are associated with a significant, global, cognitive deficit. These has spanned across multiple domains including: working memory, delayed recall,

attention, executive function and language (Watson et al., 2018). Severe burn injury may be benefited from multiple medical and surgical interventions and may even be life-threatening. Pliskin et al. (2006) found that adults with verifiable electrical insult to the brain often demonstrated significant deficits in the areas of attention/mental speed and motor control. Janus et al. (1996) found that adults struck by lightning had cognitive decline and problems in the areas of mood and behavior (Nayeb-Hashemi et al., 2009). Few studies have investigated cognitive impairment in older patients with burn injuries and their findings suggest that older patients with burn injuries may have a higher prevalence of cognitive impairment (Holmes, Jones, & Laughon, 2017). Another research which has been conducted on severe burn injury, in that particular research the older participants perceived physical and economic effects to their quality of life, on the other hand the younger group was more concerned with the psychological, vocational and social impact (Druery, Brown, & Muller, 2005).

Burns survivors are faced with challenges regarding physical recovery with pain, pruritus, skin sensitivity, scarring and repeated surgery and in some cases it causes permanent physical disability (Willebrand et al., 2002).

For managing burn injury patient, the importance of multidisciplinary team is very noticeable, it has to be involved. In burn care management doctors, burn surgeons, nurses, anesthesiologists, respiratory therapists, speech & language therapist, occupational therapist, physical therapists, psychologist, dietician works in a single benchmark and plays a vital role altogether in the betterment of the patient. Speech and language therapy is needed for treating cognitive communication impairment in burn patient. Speech & language therapist have been introduced as skilled health care providers in burn injury rehabilitation in rehabilitation facilities (Rumbach, Clayton, Muller, & Maitz, 2016). As a member of speech & language therapist can influence the patient communication skills.

Speech & language therapist has a central role in the screening, assessment, diagnosis, treatment and managing the cognitive, communication, and swallowing problems that come with the injury. Speech & language therapist play key role in the management of cognitive communication rehabilitation of a burn patient.

1.2 Significance of the study

Burn related injuries are a prominent public health issue because each year worldwide approximately 11 million individuals experience burns. Burns contribute significantly to the global burden of death and disability (Jagnoor, Lukaszyk, Fraser, Chamania, Harvey, Potokar, & Ivers, 2017). Researcher found that most of the burn patients have cognitive problems. Due to cognitive problem people face difficulty in communication. It is an important issue to know the prevalence of cognitive impairment after burn injury (Rothman, Sutter, Perrin, Li Brandi, & Feldman, 2016). Still now there is no study regarding the prevalence of cognitive impairment of burn patients in Bangladesh. In our country speech & language therapy is still considered as a new profession and people don't have proper knowledge about the role of speech & language therapist in cognition and communication.

The patient and their caregiver will benefited from this study. Patient will have appropriate knowledge about their require treatment. In Bangladesh, speech & language therapy professionals have yet to start providing services in burn care unit. Hopefully this study will encourages speech & language therapist's to provide their services in burn care. It is an uncultivated area to practice on burn injury patient. It may help clinical speech & language therapist in diagnosis, plan of investigation, treatment protocol and ensure proper treatment on cognitive-communication and swallowing deficits of a burn injury patient.

This study will help to establish a collaborative treatment approach for burn patient by improving referral system. This study will be helpful for different organizations who are working in this area. They can include speech & language therapy service in their program for delivering a comprehensive treatment service.

1.3 Objectives

1.3.1 General objectives

- To determine the number of burn injury patient affected with cognitive impairment.

1.3.2 Specific objectives

- To find out the socio demographic characteristics of the participants.
- To find out the prevalence of cognitive impairment after burn injury.
- To find out the association between the presence of cognitive impairment with the age of burn patient, conduct of burn, onset of burn, area of burn, depth of burn.

1.4 Operational definition

Key Words: Burn injury, Cognitive impairment

1.4.1 Burn injury

“Burn” is a kind of injury to the skin or other organic tissue which is caused by excessive heat or due to radiation, radioactivity, electricity, friction or contact with chemicals. Skin injuries due to chemical, respiratory damage resulting from smoke inhalation, are also considered as burns. (American Academy of Physical Medicine and Rehabilitation, 2018). In the common burn types, the most common in adults were recorded as flame burn injury and moist heat injury. There are three primary types of burn- First, second and third degree burn. Victims affected severely often experience problems with mood, anxiety, sleep, learning, and attention. These severe scarring and contractures followed by burn injuries can make greatly negative impact on victims (World Health Organization, 2018). In this study researcher focused on burn injury patient because researcher wants to identify number of cognitive impairment among burn injury patient.

1.4.2 Cognitive impairment

This is a broad term that includes a multitude of diseases. This can be both genetic and acquired. Difficulty processing thoughts lead to memory loss, decision-making difficulties, inability to concentrate, and learning difficulties. And that can be considered as cognitive impairment. This impairment does not occur to a certain age, gender or any other demographic (Cambridge Cognition, 2018). All the mental activity relating to thinking, knowing and remembering and any type of thoughts or memories indicate cognition. Research says adult patients having sustained electrical insult to the central nervous system had impairment in overall cognitive functioning which included intelligence, attention, speech, language, executive functioning (Holmes, Jones, & Laughon, 2017). In this study researcher used this term to find out the prevalence of cognitive impairment after burn injury.

1.5 Literature review

Thirty years ago the survival rate for young adults with 40% of burnt body surface area was 50%. Now the expected survival rate for young adults with 80% of burnt body surface area is 50%. Burn injuries can lead to a harmful impact on physical and psychological wellbeing as well as social wellbeing. Severe burns imparts impairments to physical health and functional capacity as well as disfigurement. The incidents that cause these injuries are often make their victims feel helpless. Overcoming this trauma requires a restoration of a sense of safety and faith in one's power. (Patterson et al., 1993).

Cognitive impairment is a key factor leading to disability among burn injury patients. Studies suggest that adults with burn injury tend to have worse cognitive FIM (Functional Independence Measure) scores than other rehabilitation populations (Purohit et al., 2013). Sever burn injury patients have greater problems in the area of cognition in the domains of working memory, delayed recall, attention, executive function and language (Watson et al., 2018).

Burn injuries localized in the calvarium and other critical structures of the body result in cognitive and affective disturbances. The skull covers the brain, which is the key organ of the nervous system. It is occasionally involved in deep burn injuries. Full thickness burns of the calvarium and the resulting cognitive impairment is often under evaluated (Nayeb-Hashemi et al., 2009).

Dementia is a very common degenerative neurological disorder characterized by a gradual, progressive and irreversible decline in cognition, memory problems, difficulty in language, problem solving and decision making abilities that may occur due to burn injury. In 2012, the study found the prevalence of dementia 8.8% and in adults aging 65 and 85 years or more. (Ehrlich, 2006). A study conducted on patients of an inpatient rehabilitation facility older patients suffering from burn injuries had a lower cognitive testing (Holmes, Jones, & Laughon, 2017). In another study out of 1535 older people who were hospitalized for a burn, 11.0% had a record of dementia. Patients with dementia were more likely to be admitted with burns to the trunk. There is also a chance for them to have a greater than 20% total body surface area (TBSA) burn. 4 out of every 100 patients older than the age of 55 had pre-existing dementia at the time of admission to the burn unit (Harvey, Mitchell, Brodaty, Draper, & Close, 2016).

A study done in an inpatient rehabilitation hospital Boston-Harvard Burn Injury Model System Center between 2007 and 2013 with 144 patients with burn injury stated that they have difficulty in cognitive communication. The assessments were done at 2 times: pre and post treatment at the hospital. The results showed that among 144 patients 79% had impairment in cognition at the time of their first assessment session. Cognitive area of a person, skills of communication, concentration, memory, problem solving ability all area interrupted due to burn injury. Potential cognitive impairments such as anoxia, toxic fume inhalation, and medical complications from the primary injury such as dehydration and electrolyte abnormalities, hypoperfusion secondary to volume depletion and shock, and use of centrally acting medications can also be the reason behind impairment in cognitive function (Purohit et al., 2013).

Duff and McCaffrey (2001) cited in Holmes et al. (2017) that adult patients who face electrical assault to the CNS may have difficulty in the speech, language, recalling, vision etc. Again, other studies showed that patients have difficulty in their physical state, cognition after electrical assault. Related studies found patients having poor attention level, decreased speed in processing after electrical insult. Pliskin et al., (2006) in a controlled study of electric injury patients, cites that people who experienced electrical injury have physical, cognitive and affective changes in their life. Injuries result in deficits such as poor attention, processing speed, and issues in motor domains in functioning. Grigorovich, Gomez, Leach, & Fish (2013) reported that they analyzed two groups of burn patients: Electrical injury patients with and without PTSD, examined their memory, attention, and executive functions and the results they got patients with PTSD had significantly worse performance in case of measures of immediate and delayed memory (Aase, Fink, Lee, Kelley, & Pliskin, 2014). Memory impairment has been identified as a core area of deficit in some studies. Electrical Injury patients are prone to psychiatric and cognitive disturbance that can intensify over time (Ammar, 2006).

People who face electrical injury and sustain brain damage may develop traumatic stress disorders (Sbordone & Saul, 2000). Rosenberg et al. (2005) stated in their study that long term cognitive and emotional difficulties were found in 1/3rd of children sustaining hypoxic injuries related to flame burns (Nayeb-Hashemi et al., 2009). Another analysis found that patients with burn injury who are admitted to an IRF setting, 79% had cognitive FIM deficits on admission, and 27% had cognitive deficits at discharge (Bajorek et al., 2017).

In burn care management speech & language therapist have to be conscious of all aspects of the impact of thermal, chemical, electrical and inhalation burns on swallowing and cognitive-communication. The Speech & language therapist functions as a member of the multidisciplinary team of health professionals that collaboratively assess provide treatment on cognition.

Speech & language therapist is to assess every aspects of communication, cognitive deficits, and swallowing and plan and program treatment according to the individual's ability to recover; client and family training or counseling and interdisciplinary consultation. The effectiveness of speech & language intervention depends largely on focusing into specific cognitive deficits (e.g., attention, recollection, executive functions) as well as general issues of social-skills training and early intervention are illustrated by scientific and clinical evidence from group-treatment and single-subject studies as well as case study (Coelho, DeRuyter, & Stein, 1996).

In this study investigator found the cognitive impairment and severity of cognitive impairment after burn injury by using cognitive questionnaire.

2.1 Study design

Investigator used cross-sectional study design to conduct the study. It is one of the most commonly used survey research design. The investigator used cross-sectional survey to meet the study aim as an effective way to collect data. Frankel & Wallen (2000) said that the main function of survey research is to obtain precise objective descriptions from a specific universe of people or entities and it requires the investigator asking a group of people questions about a particular topic or issue. It is quantitative type of research. It is used to identify the number of people having cognitive impairment after burn injury and collected information from participants at one point of time. In cross sectional study, investigator gather demographic and other relevant characteristics for study. Aside from these advantages, cross sectional survey study design is simple and easy to conduct. (Hicks, 2000).

2.2 Study place

Researcher conducted this study in National Institute of Burn and Plastic Surgery unit of Dhaka Medical College Hospital and Acid Survivors Foundation. The investigator used these places because the investigator took information from caregiver and also from observed patient.

2.3 Sample

2.3.1 Study population

All people with burn injury admitted in National Institute of Burn and Plastic Surgery unit of Dhaka Medical College Hospital and Acid Survivors Foundation.

2.3.2 Sample size

A group of subjects that will be selected from the population, who will be used in pieces of research is called sample (Hicks, 2000). Larger sample is the representative of the population in a survey study, but in many situations, it is not possible for the researcher both for practical and financial reasons (Hicks, 2000). So the investigator used a sampling equation to determine the sample size. The equation is –

We know that,

$$\begin{aligned}\text{Sample size: } n &= \frac{z^2 p(1-p)}{d^2} \\ &= \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2} \\ &= 384\end{aligned}$$

n= Required sample size,

z = confidence level at 95% (standard value of 1.96),

p = estimated prevalence of subject (0.5),

d= margin of error at 5% (standard value of 0.05)

So, sample size 384.

It is unrealistic to conduct a study on 384 sample within 2 months. It would be costly and unavailable due how to time-consuming it is. Due to limitation of time investigator attempted to collect data as much as possible. Within 2 months investigator collected 72 numbers of data. So, 72 samples selected within the short period of time.

