Predictive Factors for Community Integration Among Persons After Traumatic Brain Injury

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I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

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ABSTRACT

This cross sectional predictive study was conducted to identify the level of community integration and its predicting factors among persons after traumatic brain injury (TBI). A total of 120 TBI survivors living in the community of province number three in Nepal were selected by stratified sampling technique. The demographic and clinical information were obtained from Demographic questionnaire whereas the data related to social support, physical environment, fatigue and community integration were obtained from Multidimensional Scale of Perceived Social Support (MSPSS), Craig Hospital Inventory of Environmental Factors (CHIEF), Modified Fatigue Impact Scale (MFIS), and Community Integration Questionnaire (CIQ) respectively. The content validity of questionnaires were performed by five experts. The Cronbach's alpha coefficients for CIQ, MSPSS, CHIEF and MFIS were .75, .92, .90 and .93, respectively. The data analysis were carried out using descriptive statistics, Pearson's Product Momentum Correlation, and linear regression.

The findings of the study revealed that the level of community integration among the participants was at moderate level ($M = 15.99$, $SD = 3.32$). The study found that fatigue ($\beta = -.31$, $p < .00$) could statistically predict community integration among persons after TBI which explained 9.6% of the variance

($R^2 = .096$, $F_{(3, 116)} = 4.11$, $p <.001$). The findings of the study would be helpful for developing and implementing nursing interventions to strengthen community integration among persons after TBI.

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Sumana Lama

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Chapter 1

Introduction

This chapter includes the background and significance of the problem, objectives of the study, research questions, conceptual framework of the study, research hypothesis, definition of the terms, scope of the study, and significance of the study.

Background and Significance of the Problem

Traumatic Brain Injury (TBI) is one of the widely known causes of death and long-term disability among survivors. The World Health Organization estimated that TBI due to road traffic accident will be the third largest cause of mortality, morbidity, and disability among survivors by 2020 (Tabish & Syed, 2014; World Health Organization [WHO], 2015). Globally, more than 50 million people suffer from TBI per year (Maas et al., 2017). It has been estimated that 2% of the population of the United States are living with a TBI related disability (Centers for Disease Control and Prevention [CDC], 2016) and 1.3 million people in Europe are TBI survivors with disabilities (Majdan et al., 2017). However, no data are available for countries such as India and China where TBI incidence is high (Stocchetti & Zanier, 2016). In the context of Nepal, one survey study found that 22% of traumatic head injury persons were living with disabilities (Gupta et al., 2015).

TBI severity is classified based on the duration of unconsciousness, extent of post-traumatic amnesia and findings on structural imaging (Department of Defense &

Department of Veterans Affairs, 2009). Approximately 75% of all TBIs are mild or concussive events (Zelnick et al., 2014) and 15-23% of mild TBI patients experienced disabling symptoms such as insomnia, fatigue, cognitive disturbances, dizziness, headache, depression, and pain which persisted beyond three months (Kraus, Hsu, Schafer, & Afifi, 2014; Paunio et al., 2014; Sivertsen et al., 2014). The consequences of moderate to severe TBI shows various secondary pathological conditions including seizures, sleep disorders, neuro endocrine dysregulation, and psychiatric problems (Bramlett & Dietrich, 2015; Maroon, Mathyssek, & Bost, 2014). Hence, the severity of TBI consequences is mostly related with the challenges in psychosocial activities of daily living among TBI survivors.

The most common issues in TBI survivors are physical, cognitive, and emotional disabilities causing difficulty in daily activities and participation in the community (Khan et al., 2016; Roe, 2013). According to the International Classification of Functioning, Disability, and Health (ICF) framework (WHO, 2001) the effects of disability including in TBI survivors are described as impairments of motor and sensory dysfunction, pain, balance difficulties, spasticity, and memory impairment that result in activity limitations related to mobility, self-care, and cognition. Moreover, TBI survivors suffered from the reduction in participation with society which leads to impaired social and coping skills, unemployment, difficulty maintaining interpersonal relationships, driving, managing finances, social isolation, and poor self-esteem (WHO, 2001). Therefore, the problems with psychosocial adjustment and social participation among TBI survivors have great impacts in terms of delay in return to home or adaptation to a productive life or community integration (Parvaneh, Ghahari, & Cocks, 2014).

Community integration is important for all disabilities including TBI survivors who have been identified to have the ability to resume social roles as appropriate within their cultural and developmental context (Andelic et al., 2016; Domac & Sobaci, 2014). Many studies have shown that community integration is an essential component for rehabilitation among TBI survivors which usually secures positive outcomes in terms of social activities, community participation, and productive work (Andelic et al., 2016; Forslund, Roe, Arango-Lasprilla, Sigurdardottir, & Andelic, 2013; Mollayeva, Shapiro, Mallayeva, Cassidy, & Colantonio, 2015). Moreover, community integration is active participation in a broad range of community involvement in three major areas: (1) home integration which is active participation of the individual in the operation of the home; (2) social integration which is participation in a variety of activities outside the home, social activities/events; and (3) productive activities which include employment, educational, and volunteer activities in which the individual participates (Willer, Rosenthal, Kreutzer, & Rempel, 1993). However, community integration not only explains the integration of an individual in a social setting with equal access to community resources, it is also concerned with the issues regarding body, structure, function, activities, and external and internal environmental factors as well as societal barriers among the disabled population (Domac & Sobaci, 2014; WHO, 2001).

Community integration is usually related with positive outcomes among TBI survivors (Nalder et al., 2016). Previous studies conducted among TBI survivors revealed a high level of community integration (Andelic et al., 2016; Nalder et al., 2016). The high level of community integration was associated with returning to meaningful work, involvement in home activities, and support from family, friends, and significant others (Forslund et al., 2013; Sandhaugh, Andelic, Langhammer, & Mygland, 2015). However, some studies revealed a low level of community integration was associated with social isolation, reduced independency, psychosocial problems, and low productive activities (Abrahamson, Jensen, Springett, & Sakel, 2017; Mollayeva et al., 2015). Hence, the rehabilitation and recovery among TBI survivors successfully depend upon favorable factors.

Different factors are evidenced to facilitate or impede community integration among TBI survivors. Previous studies have focused on factors that predicted community integration among persons after TBI (Andelic et al., 2016; Fleming, Nalder, Stein, & Cornwell, 2014; Mollayeva et al., 2015). Factors that usually facilitate community integration among TBI survivors include social support (Batchos, Easton, Haak, & Ditchman, 2018; Ditchman, Sheehan, Rafajko, Haak, & Kazukauskas, 2016), whereas physical environment and fatigue were mostly found as barriers for community integration among TBI survivors (Fleming et al., 2014; Juengst, Osborne, Erler, & Raina, 2017).