2.3.3 Sampling procedure

Investigator used purposive sampling from the population who meet the inclusion and exclusion criterions.

2.3.4 Inclusion criteria

- Patients with burn injury who receive treatment from National Institute of Burn and Plastic Surgery unit of Dhaka Medical College Hospital and Acid Survivors Foundation.
- Both male and female participants.
- Age range 18- 80 years old
- All type of burn patient.
- Minimum primary level education.

2.3.5 Exclusion criteria

- Other neurological deficits (Stroke, Parkinson Disease, Multiple sclerosis, Spinal cord injury, Head injury, Myasthenia gravis).
- Evidence of head trauma.
- Severe burn patient
- Duration of injury less than 2 weeks.
- Subjects who were unwilling to participant in this study.

2.4 Data collection

2.4.1 Data collection instrument

For collecting data of this research a structured questionnaire- Mini-Mental State Examination (MMSE) has been used as a data collection tool. This tool consist of 11 questions that measures five areas of cognitive function. These are orientation, registration, attention and calculation, recall, and language. From the test score the maximum score is 30. It took only 5-10 minutes to collect the data by using MMSE in this systematic way.

2.4.2 Data collection method

Data were collected by face to face interview of all burn patients from Dhaka Medical College Hospital. Mini- Mental State Examination (MMSE) tool was used to interviewing participants. From the total score 30 if the score is <27 out of 30 this means no problem, 24-27 out of 30 means mild cognitive impairment, 18- 23/ 30 means definite cognitive decline, 10-18/30 means significant impairment of cognition, <10 /30 means profound impairment of cognition.

2.4.3 Data collection procedure

Investigator collected data from the participants through face to face interview. At first investigator took permission from SLT department of Bangladesh Health Professions Institute and then the authority of Burn and Plastic Surgery unit of Dhaka Medical College Hospital and Acid Survivors Foundation for data collection. Then investigator went to the study place with consent form and Mini-Mental State Examination (MMSE) questionnaire. Investigator explained the participant about the purpose of the study and also ensured that no personal information will be published

anywhere. Investigator requested to the carer giver of sick participant to sign on consent form. After taking consent, investigator read the instruction of Mini-Mental State Examination (MMSE) questionnaire and collect data from patient or carer response.

2.4.4 Data analysis

It was quantitative type of research and investigator used descriptive statistics for data analysis. Because descriptive statistics are commonly used to make sense of survey data (Hicks, 2000). According to Bailey (1997), descriptive statistics are special statistics of quantitative analysis that describe, organize, and summarize all data very systematically. Data were analyzed through the software named Statistical Package for Social Science (SPSS). Investigator used this technique because the aim of the study is to find out the cognitive impairment among burn injury patients. By descriptive statistics investigator showed the result easily. To show the findings or results investigator used bar graph, pie chart and table.

2.4.5 Ethical consideration

Investigator maintained rigorous manner to conduct the study. All steps of the study supervised by the supervisor. At first investigator took permission from ethical committee of Bangladesh Health Profession Institute (BHPI). Researcher also took permission from department of Speech & Language therapy, Burn and Plastic Surgery unit of Dhaka Medical College Hospital and Acid Survivors Foundation. Investigator provided clear information to all the participants about the purpose of the study before collecting the data. Investigator took participant's consent by using consent form. Researcher ensured the confidentiality to the participants. The researcher had also mentioned to the participants that the information provided by the particular might be published but their name and address would not be used in research project. Participants informed that they would not get any harm from the study and it also would not be affected psychologically, physically and would not face any bad situation for participating in the study.

Data analyzed by descriptive statistics and calculated as percentages and presented by using pie charts, column and tables.

3.1 Demographic information

3.1.1 Gender of participants

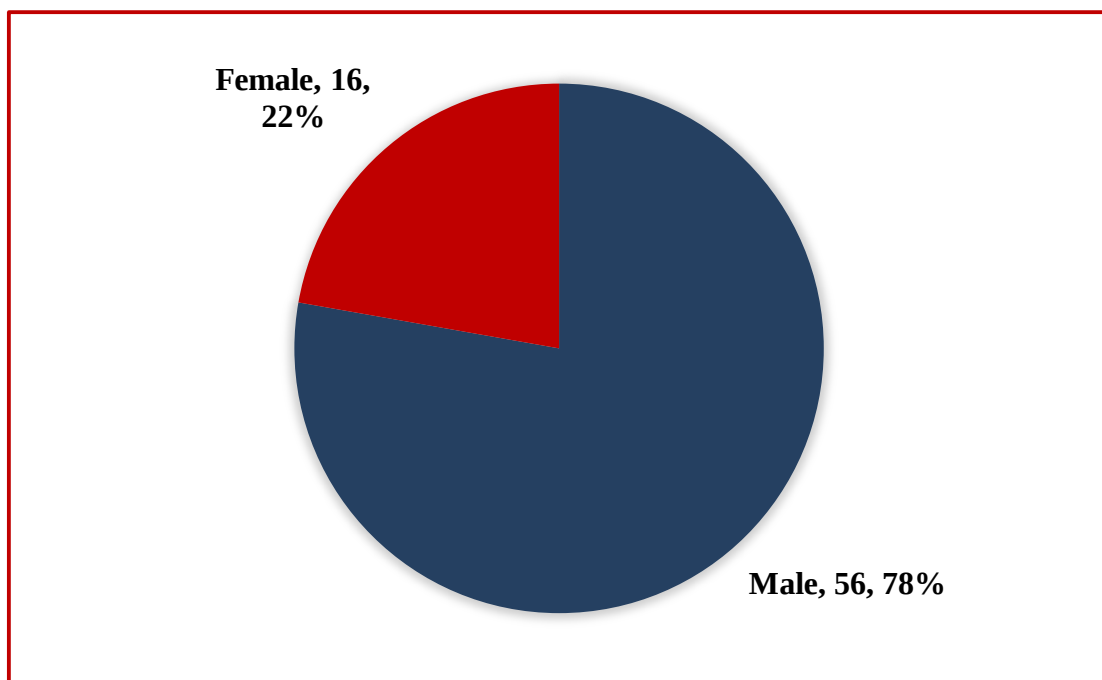


Figure 3.1.1: Gender of participants

From this pie chart it shows that among the 72 participants more than half of the participants 78% (56) were male and 22% (16) were female.

3.1.2 Age of the participants

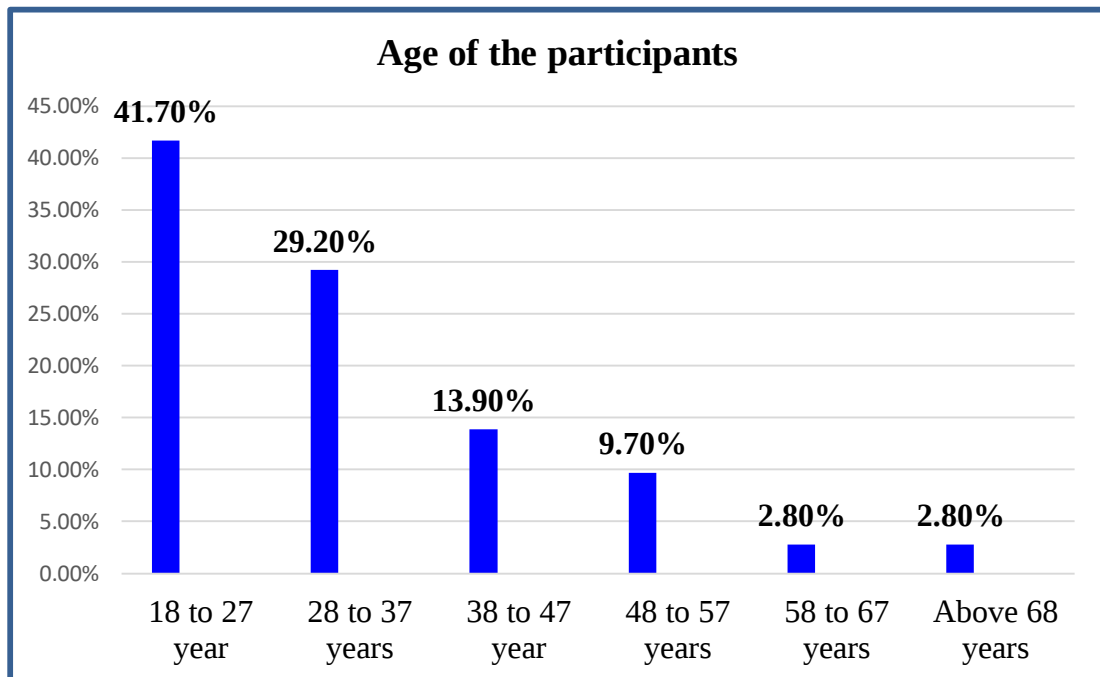


Figure 3.1.2: Age of the participants

This bar graph shows that among 72 participants the highest numbers of participants 41.7% (30) were in the age range of 18-27 years and it is found that 29.2% (21) participants were in the age between 28-37 years. Also 13.9% (10) participants were the age between 38-47 years. This bar graph also shows that a limited percentage of participants 9.7% (7) were in the age between 48-57 years. Few participants 2.8% (2) were the age between 58-67 years. And 2.8% (2) participants were above 68 years.

3.1.3 Educational level of participants

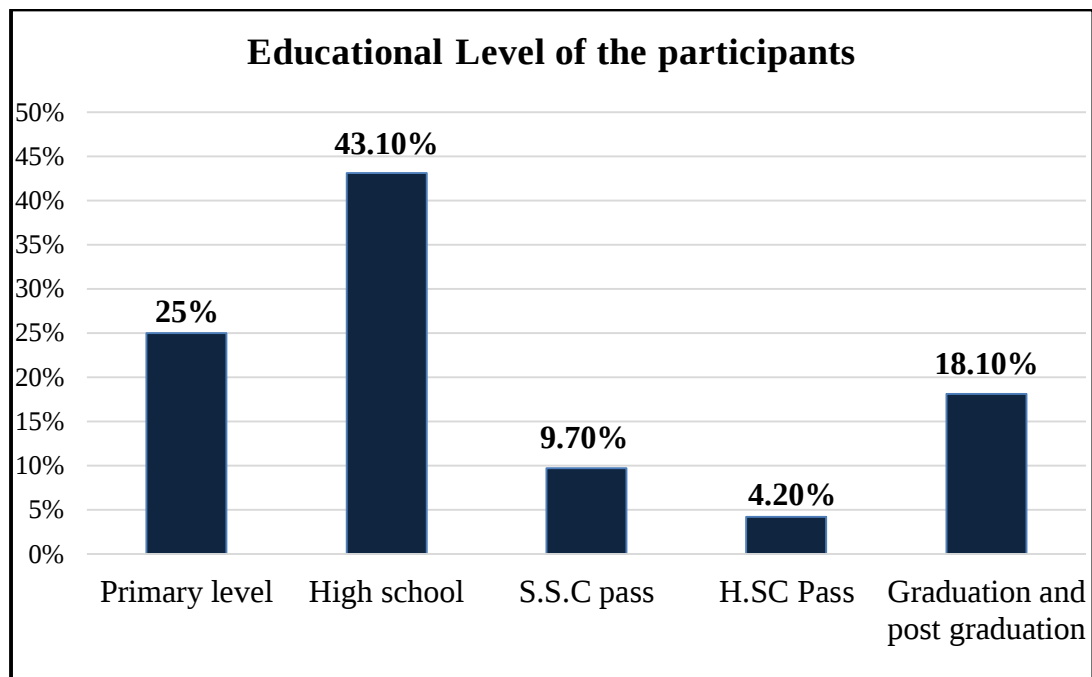


Figure 3.1.3: Educational level of participants

From 72 participants in this study majority numbers of participants were 43.1% (31), whose education was high school level. 25% (18) of participant's education level were primary. 18.1% (13) participant's education level were graduation and post-graduation and 9.7% (7) participant's education level were S.S.C pass. Among them only 4.2% (3) participants education level were H.S.C pass.

3.1.4 Occupational Status of the participants

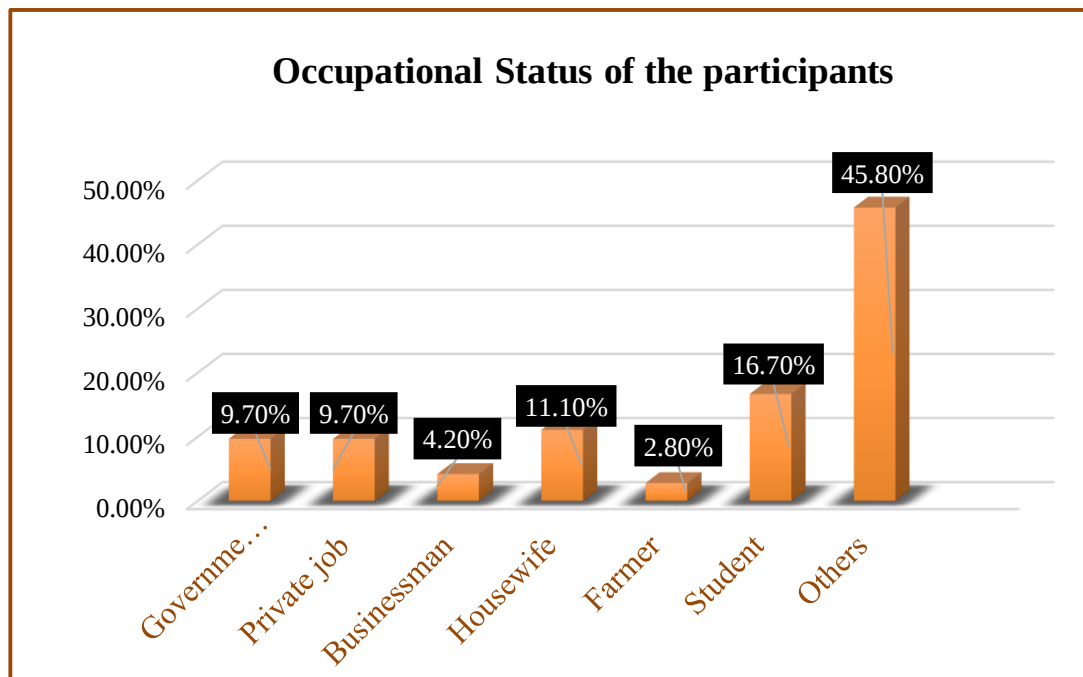


Figure 3.1.4: Occupational Status of the participants

From this graph it shows that among 72 participants 16.7 % (12) were students. Then 11.1% (8) respondents were housewife and Government job respondents were 9.7% (7). And also private job respondents were 9.7% (7). Businessman were 4.2% (3), farmer was 2.8% (2). 45.80% (33) participant's occupation come under others category that was mill worker, electrician, wood mechanic, day laborer.

3.1.5 Depth of burn

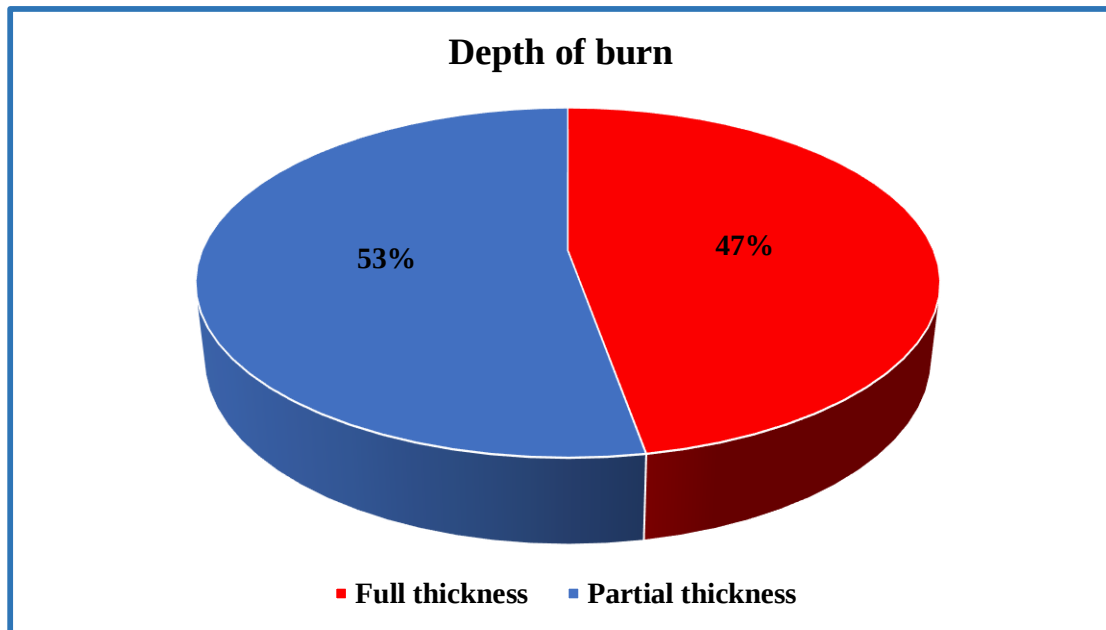


Figure 3.1.5: Depth of burn

Among 72 participants, more than half of the participants 53% (38) had partial thickness loss and 47% (34) participants had full thickness loss.

3.1.6 Onset of burn

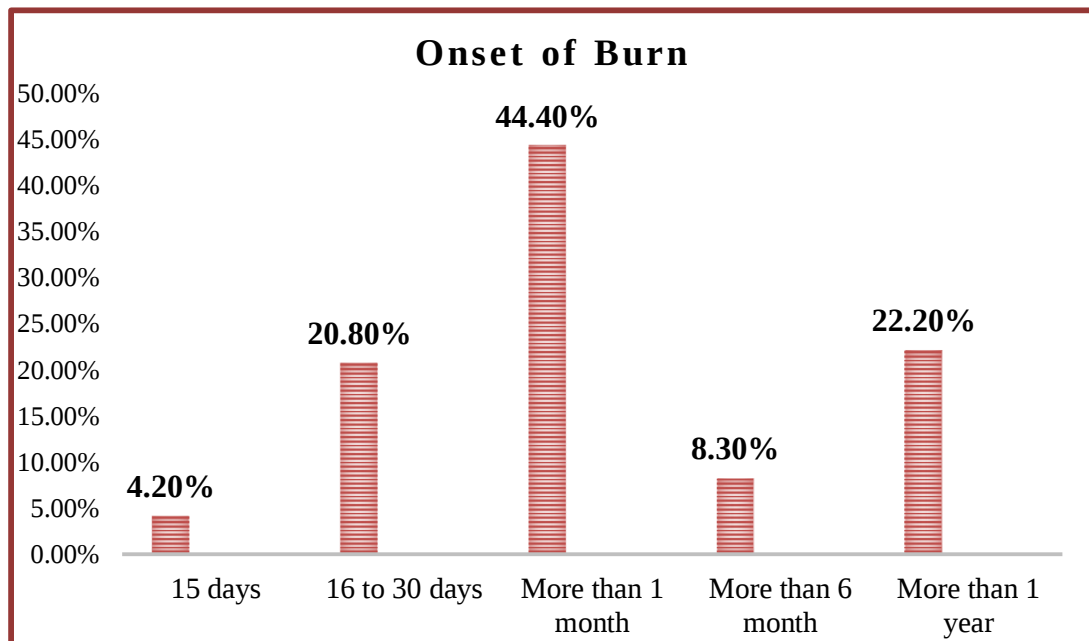


Figure 3.1.6: Onset of burn

In this study, majority of the participants 44.40% (32) had suffered burns more than 1 month ago but less than 6 months ago. It also found that majority 22.20% (16) participants had burn in 1 year earlier. And also 20.80% (15) of the participants had burn in between 16 to 30 days. Few participants 8.30 % (6) had burn in more than 6 month earlier. And 4.20% (3) participants had burn in 15 days earlier.

3.1.7 Conduct of burn

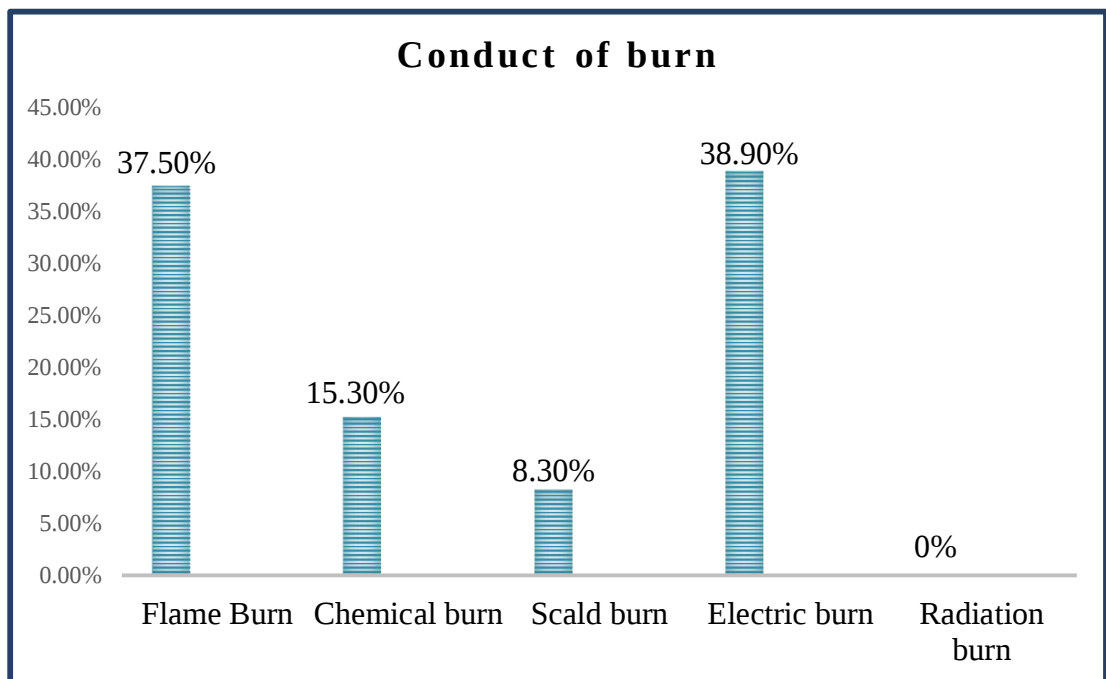


Figure 3.1.7: Conduct of burn

This study shows that from 72 participants, maximum participants 38.9% (28) conducted electrical burn. Then most of the participants, 37.5% (27) conducted by flame burn. Chemical burn conducted in 15.3% (11) participants. And only scald burn conducted in 8.3% (6) participants. And there is no radiation burn patients.

3.1.8 Area of burn

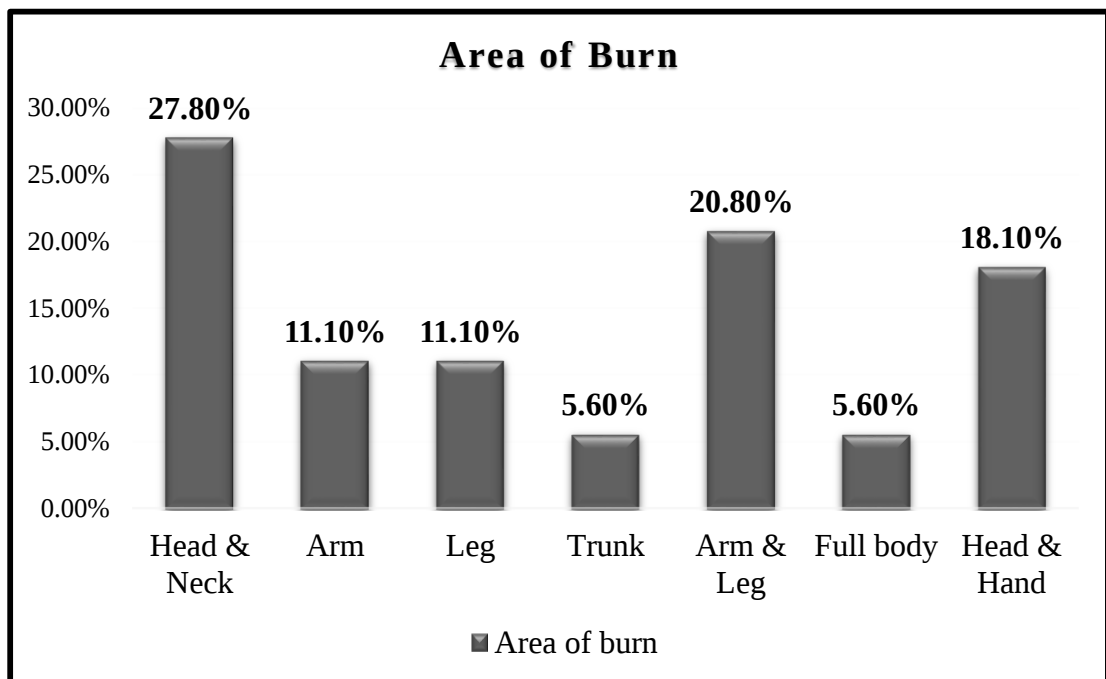


Figure 3.1.8: Area of burn

In this study among 72 participants most of the participants 27.80% (20) had head & neck area burn. 20.80% (15) participants had arm & leg area burn. Most of the participants 18.10% (13) had head & hand burn. 11.10% (8) participants had arm burn and leg burn also 11.10% (8). Only 5.60% (4) participants had trunk burn and 5.60% (4) participants had full body burn.