Social support may facilitate access to community resources, interaction with community members, and achievement of a sense of belonging (Donker-Cools, Schouten, Wind, & Frings-Dresen 2018; Nalder et al., 2016). Studies have shown that support from family and friends was positively associated with a high level of community integration whereas support from co-workers, employer, and health professionals was related to a low level of community integration (Donker-Cools et al., 2018; Nicholas & Kosciulek, 2014).

Physical environment is one of the sensitive aspects in community integration among TBI survivors and changes in the physical environment over time acted either as barriers or facilitators among TBI survivors (Fleming et al., 2014, WHO, 2001). The researchers stated that aspects of the physical environment, especially the structure, lighting, temperature, and weather, were associated with a low level of community integration among TBI survivors (Fleming et al., 2014; Pappadis, Sander, Leung, & Struchen, 2012). However, another study among TBI survivors showed that availability of automatic doors, provisions of assistance to access direction and route transit information at a bus station was associated with enhancing the level of community integration (Lefebvre & Levert, 2014).

Fatigue is one of the most common disabling symptoms among TBI survivors (Lequerica, et al., 2016). Fatigue among TBI survivors can be central fatigue (due to dysfunction of structures within the central nervous system and is characterized by depletion of hormones and neurotransmitters) and peripheral fatigue (considered as a diminished ability to contract muscles, involving the peripheral motor and sensory systems) (Malley, Wheatcroft, & Gracey, 2014). Some studies have referred fatigue after TBI as post-TBI fatigue (Lequerica, et al., 2016; Mollayeva et al., 2013). The studies found that fatigue negatively contributed in participation among the TBI survivors living in a community (Buunk, Green, Veenstra, & Spikman, 2015; Juengst et al., 2017).

Community integration is the ultimate goal of recovery and rehabilitation among TBI survivors. Some studies showed that the nurse was a productive partner with family members who provided guidance for persons with TBI to successfully achieve psychosocial adjustment and transition back to a potential role in the community (Aspillaga et al., 2014; Kivunja, River, & Gullick, 2018). Moreover, nurses in the community, who approach a disabled individual and their care providers to provide education regarding their needs and adaptations to change, help in building relationships, support, and communication with the client family members and others (Bailey, Doody, & Lyons, 2014). In addition, a nurse's awareness encourages an individual with a disability to access the available resources for community participation (Bailey et al., 2014). Hence, community nurses play an essential role for enhancing community integration among TBI persons.

Community integration is an issue for all people living with a disability including TBI. Community integration and adapting by TBI survivors depends on the context and cultural origin (Corrigan, 1994). Also, the predictors for community integration can vary or have different impacts upon TBI survivors in different cultures, contexts, and geographical regions (Andelic et al., 2016). Furthermore, studies have shown that TBI survivors gain recovery between 6 to 12 months (Mauritz et al., 2010; Ponsford et al., 2014; Stocchetti & Zanier, 2016). The most significant recovery occurs in the physical status during the first six months after TBI (Pagulayan, Temkin, Machamer, & Dikmen, 2006). In addition, evidence has found that the process of recovery among TBI survivors was influenced from various factors affecting the rehabilitation outcome (Khan, Baguley, & Cameron, 2003).

Most of the research studies from Western or developed countries may not have implications for the Eastern or developing countries with regards to different socio-cultural beliefs, religions, and health care systems. Moreover, in a developed nation, rehabilitation for TBI includes inpatient rehabilitation and community rehabilitation to help TBI survivors in the process of recovery to integrate into home, social, and productive activities (Khan et al., 2003).

However, in most Eastern countries, the trend to preserve family harmony is a higher priority than individual preferences and the family becomes a decision making unit that affects individual autonomy (Shin et al., 2013). Similarly, Nepal is a collectivist society where family constellation is the basis for social structure (Boreson & Askesjo, 2015). Most of the family structures include extended and joint family systems that show strong bonding among the family members (Boreson & Askesjo, 2015; Family life of Nepal, 2013). In addition, Nepal is a geographically diverse land where people still have difficulty in the rural areas accessing health facilities such as rehabilitation services (Center Bureau of Statistics, 2011).

Furthermore, in the context of Nepal, there continues to be a lack of rehabilitation centers for head trauma patients. This indicates limited awareness of TBI survivors regarding community integration (Sakowitz, Sharma, & Kiening, 2005). For this reason, the predictors of community integration among TBI survivors in Nepal might be different with regards to social structure, geographical region, and the health system. Similarly, the existing knowledge on community integration among Nepalese is limited compared to developed countries. Therefore, it is important to examine the level of community integration and identify the predictors of community integration among persons after TBI.

Objectives of the Study

The objectives of this study aimed:

1) To describe the level of community integration among persons after TBI.

2) To determine the predictive factors (including social support, physical environment, and fatigue) for community integration among persons after TBI.

Research Questions

The research questions of this study were:

1) What is the level of community integration among persons after TBI?

2) Do social support, physical environment, and fatigue significantly predict the community integration among persons after TBI?

Conceptual Framework of the Study

The conceptual framework of the study is based on the ICF model of functioning and disability developed by the WHO (2001) and a review of the literature related to social support, physical environment, fatigue, and community integration among persons after a TBI.

The ICF was developed under the framework of the WHO (2001) for the assessment of a health condition in response to four components: (1) body functions and structure that refer broadly to impairment and functioning at the level of the body; (2) activities that reflect the functioning at the level of individual and participation is described as involvement of the individual in the life situation; (3) environmental factors that include physical environment, social environment, and attitudinal environment; and (4) personal factors that encompass the internal psychological state and characteristics of the individual such as age, gender, coping style, and past experience (WHO, 2001). In this study, the variables within the body structure and function domain include fatigue. Variables within participation include involvement in three areas of integration which are home integration, social integration, and integration into productive activities. Also, variables within the environment include physical environment and social environment which describe social support. Moreover, the ICF framework illustrates the dynamic interactions among the health condition, body functions and structure, activities, participation, and environmental and personal factors. In particular, participation is described as being affected by impairments, activity limitations, environmental factors, and personal factors (WHO, 2001).

Similarly, evidence has shown that the ICF provides the conceptualization among people after a brain injury in relation to community integration as participation in a broad range of community involvements that include mainly three areas of integration: (1) integration into a home-like setting that includes shopping for groceries, preparing meals, doing housework, caring for children, and planning social gatherings in the home (Willer et al., 1993); (2) integration into a social network which refers to participation in a variety of activities outside the home that include shopping, leisure activities, and visiting friends. Other aspects of social integration reflect aspects of interpersonal relationships such as having a best friend and participating in social activities with friends who are not disabled (Willer et al., 1993); and (3) integration into productive activities that include employment, educational, and volunteer activities in which the individual participates (Willer et al., 1993).