3.2 Patient Concern

3.2.1 Burn patients concern about Swallowing Difficulties

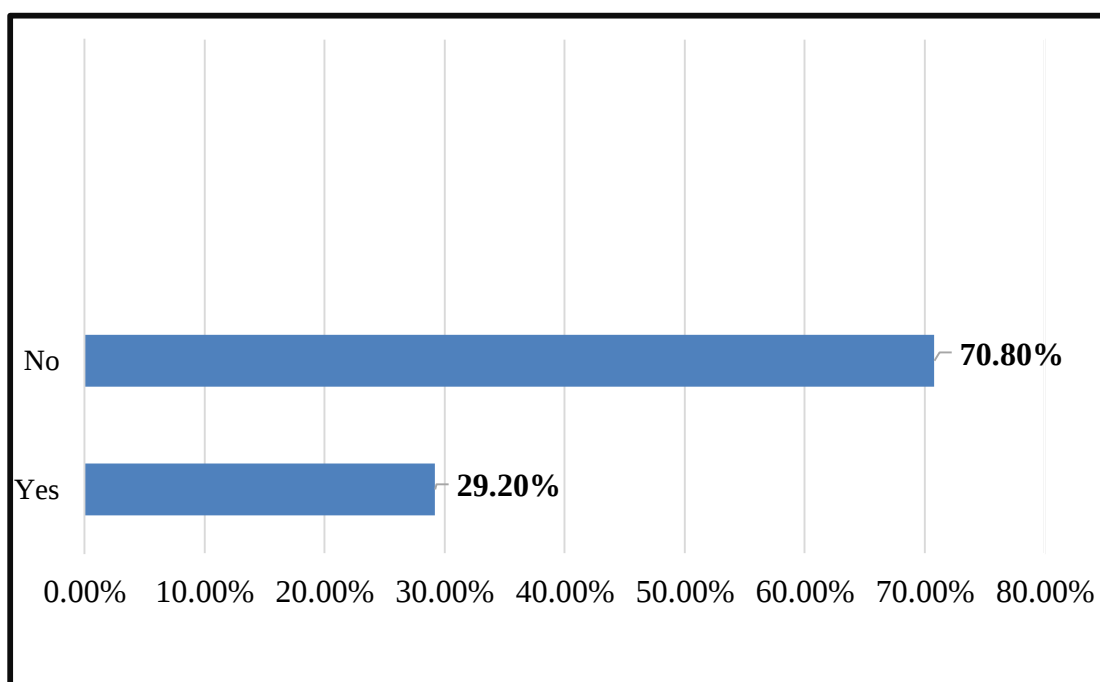


Figure 3.2.1: Burn patients concern about Swallowing Difficulties

Among 72 participants 70.80% (51) participants had no concern about swallowing difficulties. And 29.20% (21) participants was concern about swallowing difficulties.

3.2.2 Burn patients concern about Articulation Difficulties

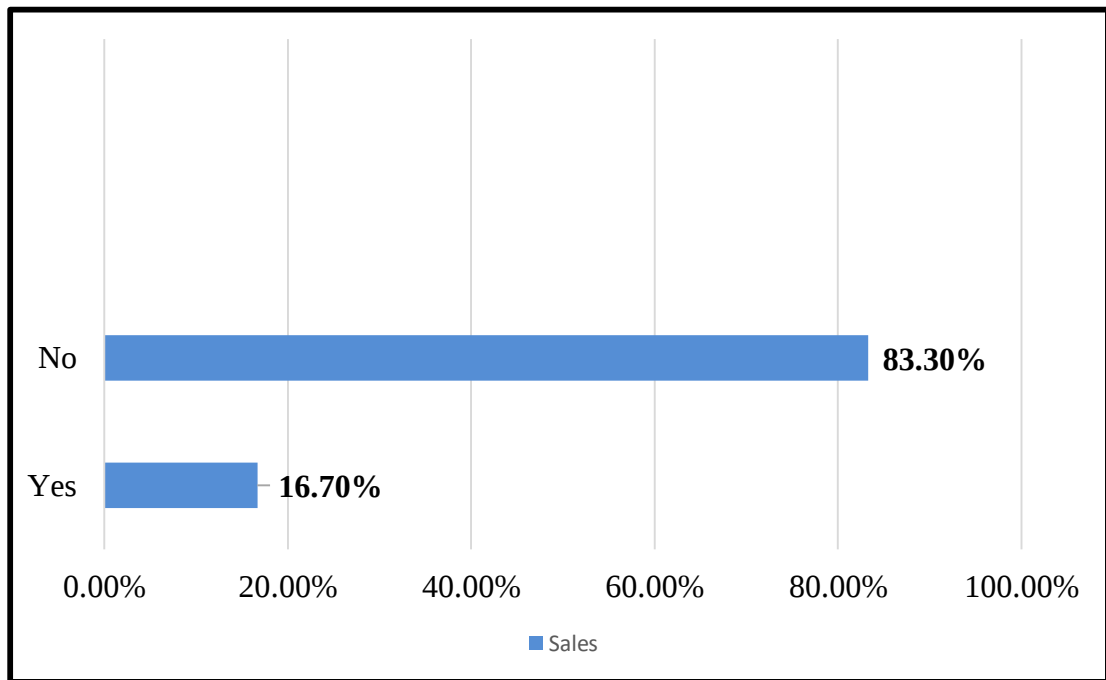


Figure 3.2.2: Burn patients concern about Articulation Difficulties

Among 72 participants 83% (60) participants had no concern about articulation difficulties. And 17% (12) participants was concern about articulation difficulties.

3.2.3 Burn patients concern about Voice Difficulties

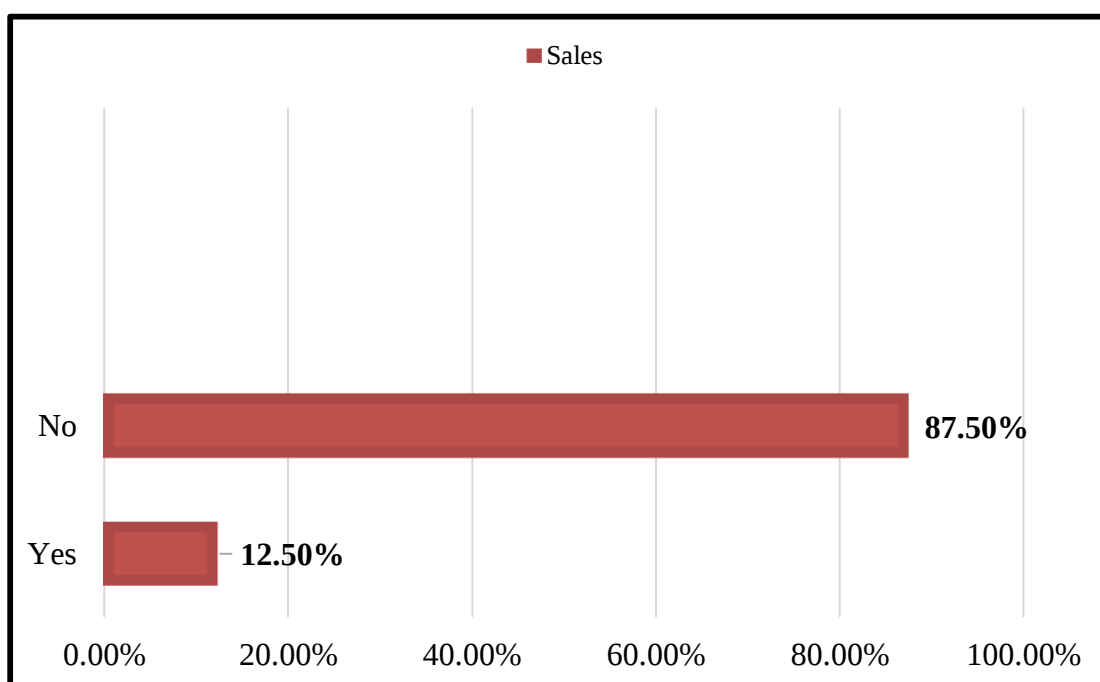


Figure 3.2.3: Burn patients concern about Voice Difficulties

Among 72 participants 88% (63) participants had no concern about voice difficulties. And 12.5% (9) participants was concern about voice difficulties.

3.3 Mini-Mental State Examination (MMSE) responses of participants

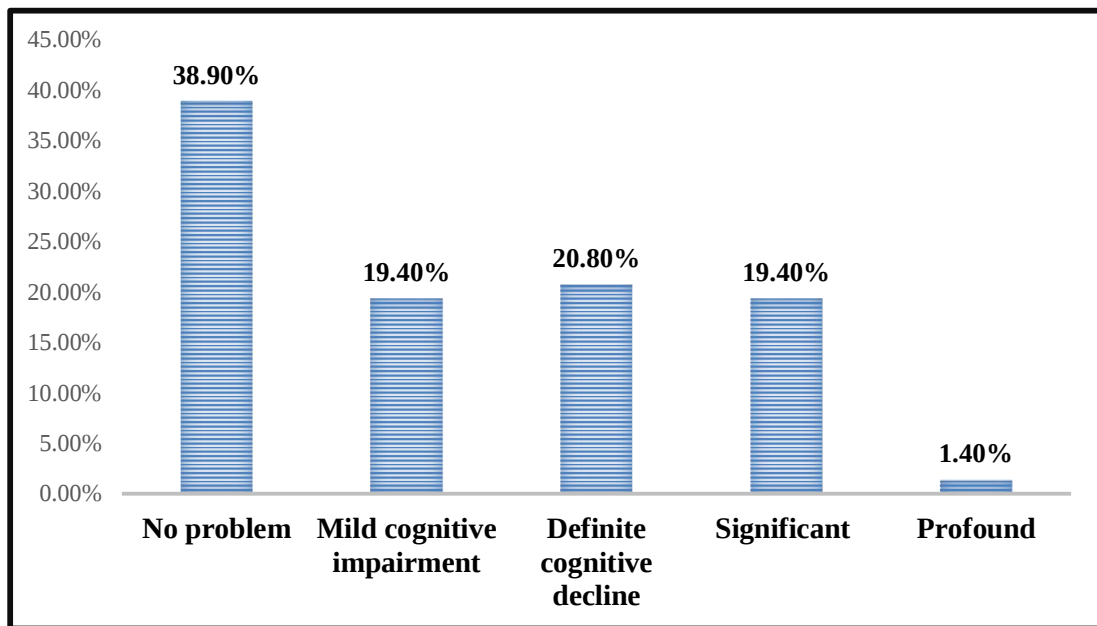


Figure 3.3: Mini-Mental State Examination (MMSE) responses of participants

In this bar graph, it shows that majority of the participants, 38.90% (28) had no problem. Maximum number of the participants 20.80% (15) had definite cognitive decline. Among 72 participants 19.40% (14) had mild cognitive impairment and significant cognitive impairment also had 19.40% (14) participants. And only 1.40% (1) participants had profound cognitive impairment.

3.3.1 According to MMSE status of orientation

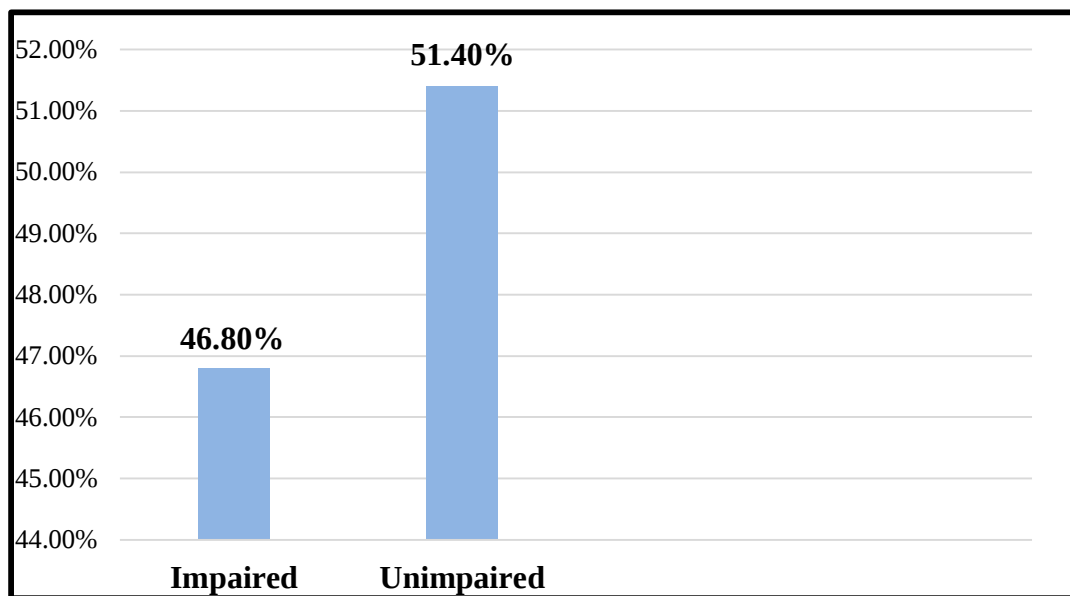


Figure 3.3.1: According to MMSE status of orientation

According to MMSE 46.80 (35) participants orientation score less than 7 out of 10. So their orientation is impaired. But 51.40% (37) participant's orientation score greater than 8 out of 10. Their orientation is unimpaired.

3.3.2 According to MMSE status of registration

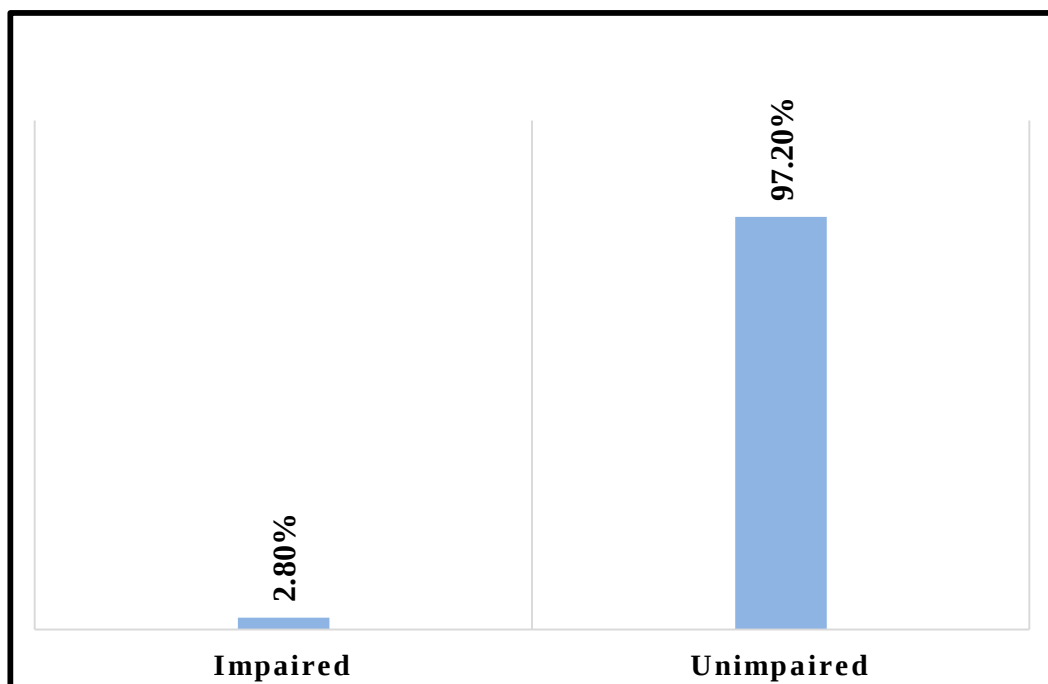


Figure 3.3.2: According to MMSE status of registration

According to MMSE 2.80 (2) participants registration score less than 2 out of 3. So their registration is impaired. But 97.20% (70) participants Orientation score greater than 1 out of 3. Their registration is unimpaired.

3.3.3 According to MMSE status of attention

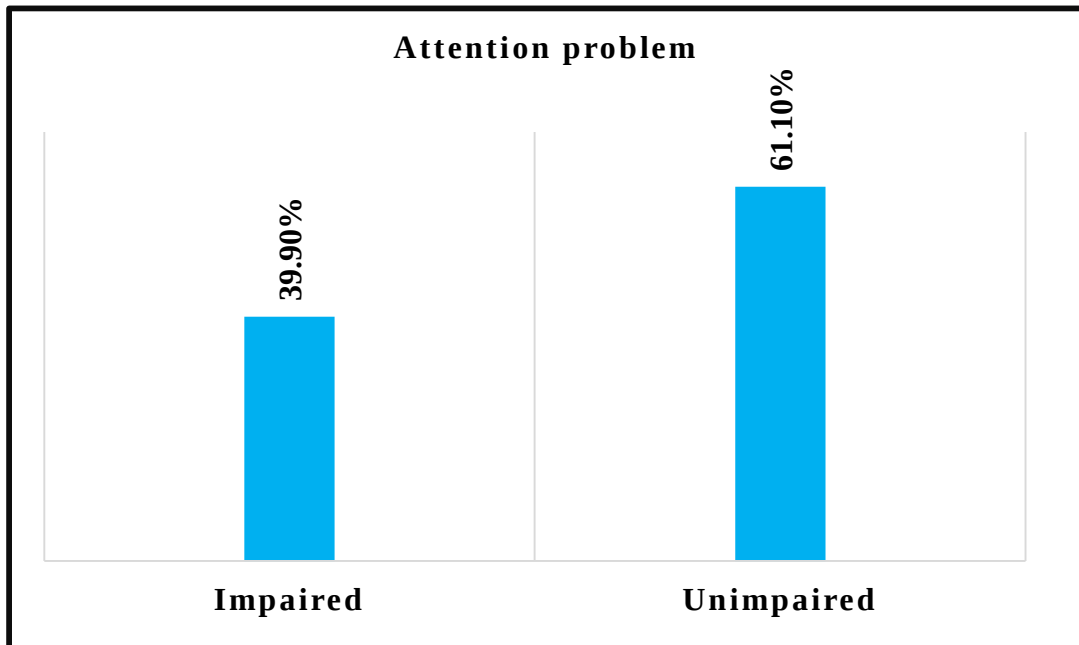


Figure 3.3.3: According to MMSE status of attention

According to MMSE 39.90% (28) participants attention score less than 4 out of 5. So their attention is impaired. But 61.10% (44) participant's attention score greater than 3 out of 5. Their attention is unimpaired.

3.3.4 According to MMSE status of recalling

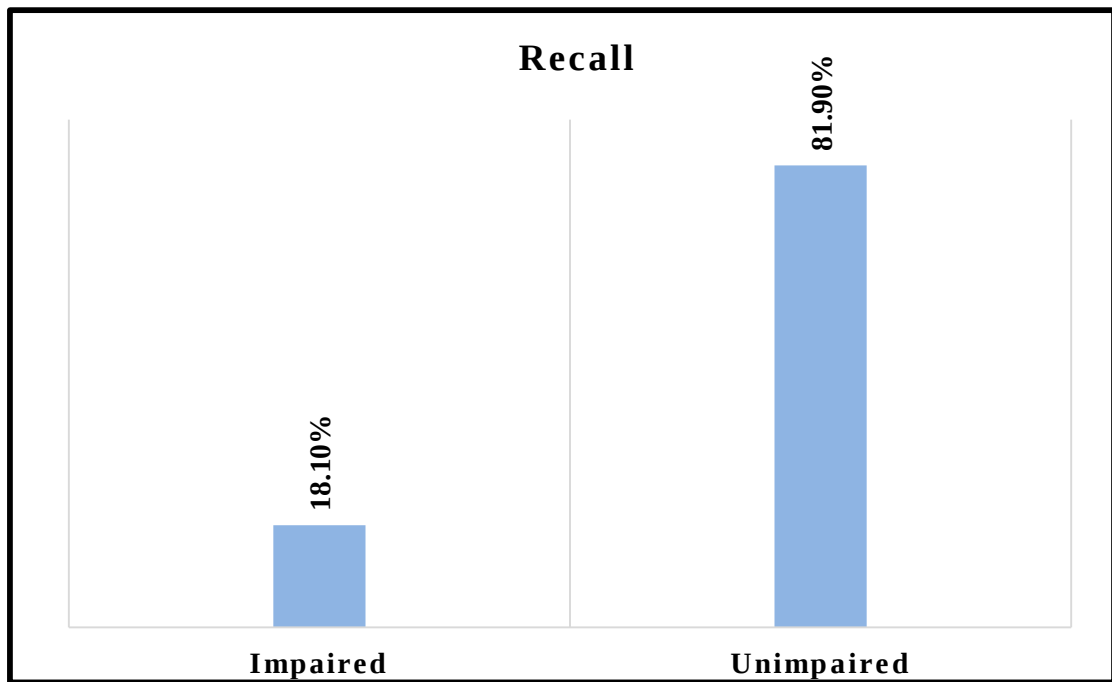


Figure 3.3.4: According to MMSE status of recalling

According to MMSE 18.10% (13) participants recalling score less than 2 out of 3. So their recalling capacity is impaired. But 81.90% (59) participant's recalling score greater than 1 out of 3. Their recalling capacity is unimpaired.

3.3.5 According to MMSE status of language

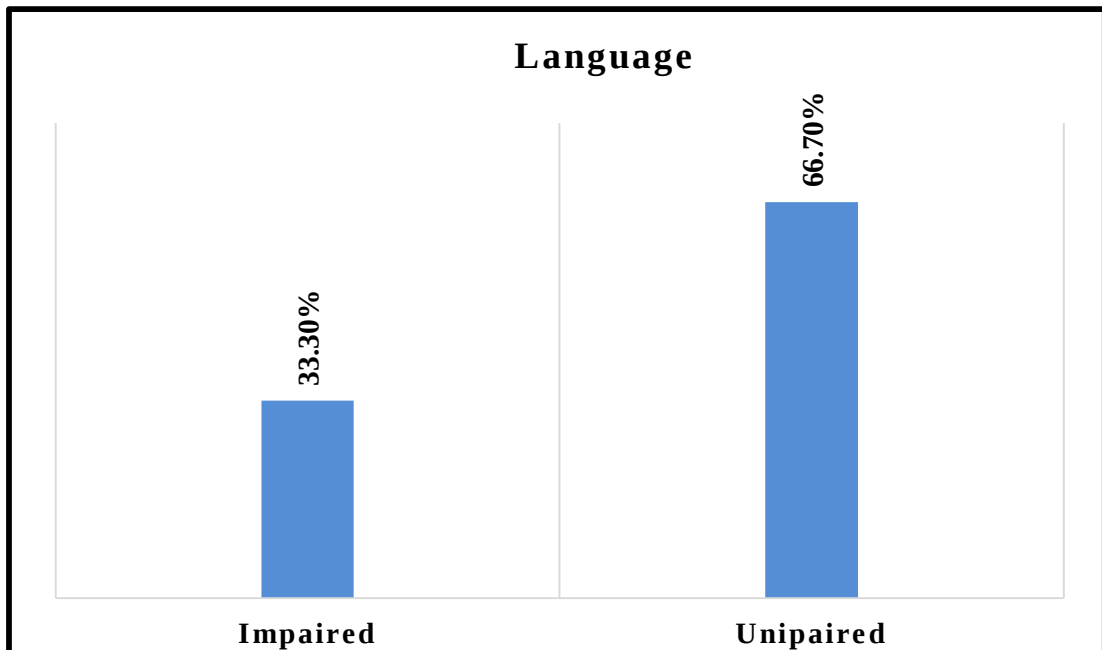


Figure 3.3.5: According to MMSE status of language

According to MMSE 33.30% (24) participants language score less than 8 out of 9. So their language is impaired. But 66.70% (48) participant's language score greater than 7 out of 9. Their language is unimpaired.