Based on the current evidence, predictors of community integration among TBI survivors include social support, physical environment, and fatigue. Social support and physical environment were highly associated with community integration among persons after TBI (Pappadis et al., 2012). In addition, these two factors were found to be predictors for community integration in previous studies conducted among brain injury survivors (Andelic et al., 2016; Fleming et al., 2014; Pugh et al., 2018). Additionally, fatigue was found to be one of the strong predictors of community integration among TBI survivors (Buunk, Groen, Veenstra, & Spikman, 2015; Juengst, Skidmore, Arenth, Niyonkuru, & Raina, 2013; Juengst et al., 2017).

Social support is a key factor related to community integration among people after TBI (Nicholas & Kosciulek, 2014; Umeasiegbu, Waletich, Whitten, & Bishop, 2013). Social support refers to an individual’s perception of support received from family, friends, and significant others (Zimet, Dahlem, Zimet, & Farley, 1988). Significant others could be professionals, co-workers, students, supervisors, and teachers (Nicholas & Kosciulek, 2014). Social support usually promotes good recovery among people after TBI (Umeasiegbu et al., 2013). Social support from family members encourages TBI persons to perform effective social roles in their respective communities (Nicholas & Kosciulek, 2014). In addition, social support shields the negative outcomes of TBI such as fatigue, depression, and anxiety thus enhancing community integration (Agtarap et al., 2017; Donker-Cools et al., 2018).

Physical environment was identified as one of the predictors of community integration in previous studies conducted among TBI survivors (Fleming et al., 2014; Pappadis et al., 2012). Physical environment is the nature and structure of the surrounding environment and community and includes the physical arrangement of the home, work, or community. The natural environment includes temperature, terrain, climate, noise, crowds, lighting, and the availability of transportation (Fleming et al., 2014; Shaikh, Kersten, Siegert, & Theadom, 2018; WHO, 2001). Changes in the physical environment over time act as barriers or facilitators for community integration among disabled people including TBI survivors (Fleming et al., 2014; Heinemann et al., 2015).

Fatigue among TBI survivors is one of the most common symptoms after injury (Lequerica et al., 2016). Fatigue among TBI survivors was found to be negatively associated with community integration (Buunk et al., 2015; Juengst et al., 2013). Most of the studies revealed fatigue as the strongest predictor of community integration among TBI persons living in a community (Juengst et al., 2013; Juengst et al., 2017). Fatigue was highly identified among higher levels of disability, severity of injury, and individuals with depressive mood (Ghroubi, Feki, Alila, & Elleuch, 2016; Holmquist, Lindstedt, & Moller, 2018).

Therefore, in this study, the ICF framework of functioning and disability along with the relevant literature review is used to describe the level of community integration and its predictors. The conceptual framework underpinning this study is shown in Figure 1.

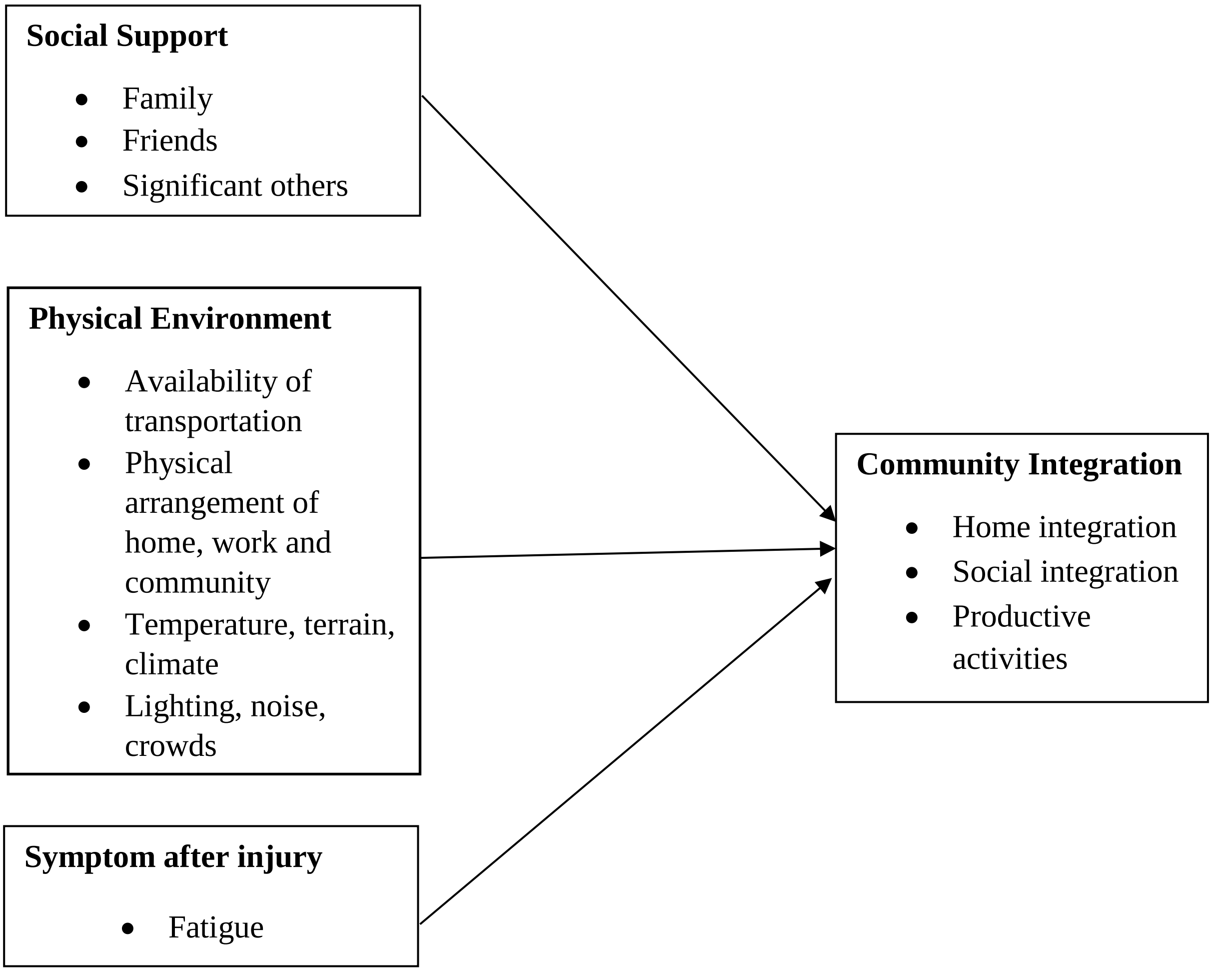

Figure 1. Conceptual Framework of the Study

Hypothesis of the Study

Social support, physical environment and fatigue significantly predict community integration among persons after TBI.