3.4 Association between variables

3.4.1 Association between age and presence of cognitive impairment

Age of Participants	Cognitive impairment among burn injury patient					Total
	No cognitive impairment	Mild problem	Definite decline	Significant decline	Profound problem	
18-27 years	13	3	8	6	0	30
28-37 years	8	5	4	4	0	21
38-47 years	2	1	3	3	1	10
48-57 years	3	3	0	1	0	7
58-67 years	1	1	0	0	0	2
68-79 years	1	1	0	0	0	2
Total	28	14	15	14	1	72

Table 3.4.1: Association between age and presence of cognitive impairment

Among the 72 participant's cognitive impairments occurrences mild problem found highest in 5 participants in the range of 28-37 years and lowest 1 participant in the age range were 38-47 years, 58-67 years and 68-79 years. Definite decline found highest in 8 participants in the range of 18-27 years and lowest participants 3 in the age range of 38-47 years. Significant decline found highest in 6 participants in the range of 18-27 years, and lowest participants 1 in the age range 48-57 years. Profound problem found highest in 1 participants in the range of 38-47years. No problem found highest in 13 participants in the range of 18-27 years, and lowest participant 1 in the age range of 58-67 years and 68-79 years.

3.4.2 Association between onset of burn and presence of cognitive

Onset of burn	Cognitive impairment among burn injury patient					Total
	No problem	Mild problem	Definite Problem	Significant problem	Profound problem	
15 days	1	1	0	0	1	3
16-30 days	5	1	4	5	0	15
More than 1 month	14	7	5	6	0	32
More than 6 month	1	2	2	1	0	6
More than 1 year	7	3	4	2	0	16
Total	28	14	15	14	1	72

Table 3.4.2: Association onset of burn and presence of cognitive impairment

Among 72 participants, the highest cognitive impairment found in 18 participant more than 1 month earlier and also cognitive impairment found in 9 participants in more than 1 year earlier. Among 16-30 days 10 participants found in problem in cognition. More than 6 month there are 5 participants problem in cognition.

3.4.3 Association between conduct of burn and presence of cognitive impairment

Conduct of burn	Cognitive impairment among burn injury patient					Total
	No problem	Mild problem	Definite Problem	Significant problem	Profound problem	
Flame burn	9	8	3	7	0	27
Electrical burn	4	1	4	2	0	11
Scald burn	6	0	0	0	0	6
Chemical burn	9	5	8	5	1	28
Radiation burn	0	0	0	0	0	0
Total	28	14	15	14	1	72

Table 3.4.3: Association between Conduct of burn and presence of cognitive impairment

Among 72 participants, mild problem occurrences found highest 8 participants in flame burn. Highest 18 number of cognitive problem found in electrical burn patients. Chemical burn occurs among 11 participants and cognitive problem found in 7 participants. No cognitive impairment found in scald burn participants.

3.4.4 Association between depth of burn and presence of cognitive impairment

Depth of burn	Cognitive impairment among burn injury patient					Total
	No cognitive impairment	Mild problem	Definite decline	Significant problem	Profound problem	
Partial thickness loss	20	8	5	4	1	38
Full thickness loss	8	6	10	10	0	34
Total	28	14	15	14	1	72

Table 3.4.4: Association between depth of burn and presence of cognitive impairment

Among 72 participants, the highest number of cognitive impairment found in 26 participants who had full thickness loss and 18 participants who had partial thickness loss.

3.4.5 Association between Area of burn and presence of cognitive impairment

Area of burn	Cognitive impairment among burn injury patient					Total
	No problem	Mild problem	Definite Problem	Significant problem	Profound problem	
Head & Neck	8	2	6	3	1	20
Arm	4	1	2	1	0	8
Leg	3	4	0	1	0	8
Trunk	1	1	2	0	0	4
Arm & Leg	5	4	2	4	0	15
Full body	1	1	1	1	0	4
Head & Hand	6	1	2	4	0	13
Total	28	14	15	14	1	72

Table 3.4.5: Association between area of burn and presence of cognitive impairment

Among 72 participants most of cognitive impairment (12) found in head & neck area. In arm & leg area 10 participants had cognitive impairment. Among head & hand area burn 7 participants had cognitive impairment. Only 3 full body burn participants had cognitive impairment. 5 leg burn participants had cognitive impairment and 4 cognitive impairment found in arm burn participants.

In this study, investigator selected 72 participants who had following burn injury where more than half of the participants 78% (56) were male and 22% (16) were female. In Bajorek et al. (2017) study 68% were male and other were female out of 5347 participants. Among the participants, 41.70% (30) were the age range between 18-27 years and also 29.20% (21) participants were the age range 28-37 years. In Bajorek et al. (2017) stated that study population mean age was 51.6 years (+_18.9 years). Holmes, Jones, & Laughon, (2017) said that older patients suffered from burn injuries have a possibility of higher prevalence in case of cognitive impairment and may also have worst consequences than the poor outcomes observed among older adults in general. This clinical study found that, the time interval of two years after a severe burns injury, patients start to demonstrate a significant deficit in cognitive function from baseline (Nayeb-Hashemi et al., 2009). In this study the association between age and presence of cognitive impairment is not significant ($X^2= 18.033$, $P> 0.05$).

Among all the participants gathered for this study, it has been observed that the highest number of participants had burn injury even 1 year earlier. Holmes, Jones, & Laughon, (2017) found that on admission, 44 patients (11%) had diagnosed with dementia. After that the rest of the 28 patients were diagnosed with dementia in hospitalized setting. This study found that the association between the onset of burn and presence of cognitive impairment is significant ($X^2= 30.820$, $P< 0.05$).

In this study, from 72 participants, maximum participants that 38.90% (28) conducted by electric burn. Then most of the participants, 37.5% (27) conducted by flame burn. Duff and McCaffrey (2001) found that electrical injury patients had worse performance on measures of immediate and delayed memory and problem in cognition. Scalds were the most common burn mechanism over a third (39.6%) of all admissions, but they occurred more frequently in people with dementia than those without dementia (53.9% vs 37.8%, $p < 0.0001$). Chemical and electrical burns were uncommon. A quarter of admissions were as a result of exposure to smoke fire or flames, and within flame burns, there was no difference in risk of fire-related burns (Purohit et al., 2013). In this study, that the association between the conduct of burn

and presence of cognitive impairment is ($\chi^2 = 17.492$, $P > 0.05$). So, it indicates that the conduct of burn and presence of cognitive impairment is not significant.

Among 72 participants, more than half of the participants 51% (38) had partial thickness loss and full thickness loss had 49% (34) participants. Pliskin et al. (2006) reported that patients who had full thickness burn their cognitive level is affected. This study, that the association between the depth of burn and presence of cognitive impairment is significant ($\chi^2 = 10.477$, $P < 0.05$).

Among 72 participants 70.80% (51) participants had no concern about swallowing difficulties. And 29.20% (21) participants had concern about their swallowing difficulties. Most of the participants also concern about their voice difficulties. 88% (63) participants had no concern voice. And 12.5% (9) participants had concern about their voice difficulties. 83% (60) participants had no concern about difficulty in articulation. And 17% (12) participants had concern about their articulation difficulties.

About area of burn in this study, nearly half of participants 27.80% (20) had head & neck area burn. This study that the association between the area of burn and presence of cognitive impairment is not significant ($\chi^2 = 17.465$, $P > 0.05$). So, the incidence rate of cognitive impairment in burn patients do not depends on area of burn.

The most important findings in this study, maximum number of the participants, 38.90% (28) had no problem. Majority of the participants 20.80% (15) participants had definite cognitive decline. Among this participants 19.40% (14) participants had mild cognitive impairment and significant cognitive impairment. And only 1.40% (1) participants had profound cognitive impairment.

Burn patients who were admitted into an IRF setting, among them 79% of total participant had cognitive FIM deficits on admission, and the other 27% had cognitive deficits at the time of discharge (Bajorek et al., 2017). Adults with burn injury showed significant signs of impairment in scores of cognitive Functional Independence Measure (FIM) test than other rehabilitation populations. The population of burn patient has clearly lower cognitive FIM scores, with memory appearing to be the driver of overall cognitive functional impairment (Purohit et al., 2013).

Adults with burn injury have been reported to have worse cognitive FIM total scores on admission comparing to other rehabilitation populations, particularly in the

memory domain. In one of the analysis done upon burn patients admitted to an IRF setting, the percentage was 79% who had cognitive FIM deficits on admission. In this study mini mental state examination (MMSE) had been used for identify cognitive deficit. The MMSE asked questions which is useful for assessing the five areas of cognitive functioning (orientation, immediate memory, attention/concentration, delayed recall, language).According to MMSE 46.80 (35) participant's orientation score less than 7 out of 10. But 51.40% (37) participants Orientation score greater than 8 out of 10. According to MMSE scoring 2.80 (2) participants registration score less than 2 out of 3. But 97.20% (70) participants Orientation score greater than 1 out of 3. According to MMSE 39.90% (28) participants attention score less than 4 out of 5. But 61.10% (44) participant's attention score greater than 3 out of 5. According to MMSE 18.10% (13) participants recalling score less than 2 out of 3. But 81.90% (59) participant's recalling score greater than 1 out of 3. According to MMSE 33.30% (24) participants language score less than 8 out of 9. But 66.70% (48) participant's language score greater than 7 out of 9 (Less than means problem, Greater than means no problem).

Burns can be defined as one of the most devastating form of trauma that has afflicted mankind since ancient times. Patients with burn injuries have high risk of cognitive deficits. Cognitive impairments is a life threatening problem including attention, memory, problem solving, decision making, and knowledge. In this study the total participants were 72 where most of the participants 78% (56) were male. Cognitive impairment found highest 17 participants in the age range 18-27 years. In this study, investigator found that highest cognitive impairment found 18 participants in more than one month earlier. Highest 19 electric burn patients found who have problem in cognition. The highest number of cognitive impairment found in 26 participants who had full thickness loss. Most of cognitive problem (12) found in head & neck area. Head & Neck region burn patients have shown major signs of vulnerability that results in cognitive impairments. Memory deficits appear to be the main factor of these cognitive deficits. These deficits can be identified at the time of admission with procedure like, cognitive screening, potentially affecting patient outcomes and disability benefits, among other factors. Screening for cognitive deficits typically involves evaluation by a speech therapist (Purohit et al., 2013). If there is any signs of a difficulty in screening reveals, this particular difficulties can be further addressed by a speech therapist to ensure a proper decision making in diagnosis and treatment. The treatment procedure may include members; like, rehabilitation psychologists, occupational therapists, neuropsychologists, rehabilitation nurses, or physicians. Identifying these difficulties early in the rehabilitation stay may possibly improve the treatment goals and outcomes for these patients. For patients with burn injury, further research is needed to understand the impact of these deficits on rehabilitation outcomes and the potential value of cognitive therapies as intervention.

5.1 Limitation

This is the first study on cognitive impairment among burn injury patients in Bangladesh. So there were some limitations and barriers during conducting the study.

Those are following below:

- 72 participants were selected to conduct the study for a short period of time. Participants were small in number to conduct survey to find out the number of cognitive impairment.
- Standard tools were barely available for checking burn injury patient's cognition but it was not free and cost was not affordable.
- Researcher faced difficulty while conducting the study because of few numbered books and information relating burn injury and communication.

5.2 Recommendation

By conducting the study, investigator found that cognitive impairment occurring in burn injury depends on age, type and area of burn. This is the first time this kind of study on cognitive impairment among burn injury patient. This study selected only 72 participants as sample. It is suggested to increase the number of the sample as well as study location for further study on it.

- The same study can be conducted by other researchers increasing the number of the participants and changing the study location.
- Another study can be done on how cognitive impairment affects as the quality of life after burn injury.
- Further study can be conducted on cognitive communication difficulties among burn injury patient.
- Also on speech difficulties among burn injury patient.
- Another study can be conducted on voice characteristics of burn injury patient.
- Speech & Language therapist role in multi-disciplinary burn care management.
- Long-term cognitive deficits after severe burns injury.

- Aase, D. M., Fink, J. W., Lee, R. C., Kelley, K. M., & Pliskin, N. H. (2014). Mood and cognition after electrical injury: A follow-up study. *Archives of clinical neuropsychology*, 29, 125-130. doi: 10.1093/arclin/act117
- American Academy of Physical Medicine and Rehabilitation. (2018). *Burn Rehabilitation*. Retrieved June, 2018, from <https://now.aapmr.org/burn-rehabilitation/>
- Ammar, A. N., Fink, J. W., Malina, A. C., Ramati, A., Kelley, K. M., Crawford, I., & Pliskin, N. H. (2006). Memory functioning in electrically injured patients with and without PTSD. *Acta Neuropsychologica*, 4, 119-124. <https://uic.pure.elsevier.com/en/publications/memory-functioning-in-electrically-injured-patients-with-and-with>
- Baily, D.M. (1997). *Research for the Health Professional: a Practical Guide* (2nd ed.). Davis Company, USA.
- Bajorek, A.J., Slocum, C., Goldstein, R., Mix, J., Niewczyk, P., Ryan, C.M., & Schneider, J.C. (2017). *PM&R*, 9, 1-7. [https://www.pmrjournal.org/article/S1934-1482\(16\)30252-0/abstract](https://www.pmrjournal.org/article/S1934-1482(16)30252-0/abstract)
- Bhansali, C., Gandhi, G., Sahastrabudhe, P., & Panse, N. (2017). Epidemiological study of burn injuries and its mortality risk factors in a tertiary care hospital. *Indian Journal of Burns*, 25, 62-62. doi: <https://go.galegroup.com/ps/i.do?p=AONE&sw=w&u=googlescholar&v=2.1&it=r&id=GALE%7CA519525522&sid=classroomWidget&asid=99e87209>

- Bond, S., Gourlay, C., Desjardins, A., Bodson-Clermont, P., & Boucher, M.E. (2017). Anxiety, depression and PTSD- related symptoms in spouses and close relatives of burn survivors: When the supporter needs to be supported. *Burns*, 43, 592-601. [https:// www. Burnsjournal.com/ article/ S0305-4179 \(16\) 30403-X/ abstract? code=jbur-site](https://www.burnsjournal.com/article/S0305-4179(16)30403-X/abstract?code=jbur-site)
- Cambridge Cognition, (2018). *Cognition & Cognitive Behaviour*. Retrieved June, 2018, from <http://www.cambridgecognition.com/blog/entry/what-is-cognition>
- Coelho, C. A., DeRuyter, F., & Stein, M. (1996). Treatment efficacy: Cognitive-communicative disorders resulting from traumatic brain injury in adults. *Journal of Speech, Language, and Hearing Research*, 39, 5-17. doi:10.1044/jshr.3905.s5
- Comprehensive Rehabilitation of Burns, Steven V. Fisher, M.D. Phala A. Helm, M.D. Williams & Wilkins, 1994, Baltimore, MD 21202, U.S.A, Waverly Press, Inc.
- Druery, M., Brown, T. L. H., & Muller, M. (2005). Long term functional outcomes and quality of life following severe burn injury. *Burns*, 31, 692-695. doi: 10.1016/j.burns.2005.03.001
- Ehrlich, A. R. (2006). Dementia as a risk factor for major burns. *Journal of burn care & Research*, 27, 120-120. <https://academic.oup.com/jbcr/article-abstract/27/1/120/4555513>
- Fisher, S.V., Helm, M.D.P, Williams & Wilkins. (1994). *Comprehensive Rehabilitation of Burns*. Baltimore: Waverly Press, Inc.

- Frankel, J., & Wallen, N. (2000). *How to Design and Evaluate Research in Education*. USA:McGraw Hill.
- Gupta, J. L., Makhija, L. K., & Bajaj, S. P. (2010). National programme for prevention of burn injuries. *Indian Journal of Plastic Surgery: Official Publication of the Association of Plastic Surgeons of India*, 43, 6-10. doi: 10.4103/0970-0358.70716
- Harvey, L., Mitchell, R., Brodaty, H., Draper, B., & Close, J. (2016). Dementia: A risk factor for burns in the elderly. *Burns*, 42, 282-290. [https://www.burnsjournal.com/article/S0305-4179\(15\)00333-2/abstract](https://www.burnsjournal.com/article/S0305-4179(15)00333-2/abstract)
- Hicks, C. M. (2000). *Research methods for clinical therapists* (3rd ed.). London: Churchill Livingstone.
- Holmes, E. G., Jones, S. W., & Laughon, S. L. (2017). A retrospective analysis of neurocognitive impairment in older patients with burn injuries. *Psychosomatics*, 58, 386-394. [https://www.psychosomaticsjournal.com/article/S0033-3182\(17\)30067-1/abstract](https://www.psychosomaticsjournal.com/article/S0033-3182(17)30067-1/abstract)
- Horridge, G., Cohen, K., & Gaskell, S. (2010). BurnEd: parental, psychological and social factors influencing a burn-injured child's return to education. *Burns*, 36, 630-638. <https://www.sciencedirect.com/science/article/pii/S0305417909004562>
- Jagnoor, J., Lukaszyk, C., Fraser, S., Chamania, S., Harvey, L. A., Potokar, T., & Ivers, R. Q. (2017). Rehabilitation practices for burn survivors in low and middle income countries: A literature review. *Burns*, 44, 1052-1064. <https://www.sciencedirect.com/science/article/pii/S0305417917305557>

- Mashreky S.R., Rahman A., Chowdhury S., Giashuddin S., Svanström L., Linnan M., Shafinaz S., Uhaa I.J., Rahman F. Epidemiology of childhood burn: Yield of largest community based injury survey in Bangladesh. *Burns*, 14, 856–862. doi: 10.1016/j.burns.2007.09.009
- Nayeb-Hashemi, N., Rosenberg, M., Rosenberg, L., Sharp, S., Thomas, C., Holzer, C., & Meyer, W. (2009). Skull burns resulting in calvarial defects: Cognitive and affective outcomes. *Burns*, 35, 237-246. [https://www.burnsjournal.com/article/S0305-4179\(08\)00211-8/abstract?code=jbur-site](https://www.burnsjournal.com/article/S0305-4179(08)00211-8/abstract?code=jbur-site)
- Patterson, D. R., Everett, J. J., Bombardier, C. H., Questad, K. A., Lee, V. K., & Marvin, J. A. (1993). Psychological effects of severe burn injuries. *Psychological bulletin*, 113, 362. doi:10.1037/0033-2909.113.2.362
- Purohit, M. P., Goldstein, R., Ryan, C. M., Niewczyk, P., Zafonte, R. D., Gerrard, P., & Schneider, J. C. (2013). Cognition in Patients with Burn Injury in the Inpatient Rehabilitation population. *PM&R*, 5v, S264. [https://www.pmrjournal.org/article/S1934-1482\(13\)00858-7/abstract?code=pmrj-site](https://www.pmrjournal.org/article/S1934-1482(13)00858-7/abstract?code=pmrj-site)
- Rothman, D. J., Sutter, M., Perrin, P. B., LiBrandi, H., & Feldman, M. J. (2016). Coping styles and Quality of life in adults with burn. *Burns*, 42, 1105-1110. [https://www.burnsjournal.com/article/S0305-4179\(16\)000826/abstract?code=jbur-site](https://www.burnsjournal.com/article/S0305-4179(16)000826/abstract?code=jbur-site)

- Rumbach, A. F., Clayton, N. A., Muller, M. J., & Maitz, P. K. (2016). The speech-language pathologist's role in multidisciplinary burn care: An international perspective. *Burns*, 42, 863- 871. doi:10.1016/j.burns.2016.01.011
- Sbordone, R. J., & Saul, R. E. (2000). *Neuropsychology for health care professionals and attorneys*. CRC Press.
- Tripathi, S., & Basnet, S. J. (2017). Epidemiology of burn injuries in Nepal: a systemic review. *Burns & trauma*, 5, 10. doi:10.1186/s41038-017-0075-3
- Watson, E. J., Nenadlová, K., Clancy, O. H., Farag, M., Nordin, N. A., Nilsen, A., & Edginton, T. L. (2018). Perioperative Research into Memory (PRiMe): Cognitive impairment following a severe burn injury and critical care admission, part 1. *Burns*. 44, 1167-1178. <https://www.sciencedirect.com/science/article/pii/S0305417918302250>
- Willebrand, M., Norlund, F., Kildal, M., Gerdin, B., Ekselius, L., & Andersson, G. (2002). Cognitive distortions in recovered burn patients: the emotional Stroop task and autobiographical memory test. *Burns*, 28, 465-471. [https://www.burnsjournal.com/article/S0305-4179\(02\)00052-9/abstract?code=jbur-site](https://www.burnsjournal.com/article/S0305-4179(02)00052-9/abstract?code=jbur-site)
- World Health Organization. (2018). *Burns*. Retrieved June, 2018, from http://www.who.int/violence_injury_prevention/other_injury/burns/en/
- World Health Organization. (2018). *Burns*. Retrieved September, 2018, from <http://www.who.int/news-room/fact-sheets/detail/burns>

Annexure-1 (A)

Demographic information

Date:

Name:

Age:

Sex:

Education:

Occupation:

Depth of Burn:

Onset of Burn:

Area of Burn:

Conduct of Burn:

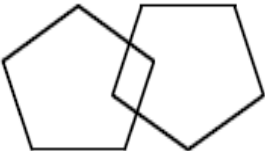
Do you have any significant change on your voice?

Do you face any difficulty during speech production?

Do you feel any difficulties/ discomfort during swallow?

Annexure-1 (B)

Mini-Mental State Examination (MMSE) (English)

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

Annexure-1 (C)

নামঃ

বয়সঃ

লিঙ্গঃ

শিক্ষাগত যোগ্যতাঃ

পেশাঃ

অগ্নিদগ্ধ জায়গার গভীরতাঃ

অগ্নিদগ্ধের প্রাচুর্যকালঃ

শরীরে কোন অংশ অগ্নিদগ্ধ হয়েছে:

অগ্নিদগ্ধ হওয়ার মাধ্যমঃ

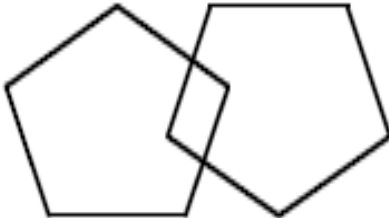
আপনার কণ্ঠস্বর এর কোন পরিবর্তন হয়েছে কিনা?

কথা বলতে গিয়ে কোন অস্পষ্টতা বা কথা বলতে কোন সমস্যা হয় কি না?

খাবার খেতে কোন সমস্যা হয় কি না?

Annexure-1 (D)

Mini-Mental State Examination (MMSE) (Bangla)

সর্বাধিক স্কোর	রোগীর স্কোর	প্রশ্নাবলি
৫		কোন বছর? কোন ঋতু? তারিখ? দিন? মাস? "
৫		"আপনি এখন কোথায় আছেন? দেশের নাম কি? শহরের নাম কি? আপনার গ্রামের বাড়ি কোথায়? হাসপাতালের নাম কি? আপনি হাসপাতালের কোন তলায় আছেন? "
৩		আমি তিনটি বস্তুর নাম বলব। আমার শেষ হয়ে গেলে, আপনি শব্দগুলো পুনরায় বলবেন। এই শব্দগুলো মনে রাখবে কারণ আমি আপনাকে কয়েক মিনিটের মধ্যে আবার এই নাম গুলো জিজ্ঞাসা করব। মানুষ , বল, গাড়ী
৫		রোগীকে "কমলা" শব্দটি বলুন। তারপর রোগীকে উল্টো ভাবে শব্দটি বলতে বলুন।
৩		আমি আপনাকে ৩ টি নাম মনে রাখতে বলেছিলাম? ঐগুলো বলুন
২		রোগীকে ২ টি সাধারণ জিনিসের নাম বলা হবে যেমন ঘড়ি ও পেন্সিল। এগুলো দেখিয়ে রোগীকে এর নাম জিজ্ঞেস করুন।
১		আপনাকে আমি বাক্যাংশ বলা হবে আপনি এরপর পুনরাবৃত্তি করবেন। " যদি না, এবং, কিন্তু "
৩		একটি কাগজ ডাণ্ড হাতে নিন এবং ভাঁজ করে মেঝেতে রাখুন।
১		অনুগ্রহ করে এটি পড়ুন এবং এখানে যা বলা হয়েছে তা করুন। " তোমার চোখ বন্ধ করো"।
১		একটি বাক্য লিখুন।
১		ছবিটি আঁকুন। 
৩০		মোট

Annexure-2

Results (Chi square tests)

2.1 Association between age and presence of cognitive impairment

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.033 ^a	20	.585
Likelihood Ratio	18.164	20	.577
Linear-by-Linear Association	.375	1	.540
N of Valid Cases	72		

Association between age and presence of cognitive impairment examined by chi-square test. The association was not significant ($p > 0.05$).