Definitions of Terms

Community integration. Community integration is perceived as active participation of an individual after TBI in three areas: home integration; social integration; and productive activities/work. A Community Integration Questionnaire (CIQ) was used to measure community integration where a high score indicates a high level of community integration (Willer et al., 1993).

Social support. Social support refers to an individual's perception of support received from family, friends, and significant others. Significant others could be professionals, co-workers, students, supervisors, and teachers. Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS) where a high score indicates greater perceived social support (Zimet et al.,1988).

Physical environment. Physical environment is the nature and structure of the surrounding environment and community which include the physical arrangement of home, work or community and the natural environment such as temperature, terrain, climate, noise, crowd, lighting, and availability of transportation. Physical environment was measured using the Craig Hospital Inventory of Environmental Factors (CHIEF) and a high score indicates more environment barriers (Whiteneck et al., 2004).

Fatigue. Fatigue refers to the subjective phenomenon that can be expressed as a sense of disproportionate exertion and associated with physical or mental exhaustion that interferes with the person's ability to perform. Fatigue was measured using the Modified Fatigue Impact Scale (MFIS) and a high score indicates greater fatigue (Fisk et al., 1994).

Scope of the Study

The study was conducted to assess the level and predictive factors of community integration among persons after TBI in Nepal. The study was carried out in the communities of province number three that includes thirteen districts of Nepal. The data collection was conducted between December 2018 and April 2019.

Significance of the Study

The findings of the study will contribute to providing a basis for developing a transitional nursing care model or program to enhance community integration among persons after TBI. In addition, the study findings can help raise the awareness among health care teams including nurses to provide better care and services for TBI survivors. Furthermore, the study findings provide baseline data for future research related to community integration among persons after TBI in Nepal.

Chapter 2

Literature Review

This chapter presents a review of literature related to an overview of TBI and community integration, social support, physical environment, and fatigue among persons after TBI.

1. Overview of TBI and Its Impacts
2. Overview of International Classification of Functioning, Disability and Health (ICF) Framework
3. Community Integration of Persons After TBI and Its Factors and Assessment
4. Social Support of Persons After TBI and Its Assessment
5. Physical Environment of Persons After TBI and Its Assessment
6. Fatigue of Persons After TBI and Its Assessment
7. The Relationship Between Social Support, Physical Environment, Fatigue and Community Integration Among Persons After TBI
8. Summary of the Literature Review

Overview of Traumatic Brain Injury and Its Impact

This section includes definitions, incidence, cause, pathophysiology, severity, impact of TBI, and the role of nurses in caring for TBI persons living in a community setting.

Definition of TBI. Traumatic Brain Injury is defined as a form of acquired brain injury that occurs when physical and external forces abruptly and violently impact the brain either from a penetrating object or a bump, blow, or jolt to the head (National Institute of Neurological Disorders and Stroke, 2017). The Brain Injury Association of America (2013) defined TBI as an alteration in brain function or other evidence of brain pathology caused by an external force. Similarly, the Centers for Disease Control and Prevention (CDC, 2017) defined TBI as a major public health problem caused by a blow, bump or jolt to the head or a penetrating head injury that disrupts the normal functions of the brain. The WHO (2006) defined TBI as a displacement of the brain inside the skull from a sudden hit by an external mechanical force resulting in injury against the solid meningeal membrane, the dura, or against the inside of the neurocranium.

In summary, TBI can be defined as an acquired brain insult that occurs as a result of physical and external forces either from vigorous hits of an object or an object pierces the skull and brain tissue.

Incidence and cause of TBI. The WHO has estimated that TBI due to road traffic accidents will be the third largest cause of mortality, morbidity, and disability among survivors by 2020 (Tabish & Syed, 2014; WHO,2015). Globally, more than 50 million people suffer from TBI per year (Maas et al., 2017). Li, Zhao, Yu, and Zhang

(2016) identified 60 reports from 29 countries with data on TBI epidemiology and stated that Asia had the highest incidence of TBI at 42.4% compared to Europe at 29% and North America at 22.3%. Furthermore, the study found that the incidence of motor vehicle collision was the leading cause of TBI in China, Pakistan, Japan, Australia, France, Spain, Austria, England, Croatia, Slovakia, Bosnia, Macedonia, the Netherlands, and Italy, whereas fall was the leading cause in the United States, Canada, New Zealand, Sweden, Scotland, Norway, and Finland (Li et al., 2016). Moreover, they found that men were at a higher risk of TBI than women with average ages at the time of TBI that ranged from 27 to 59.67 years while the median ages ranged from 29 to 45 years and the overall mild, moderate, and severe ratio was 55:27.7:17.3 based on the Glasgow Coma Scale (GCS) scores (Li et al., 2016).

In Nepal, general trauma is the third leading cause of death resulting in 8% of all mortality cases in the country (Joshi & Shrestha, 2009). In one of the few studies regarding the spectrum of head injuries, made by Bajracharya, Agrawal, Yam, Agrawal, and Lewis (2010), the top three causes of TBI were fall from height, road traffic accident, and physical assaults. In addition, the study also found that the male to female ratio was 2.7:1 and the majority of the patients belonged to the age group of 21-40 years (Bajracharya et al., 2010).

Severity of TBI. The Department of Defense & Department of Veterans Affairs (2009) classified TBI into mild, moderate, and severe depending on the duration of unconsciousness, extent of post-traumatic amnesia, findings on structural imaging, and the GCS score. Mild TBI/concussion is defined as a condition in which the confused or disoriented state lasts <24 hours, or loss of consciousness is up to 30 minutes, or memory loss lasts <24 hours. However, the definition excludes penetrating TBI and a computed tomography (CT) brain scan not indicated in most patients, but, if obtained, is normal. Moderate TBI is defined as a confused or disoriented state that lasts >24 hours or loss of consciousness is >30 minutes but <24 hours, or memory loss is >24 hours but <7 days. However, moderate TBI may meet the criteria for mild TBI except an abnormal CT brain scan is present and excludes penetrating TBI where a structural brain imaging study may be normal or abnormal. Severe TBI is defined as the state of confusion or disorientation for >24 hours, or loss of consciousness >24 hours, or memory loss >7 days that excludes penetrating TBI and a structural brain imaging study that may be normal but usually is abnormal.

To date, usually the clinical treatments for TBI are classified based on the severity criteria as mild, moderate, and severe depending upon the duration of unconsciousness, extent of post-traumatic amnesia, findings on structural imaging, and the GCS score (Department of Veterans Affairs, 2009; Saatman et al., 2008). This study used the GCS score to classify the severity of the injury because it is widely used in clinical settings and has high inter-observer reliability.

Pathophysiology of TBI. The pathophysiology of TBI has been explained in various ways from different authors but the core is the same for all. Pearn et al. (2017) described the pathophysiology based on the headings of mechanism of injury, mechanism of neuro inflammation, network dysfunction, and preclinical in vivo models of TBI, whereas McGinn and Povlishock (2016) explained the pathophysiology based on the headings of focal TBI, diffuse TBI, functional changes evoked by TBI, excitotoxicity and ionic flux, metabolic change, and neuro-inflammation. Similarly, Tran (2014) described an understanding of the pathophysiology of TBI where the author described the pathobiology based under the headings of primary injury, secondary injury, ionic disturbance, excitotoxicity, mitochondrial dysfunction, oxidative stress, apoptosis/necrosis, and neuro-inflammation. Likewise, Prins, Greco, Alexander, and Giza (2013) also studied the pathophysiology of TBI where the authors explained the process with the titles neurochemical changes associated with TBI, changes in cerebral glucose metabolism in TBI, post-TBI energy crisis causes and consequences, the role of free radicals in TBI, and the central role of mitochondria in TBI. Therefore, from this review, the pathophysiology of TBI is generally described under the headings primary injury, secondary injury, and in vivo models.

Primary injury. This is usually caused in TBI due to direct contact and mechanical forces such as acceleration-deceleration, rotational forces that suddenly damage the brain and its intracranial contents referred as focal brain damage and diffuse TBI (Pearn et al., 2017; Tran, 2014). Focal brain injuries include laceration, hemorrhage, and contusion which occur in a specific location associated with a situation in which the head collides with or is struck by an object. Such injuries are often visible from imaging and neurological deficits that often depend upon the location and severity of the injuries (Tran, 2014). Diffuse TBIs are concussion and diffuse axonal injury that occur in a wide area of the brain and are usually due to acceleration-deceleration forces seen in motor vehicle accidents (Pearn et al., 2017; Tran, 2014). Diffuse injuries are usually associated with axonal shearing, tearing, and stretching that lead to a cascade of calcium mediated events that alter axonal transportation that results in focal axonal swelling and disconnection with detached axonal projection. These events cause target deafferentation and synaptic loss together with generalized wallerian degeneration. Diffuse axonal injury can be conceptualized as a disease of disconnection that leads to diffusion of circuit disruptions that result in disrupting excitatory and inhibitory networks (Mc Ginn & Povlishock, 2016; Pearn et al., 2017; Tran, 2014).

When an injury is severe enough due to a single event or repetitive mild events, the trauma may result in blood-brain barrier damage and leakage which can increase neuro-inflammation and poor regulation of molecules, ions, amino acids, and proteins which can cause secondary injury (Shlosberg, Benifla, Kaufer, & Friedman, 2010; Shetty, Mishra, Kodali, & Hattiangady, 2014).

Secondary injury. This is a cascade of cellular events triggered by the initial mechanical damage of the cerebral tissues due to the primary injury. Secondary injury occurs from hours to days to months after the initial trauma and causes neurochemical, metabolic, and cellular changes (Mc Ginn & Povlishock, 2016; Kumar & Loane 2012; Pearn et al., 2017; Tran, 2016). This cascade of secondary injury includes ionic homeostasis disturbance, excessive release of neurotransmitters, mitochondrial dysfunction, lipid peroxidation, and membrane degradation. All of these cause neuronal cell death (Pearn et al., 2017; Tran, 2016).

In vivo models. Moreover, there are several in vivo models that are very useful in explaining the pathophysiology of TBI. There are four models: (1) the fluid percussion injury model creates a mixed injury that includes both focal and diffuse injuries (Pearn et al., 2017); (2) the controlled cortical impact injury model creates focal cortical tissue damage, subdural hematomas, diffuse axonal injury, and disruption of the blood-brain barrier (Pearn et al., 2017); (3) the weight drop impact injury model deals with the release of weight from a known height onto the closed skull to produce movement of the brain and includes four different models (i.e., Feeney's, Shohami's, Marmarou's, and Maryland's) (Pearn et al., 2017; Prins et al., 2013); and (4) the blast injury model is used for the study of TBI in military personnel (Pearn et al., 2017).

Impact of TBI. The human brain is the center organ of the human body that controls and regulates body mechanisms. Any trauma to the brain may result in damage at the cellular level due to a lack of oxygen, excessive bleeding, swelling/pressure within the skull, or the tearing of neurons. The long structure and consequences of TBI result in chemical changes within the brain or functional changes that affect the physical, cognitive, emotional, behavioral, and social capacities in TBI patients. These changes not only burden their daily life activities but also affect their families (Brain Injury Association North Carolina, 2016; Stocchetti & Zanier, 2016).

***Physical problems*.** One of the consequences of TBI is physical problems that usually affect daily living. Examples of physical problems that depend on the damaged area of the brain include headache, sleep disturbance, fatigue, sensory changes that cause dizziness and affect balance, spasticity, muscle weakness/immobility, bowel and bladder changes, loss of consciousness, difficulty in swallowing, appetite, weight, apraxia, seizure, and heterotrophic ossification (Air

Force Center of Excellence for Medical Multimedia, 2015; Brain Injury Association North Carolina, 2016).

Frontal damage. Frontal lobe injury brings physical problems such as loss of simple movement of various body parts (i.e., paralysis), inability to plan a sequence of complex movements (i.e., sequencing), and loss of spontaneity in interacting with others (Lehr, 2018).

Parietal damage. Injury in the parietal lobe causes patients to suffer from physical problems such as the inability to attend to more than one object at a time, difficulty in distinguishing left from right, and a lack of awareness of certain body parts and/or surrounding space (i.e., apraxia) that leads to difficulties in self-care. Furthermore, patients suffer from the inability to maintain visual attention, and difficulties with eye and hand coordination (Lehr, 2018).

Temporal damage. Injury in the temporal lobe is exhibited by difficulty in recognizing faces (i.e., prosopagnosia), difficulty in understanding spoken words (i.e. Wernicke's aphasia), disturbance with selective attention to what we see and hear, difficulty with identification of and verbalization concerning objects, and the inability to categorize objects (i.e., categorization) (Lehr, 2018).

Occipital damage. Damage to the occipital lobe causes vision problems such as defects in vision (i.e., visual field cuts), difficulty locating objects in the environment, difficulty identifying colors (i.e., color agnosia), production of hallucinations and visual illusions (i.e., inaccurately seeing objects), word blindness (i.e., inability to recognize words), and the inability to recognize the movement of an object (i.e., movement agnosia) (Lehr, 2018).

Brain stem damage. Brain stem injuries result in decreased vital capacity in breathing, speech, swallowing food and water (i.e., dysphagia), difficulty with organization/perception of the environment, problems with balance and movement, dizziness and nausea (i.e., vertigo), and sleeping difficulties (i.e., insomnia, sleep apnea) (Lehr, 2018).