2.2 Association between onset of burn and presence of cognitive impairment

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.820 ^a	16	.014
Likelihood Ratio	15.597	16	.481
Linear-by-Linear Association	1.107	1	.293
N of Valid Cases	72		

Association between onset of burn and presence of cognitive impairment examined by chi-square test. The association was significant ($p < 0.05$).

2.3 Association between conduct of burn and presence of cognitive impairment

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.492 ^a	12	.132
Likelihood Ratio	19.494	12	.077
Linear-by-Linear Association	.008	1	.927
N of Valid Cases	72		

Association between conduct of burn and presence of cognitive impairment examined by chi- square test. The association was not significant ($p>0.05$).

2.4 Association between depth of burn and presence of cognitive impairment

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.477 ^a	4	.033
Likelihood Ratio	11.119	4	.025
Linear-by-Linear Association	6.967	1	.008
N of Valid Cases	72		

Association between depth of burn and presence of cognitive impairment examined by chi- square test. The association was significant ($p<0.05$).

2.5 Association between area of burn and presence of cognitive impairment

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.465 ^a	24	.828
Likelihood Ratio	18.591	24	.773
Linear-by-Linear Association	.118	1	.731
N of Valid Cases	72		

Association between area of burn and presence of cognitive impairment examined by chi- square test. The association was not significant ($p>0.05$).

Annexure-3(A)

CONSENT FORM

Assalamualaikum/Namaskar, my name is Twasin Tazin. I am conducting this study for a Bachelor project study titled “Cognitive impairment among burn injury patient” from Bangladesh Health Professions Institute (BHPI), under the Medicine faculty of Dhaka University. I would like to know about some personal and other related questions. This will take approximately 10-15minutes.

I would like to inform you that this is a purely academic study and will not be used for any other purpose. All information provided by you will be treated as confidential and in the event of any report or publication it will be ensured that the source of information remains anonymous.

Your participation in this study is voluntary and you may withdraw yourself at any time during this study without any negative consequences. You also have the right not to answer a particular question that you don't like or do not want to answer during the interview.

If you have any query about the study or your right as a participant, you may contact with Twasin Tazin researcher and/ or Md. Sazzad Hossain Supervisor and Head of the Speech & Language Therapy Department, Bangladesh Health Professions Institute (BHPI).

Do you have any questions before I start?

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

YES/ NO

Signature/Fingerprint of the Participant:

Date:

Signature of the Investigator:

Date:

Signature/Fingerprint of the witness:

Date:

Annexure-3 (B)

সম্মতিপত্র

আসসালামুয়ালাইকুম/নমস্কার, আমার নাম তাসিন তাজিন। আমি একটা ব্যাচেলর প্রোজেক্টের জন্য, বাংলাদেশ হেলথ প্রফেশনস ইন্সটিটিউট, ঢাকা বিশ্ববিদ্যালয় হইতে, “অগ্নিদগ্ধ রোগীদের বুদ্ধিমত্তা ও জ্ঞান সম্বন্ধীয় সমস্যা” এই বিষয়ের উপর গবেষণা করছি। এই বিষয়ের উপর আমি কিছু ব্যক্তিগত এবং অন্যান্য বিষয় সম্পর্কে জানতে চাই। এই আলোচনার সময় সীমা সর্বোচ্চ ১০- ১৫ মিনিট। গবেষক, অংশগ্রহনকারীদের কাছ থেকে গৃহীত সকল তথ্যের গোপনীয়তা রক্ষা করবেন এবং প্রকাশের ক্ষেত্রে নাম বাদ দিয়ে প্রকাশ করা হবে। এই গবেষণায় আপনার অংশগ্রহণ হবে ঐচ্ছিক এবং আপনি যে কোন সময়ে এই গবেষণা থেকে নিজেকে প্রত্যাহার করতে পারবেন। এখানে উল্লেখ্য যে, এই সাক্ষাৎকার গ্রহনকালে অংশগ্রহনকারী সকল প্রশ্নের জবাব দিতে বাধ্য থাকবেন না। আপনার যদি কোন তথ্য জানার থাকে বা অংশগ্রহনকারী হিসেবে আপনার অধিকার যে, আপনি যোগাযোগ করতে পারেন গবেষক অথবা সুপারভাইজার এবং স্পীচ অ্যান্ড ল্যাংগুয়েজ থেরাপি বিভাগের প্রধান মোঃ সাজ্জাদ হোসেন, স্পীচ অ্যান্ড ল্যাংগুয়েজ থেরাপি বিভাগ, বাংলাদেশ হেলথ প্রফেশনস ইন্সটিটিউট।

আলোচনা শুরু করার আগে,

আপনার কি কিছু জানার আছে?

আলোচনার জন্য আমি কি অনুমতি পেতে পারি?

হ্যাঁ/না

অংশগ্রহনকারীর স্বাক্ষর / টিপসইঃ

তারিখঃ

গবেষকের স্বাক্ষরঃ

তারিখঃ

সাক্ষ্যপ্রদানকারীর স্বাক্ষর/ টিপসইঃ

তারিখঃ

Annexure-4 (A)

Permission letter from BHPI



বাংলাদেশ হেল্থ প্রফেশনস ইনস্টিটিউট (বিএইচপিআই)
BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)
(The Academic Institute of CRP)
CRP-Chapain, Savar, Dhaka, Tel: 7745464-5, 7741404, Fax: 7745069
BHPI-Mirpur Campus, Plot-A/5, Block-A, Section-14, Mirpur, Dhaka-1206. Tel: 8020178, 8051662-3, Fax: 8053661

সিআরপি-বিএইচপিআই/১০/১৮/৬৮

তারিখঃ ০১.১০.২০১৮

প্রতি
নির্বাহী পরিচালক
এসিড সার্ভাইবার ফাউন্ডেশন
মিরপুর ১৪, ঢাকা- ১২০৬ বাংলাদেশ

বিষয় : রিসার্চ প্রজেক্ট এর জন্য আপনার প্রতিষ্ঠান সফর ও তথ্য সংগ্রহ প্রসঙ্গে।

জনাব,
আপনার সদয় অবগতির জন্য জানাচ্ছি যে, পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্রে-সিআরপি'র শিক্ষা প্রতিষ্ঠান বাংলাদেশ হেল্থ প্রফেশনস ইনস্টিটিউট (বিএইচপিআই) ঢাকা বিশ্ববিদ্যালয় অনুমোদিত বিএসসি ইন স্পীচ এন্ড ল্যান্গুয়েজ থেরাপি কোর্স পরিচালনা করে আসছে।
উক্ত কোর্সের ছাত্রছাত্রীদের কোর্স কারিকুলামের অংশ হিসাবে বিভিন্ন বিষয়ের উপর রিসার্চ ও কোর্সওয়ার্ক করা বাধ্যতামূলক।
বিএইচপিআই'র ৪র্থ বর্ষ বিএসসি ইন স্পীচ এন্ড ল্যান্গুয়েজ থেরাপি কোর্সের ছাত্রী তুসিন তাজিন তার রিসার্চ সংক্রান্ত কাজের তথ্য সংগ্রহের জন্য আগামী ০৬.১০.২০১৮ তারিখ থেকে ১০.১২.২০১৮ তারিখ পর্যন্ত আপনার প্রতিষ্ঠানে সফর করতে আমহী। তার রিসার্চ এর শিরোনামঃ
“Cognitive impairment among burn injury patient”
তাই তাকে আপনার প্রতিষ্ঠান সফর এবং প্রয়োজনীয় তথ্য প্রদান সহ সার্বিক সহযোগিতা প্রদানের জন্য অনুরোধ করাছি।

ধন্যবাদান্তে



মোঃ সাব্বাস হোসেন
সহকারী অধ্যাপক ও বিভাগীয় প্রধান
স্পীচ এন্ড ল্যান্গুয়েজ থেরাপি বিভাগ
বিএইচপিআই।

Annexure-4 (B)

Permission from Dhaka Medical College Hospital (DMCH)



বাংলাদেশ হেল্থ প্রফেশন ইনস্টিটিউট (বিএইচপিআই)
BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)
(The Academic Institute of CRP)
CRP-Chapain, Savar, Dhaka, Tel: 7745464-5, 7741404, Fax: 77451069
18 HP-Mirpur Campus, Plot-A/5, Block-A, Section-14, Mirpur, Dhaka-1206. Tel: 8020178, 8053662-3, Fax: 8053661

সিআরপি-বিএইচপিআই/০৯/১৮/৬৮

তারিখ : ২৩.০৯.২০১৮

প্রতি

অধ্যক্ষ এবং বিভাগীয় প্রধান

ডিপার্টমেন্ট অফ বার্ন এবং প্লাস্টিক সার্জারি, ঢাকা মেডিকেল কলেজ এবং,

প্রজেক্ট পরিচালক

শেখ হাসিনা ন্যাশনাল ইনস্টিটিউট অব বার্ন এন্ড প্লাস্টিক সার্জারি

সচিবালয় রোড, ঢাকা- ১০০০।

বিষয় : রিসার্চ প্রজেক্ট এর জন্য আপনার প্রতিষ্ঠান সফর ও তথ্য সংগ্রহ প্রসঙ্গে।

জনাব,

আপনার সদয় অকণ্ঠির জন্য জানাচ্ছি যে, পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্রে-সিআরপি'র শিক্ষা প্রতিষ্ঠান বাংলাদেশ হেল্থ প্রফেশনস ইনস্টিটিউট (বিএইচপিআই) ঢাকা বিশ্ববিদ্যালয় অনুমোদিত বিএসসি ইন স্পীচ এন্ড ল্যাঙ্গুয়েজ থেরাপি কোর্স পরিচালনা করে আসছে।

উক্ত কোর্সের ছাত্রছাত্রীদের কোর্স কারিকুলামের অংশ হিসাবে বিভিন্ন বিষয়ের উপর রিসার্চ ও কোর্সওয়ার্ক করা বাধ্যতামূলক।

বিএইচপিআই'র ৪র্থ বর্ষ বিএসসি ইন স্পীচ এন্ড ল্যাঙ্গুয়েজ থেরাপি কোর্সের ছাত্রী তাসিন তাজিন তার রিসার্চ সংক্রান্ত কাজের তথ্য সংগ্রহের জন্য আগামী ২৭.০৯.২০১৮ তারিখ থেকে ২৭.১১.২০১৮ তারিখ পর্যন্ত আপনার প্রতিষ্ঠানে সফর করতে আগ্রহী।

তাই তাকে আপনার প্রতিষ্ঠান সফর এবং প্রয়োজনীয় তথ্য প্রদান সহ সার্বিক সহযোগিতা প্রদানের জন্য অনুরোধ করছি।

ধন্যবাদে

মোঃ সাজ্জাদ খোসেন

সহকারী অধ্যাপক ও বিভাগীয় প্রধান

স্পীচ এন্ড ল্যাঙ্গুয়েজ থেরাপি বিভাগ

বিএইচপিআই।

Forwarded

Dr. Md. Rabiul Karim Khan
MBBS, FCPS (Plastic Surgery)
Associate Professor
Dept. of Burn & Plastic Surgery
Dhaka Medical College Hospital

Prof. Dr. Md. Sazzad Khondoker
Professor & Head
Department of Plastic Surgery & Burn Unit
Dhaka Medical College & Hospital, Dhaka
Prof. Dr. Md. Sazzad Khondoker
Professor of Plastic Surgery
National Institute of Burn & Plastic Surgery
Dhaka Medical College & Hospital

Annexure-4 (C)

Permission from Acid Survivors Foundation