Cerebellum damage. Cerebellum injury consequences described by Lehr (2018) included such problems as loss of the ability to coordinate fine movements, loss of the ability to walk, inability to reach out and grab objects, tremors, dizziness, slurred speech (i.e., scanning speech), and the inability to make rapid movements.

Immediately or soon after a TBI, several physical complications occur which increase the risk for a greater number of other severe complications such as post-traumatic seizures, hydrocephalus, meningitis, paralysis, spasticity, pressure sores, deep vein thrombosis, respiratory infections, urinary tract infections, and constipation (Gainer, 2015; Pangilinan, 2014).

Cognitive problems. Cognitive impairment is one of the major consequences after brain injury that commonly occurs in moderate to severe brain injuries (Rabinowitz & Levin, 2014). Cognitive problems include problems associated with thinking and learning abilities. The problems associated with cognitive changes in TBI are memory/recall and mental flexibility, attention/concentration and learning, planning, and organization, initiation and motivation, task-switching and sequencing, safety awareness and impulsivity, problem solving, decision making, judgment and reasoning, social skills, processing, understanding or producing speech, and fatigue (Brain Injury Association North Carolina, 2016; CEMM, 2015).

These cognitive problems arise based on the location of the brain injury (Lehr, 2018). Frontal damage causes loss of flexibility in thinking, persistence of a single thought (i.e., perseveration), the inability to focus on task (i.e., attending), and difficulty with problem solving and the inability to express language (i.e., Broca's Aphasia) (Lehr, 2018). Likewise, parietal damage causes cognitive problems such as the inability to name an object (i.e., anomia), the inability to locate words for writing (i.e., agraphia), problems with reading (i.e., alexia), and difficulty doing mathematics (i.e., dyscalculia) (Lehr, 2018). Moreover, temporal damage results in cognitive problems like short-term memory loss and interference with long-term memory (Lehr, 2018). Furthermore, occipital damage causes cognitive problems related to difficulties with reading and writing (Lehr, 2018).

Emotional or behavioral problems. One of the most common difficulties among TBI persons is the problem associated with behavior and emotion that often bring troubles related to re-hospitalization and seeking care from health professionals (Boutin et al., 2013). The problems that include changes in behavior may be frustration, increased anger or aggressiveness, impulsivity or difficulties in self-control, faulty or poor judgment, decreased ability to initiate a conversation or activity, lack of initiation, repetitive behaviors (i.e., perseveration), less effective or ineffective social skills, changes in sexual behaviors, impaired self-awareness about how TBI impacts self and others, apathy or indifference, suspiciousness, changes in sleep patterns, and new behaviors of smoking, drinking alcohol, or other substance use (Brain Injury Association North Carolina, 2016; CEMM, 2015). Emotional effects may include problems such as depression, increased anxiety, mood swings (i.e., emotional lability), changes in self-esteem, and apathy or indifference (Brain Injury Association North Carolina, 2016; CEMM, 2015).

Social problems. Moreover, studies have shown that social problems after TBI have adverse effects in social relationships, functional status, productive activities, recreation, and leisure (Temkin, Corrigan, Dikmen, & Machamer, 2009). Most TBI survivors suffer from unemployment after injury because it takes time to return to work as well as returning to the same position prior to the injury for those who were employed (Stocchetti & Zanier, 2016; Temkin et al., 2009). In addition, a study showed that the rate of employment among TBI survivors 10 years after the injury in the working age group was 58% because of difficulties in restarting their jobs (Andelic et al., 2009). Similarly, a study from the USA reported 73% of cases with mild TBI returned to work, whereas the proportion dropped to 49% in severe TBI (Moretti et al., 2012).

In summary, the impact of TBI is described as a combination of physical, cognitive, emotional, and social problems that have long-term effects among TBI survivors. These long-term consequences should be better understood to develop ultimate goals of treatment to return TBI survivors to an enjoyable life, thereby enhancing integration with home, social functions, and community.

Process of recovery among TBI survivors. Most TBI survivors recover within 6 to 12 months after injury (McMillan, Teasdale, & Stewart, 2012; Ponsford et al., 2013). The recovery process occurs in the physical and neuropsychological status among TBI survivors. Significant improvement occurred in the physical status during the first six months among TBI survivors (Pagulayan et al., 2006). Physical status improvements enhance activities in daily living and motor functional status (Sigurdardottir et al., 2009). The recovery process for neuropsychological status take place at different rates across functions and differs in severity (Kersel, Marsh, Havil, & Sleigh, 2001). Studies revealed that recovery of the neuropsychological status occurs within the first few years after TBI (Mauritz et al., 2010; Stocchetti & Zanier, 2016). Moreover, studies identified some factors such as location of injury, GCS score at the time of admission and discharge (Mauritz et al., 2010), rehabilitation process (Khan et al., 2003), and common symptoms (Iverson, 2007) that affected the recovery process to continue for at least five years among TBI survivors (Khan et al., 2003). However, major TBI trials in the past 20 years have assessed the outcome from 6 months after the injury (Stocchetti & Zanier, 2016).

The essential role of nurses in caring for persons after a TBI in transition to continuum of care. Nurses are one of the important factors in an interdisciplinary team for providing care to TBI persons throughout the trajectory from a TBI rehabilitation center to the community (WHO, 2010; Yu, Tam, & Lee, 2015). In the community, nurses play an important role in providing education, communication and collaboration, awareness, availability, and accessibility of resources to promote and achieve the optimum level of physical, psychological, and social well-being (Bailey et al., 2014). Similarly, nurses, as part of a rehabilitation team, appreciate both the patient and caregivers while developing a plan to help an individual with TBI to achieve successful psychosocial adjustment and transition into the community (Aspillaga et al., 2014).

In addition, nurses approach an individual with a disability and their care providers in the community to educate them regarding their needs and adaptations in various roles (i.e., building relationships, providing support, and assisting with communication between the disabled person and the family members and others) (Bailey et al., 2014). Moreover, the WHO (2010) explained the role of a nurse as assessing and motivating patients to perform self-activities and providing care, consultation, education, and training according to the needs. However, the role of a nurse can differ according to national health policies and available resources.

TBI is a chronic problem that not only needs physical management but also requires psychosocial care which is an essential component of nursing management for TBI individuals and their families (Kivunja et al., 2018). Therefore, nurses are responsible for promoting psychosocial abilities of TBI patients for community integration by maintaining a positive atmosphere, counseling the patients and family members, improving social skills, providing cognitive behavior therapy, and functional and recreational training (Brainline, 2009; Camica, et al., 2014; Sandhaug, Andelic, Vatne, Seiler, & Mygland, 2010).

Furthermore, a previous study showed that the roles and responsibilities of nursing towards a better integration of community services was found to be difficult due to unclear functions and a weak understanding and definition of community health priorities as well as a lack of comprehensive analysis and joint intersectoral action for community integration (Zahorka, Fota, & Negraru, 2016). In the context of Nepal, nurses and community health assistants who work in a primary health center provide care for TBI persons in the community by managing pain and counseling patients and family members. Due to unavailability of equipment and personnel, the nurses and health assistants refer TBI patients to the tertiary center (Gupta et al., 2015). However, because of geographical obstacles and the lack of transportation, some TBI persons have difficulty accessing health facilities in Nepal (Gupta et al., 2015).

Overview of the International Classification of Functioning, Disability and Health (ICF) Framework

The ICF is the WHO's framework for health and disability to describe functioning and disability related to a health condition within the context of the individual's activities and participation in daily living. The framework defines the components of health and health related states of well-being from the perspectives of the body, the individual, and society into two basic categories: (1) body functions and structure and (2) activities and participation (WHO, 2001). The ICF framework also acknowledges the importance of environmental factors that include the physical, social, and attitudinal environments in which people live and conduct their lives (WHO, 2001).

Body functions and structure includes the functional and structural elements of the body. The body structures are the anatomical parts of the body such as organs, limbs, and their components (e.g., lobes of the brain). Body functions are the physiological aspects of the different body systems (e.g., eye-hand coordination, working memory). They include psychological functions since they are mediated by a body structure. Positive assessment of an element at this level implies structural and functional integrity. A negative evaluation of functioning at this level implies impairment at the structural or functional level (WHO, 2001).

Similarly, the activities and participation component covers the complete range of individual and societal functioning and disability or involvement in an area of life and being accepted or having access to needed resources (WHO, 2001). The ICF list of activities and participation covers a range from such basic actions and tasks as learning, self-care, and mobility to more complicated actions and tasks as interpersonal interactions, work, and community life. Activities and participation are assessed through the performance and capacity which are regarded as the qualifier. The capacity is an individual's ability to execute a task or action and performance is the involvement in a life situation. Difficulties or problems in capacity and performance result in limitations or restrictions in activity or participation (WHO, 2001). A problem at the performance level indicates a need for intervention in that person's environment and a problem in capacity indicates a need for pharmacological, physical, occupational, cognitive or speech therapy, or the implementation of compensatory strategies (Bilbao et al., 2003). Moreover, the activities and participation component introduces new concepts and applications in the field of brain injury rehabilitation. Brain injury professionals have typically worked at the capacity level, assessing cognitive, language, motor, and physical abilities that have implications for real life functioning. The performance level reflects what a person is doing at home and in his real life. In addition, the capacity-performance dichotomy opens the possibility of a more accurate study and assessment of the physical, emotional, and cognitive capabilities as they relate to true functioning (Bilbao et al., 2003).

The ICF model also explains the contextual factors which include the environmental and personal factors that impact the individual with a health condition and that individual’s health and health related states. Environmental factors consist of physical, social, and attitudinal environments in which people live and sustain their life. An element of the external to the individual’s environment which has a positive influence on the individual’s functioning is called a facilitator while barriers or hindrances are elements of the external to the individual’s environment which have a negative influence on any domain of functioning (WHO, 2001). Similarly, personal factors are the internal variables of the individual that are not part of a health condition or health status which influence functioning (WHO, 2001). They are the personal attributes of the person that may have an influence on the individual’s performance in a given moment. The ICF framework does not include a list of elements in this category.

Therefore, the interactions among body functions and structure, activities and participation, and contextual factors that are both environmental and personal can be illustrated as shown in Figure 2.

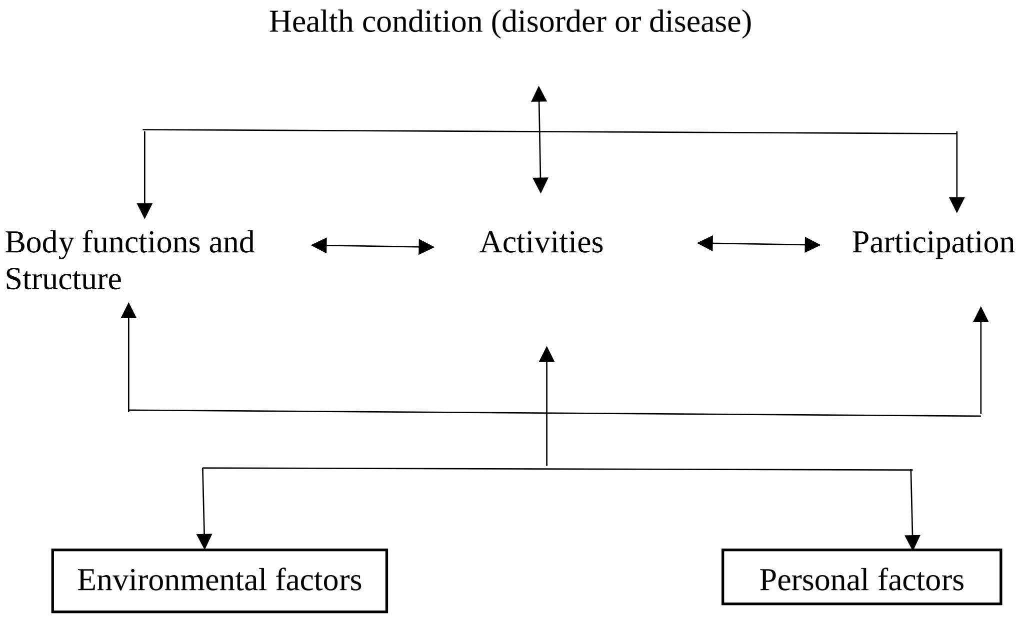

Figure 2. Interactions Between the Components of ICF.

Moreover, the ICF functioning and disability model illustrates the dynamic interaction among health condition, body function and structure, activity, participation, environmental factors, and personal factors. The interactions in TBI have been assessed where the health condition is TBI and the problems after injury include fatigue and impairment in body functions/structure which may result in limitations in the types of activities or participation (i.e., independently doing households, integrating in productive activities or social network) which is mainly influenced by environmental factors (i.e., physical structure/natural environment, social support), and personal factors (Ditchman et al., 2016; Xiong et al., 2016).

Hence, the ICF model of disability provides researchers, practitioners, and policymakers with a common language to plan accordingly to achieve the ultimate goal of rehabilitation and recovery among disabled persons including TBI survivors.

Community Integration of Persons After TBI and Its Factors and Assessment

This section includes the definitions, factors related to community integration, assessment, and existing evidence of community integration of TBI.

Definition of community integration. The term community integration is identified as the participation indicator in WHO's ICF. Also, a revision in the concept of handicap has universally noted participation as community integration (WHO, 1980). However, the WHO's definition of Participation does not include integration of the individual with a social setting and equal access to community resources that bridge the gap of issues regarding body, structure, function, activities, and external and internal environmental factors as well as societal barriers among the disabled population (Domac & Sobaci, 2014). The researchers then attempted to articulate the understanding of community integration and define the term based on previous studies.

Willer et al. (1993) defined community integration as active participation in a broad range of community involvement mainly in three areas of home, social, and productivity. Similarly, Gordon and Brown (1997) defined community integration as vocational/economic roles including working as a student, volunteer, homemaker or as a salaried worker, social network involvement of social groups as family friends, community setting, self-help group, and patterns of daily living activities such as travel to work/school, grocery shopping, going to movies, dining out, and cleaning the house.

In addition, Dijkers (1998) conceptualized community integration as social participation based on orientation and physical independence, instrumental activities of daily living, independent living, social health, and social adjustment, whereas Esselman et al. (2001) described community integration as an individual’s ability to be active in his or her expected community role at home, participating in both leisure activities in the community, and in productive activities such as work, school, or volunteer work.

Community integration is constructed from home environment, relationship, and productive activities (Dijkers, 1998; Esselman et al., 2001; Willer et al., 1993). According to Willer et al. (1993), community integration has been described from three different characteristics or attributes. These three attributes include: (1) home integration as the active participation of an individual in the household chores that includes shopping for groceries, preparing meals, doing housework, caring for children, and planning social gatherings in the home. Individuals may choose to live in a variety of living situations and family arrangements ranging from returning to a spousal situation to living with their family of origin, or to living with unrelated others; (2) social integration refers to participation in a variety of activities outside the home including shopping, leisure activities, and visiting friends. Apart from visiting friends or relatives outside the home, social events held in the home, such as having friends visit, were not considered part of social activities. Other aspects of social integration reflected aspects of interpersonal relationships such as having best friend and participating in social activities with friends who are not disabled; and (3) performance of productive activities is explained as the extent to which the individual gets out of the house during the day for purposes of employment, education, and volunteer activities in which the individual participates (Willer et al., 1993).

To conclude, community integration is the active participation of an individual in all three aspects of community. The most common elements that describe the characteristics or attributes of community integration is home integration, social integration, and work/productivities that are important issues for all people with disabilities including persons with brain injury to secure a positive outcome in community based rehabilitation. Since the attributes of community integration explained by Willer et al. (1993) reflect well the complete picture of community integration among persons living with TBI, the level of community integration in this study will be examined based on this concept.

Factors related to community integration. Several studies have examined the factors related to community integration among persons after a TBI and among the identified factors some contribute positively and some negatively towards community integration. These factors are categorized into individual factors, injury related factors, social factors, and environmental factors (Fleming et al., 2014; Khan et al., 2016; Pugh et al., 2018; Shaikh et al., 2018). Details of the factors related to community integration among TBI survivors are presented in the following section.

Individual factors. The individual factors consist of age, gender, level of education, ethnicity, marital status, income, and employment status (Andelic, et al., 2016; Khan et al., 2016; Pugh et al., 2018; Shaikh et al., 2018). Some previous studies showed that the influence of this factor on community integration was controversial.

Age. It was found that the age of TBI survivors was associated with the level of community integration but the findings were inconsistent. A study conducted among mild TBI survivors in Canada reported that older TBI survivors had poor community integration outcomes compared to younger ones (*r* = -.09) (Mollayeva et al., 2015). Similarly, another study conducted among moderate to severe TBI survivors also demonstrated that a low level of community integration was present in older people rather than in younger people (*β* = -.05) (Andelic et al., 2016). It was mentioned that retirement and unemployment occurred more frequently in the older population compared to the younger population which indicated low level of community integration (Forslund et al., 2013). However, other studies reported that age was less significant for determining the level of community integration (Fleming et al., 2014; Pugh et al., 2018).

Gender. There is inconsistency in the findings between community integration and gender. The evidence related to community integration among TBI survivors indicated that female survivors more frequently reported being unemployed or looking for work than male survivors which reflects low community integration among the female TBI survivors (*p* < .05) (Pugh et al., 2018). In contrast, the study conducted by Willemse-Van Son et al. (2009) reported that males had poor community integration levels compared to females because of more dependency in performing daily activities. However, some studies reported that gender did not play a significant role in community integration (Andelic et al., 2016; Fleming et al., 2014)

Education. The evidence suggests that a higher level of education in TBI survivors determines a positive relationship with community integration. TBI survivors with a higher education were found to have a high level of community integration especially related with productive activities (*p* = .01) (Mollateva, et al., 2015). It was explained that TBI survivors with a higher level of education had better community integration than those with a low level of education ($\beta = .16$, $p < .01$) (Andelic et al., 2016). The researcher stated that TBI survivors with a higher education had more opportunities to return to productive activities or work (Andelic et al., 2016).

Ethnicity. There are inconsistent findings between ethnicity and community integration**.** A study among American veterans with TBI found that black women had a lower level of community integration compare to white women which could be due to factors other than TBI such as discrimination and sex bias that may contribute to poorer community integration (Pugh et al., 2018). However, the study conducted by Pappadis et al. (2012) stated that racially self-identified as Black was associated with increased participation in comparison to non-Black.

Marital status. The direction of the relationship between marital status and community integration is inconsistent. Previous studies showed that TBI survivors who were single had a low level of community integration compared to those who were married or in a relationship ($\beta = -.11$, $p < .05$; $r = - .23$, $p < .05$) (Hall et al., 2018; Pugh et al., 2018). Contrary to a previous study finding, other studies revealed that singled, divorced, and widowed TBI survivors presented greater community integration than TBI survivors who were married or in a relationship ($\beta = -.57$, $p < .00$; $\beta = - .09$, $p = .05$ respectively) (Andelic et al., 2016; Mollayeva et al., 2015). The researcher argued that individuals living alone performed most of the housework as well as work related activities on their own, subsequently they showed greater community integration (Andelic et al., 2016). However, another study conducted among TBI survivors in Norway showed that the relationship status was not significantly related with community integration (Forslund et al., 2013).

Income. Income is also one of the contributing factors of community integration among TBI survivors and most of the studies have shown a negative relationship between income and community integration. TBI survivors who had a lower income consistently reported a low level of community integration ($\beta = -.32$, $p < .05$) (Pugh et al., 2018). Similarly, another study showed that financial strain among TBI survivors was associated with low community integration (Nalder et al., 2016).

Employment status. Employment status has been found to be positively associated with community integration. Studies have shown that TBI survivors who returned to meaningful work were associated with a high level of community integration (Mollayeva et al., 2015; Nalder et al., 2016). In addition, Mollayeva et al. (2015) described that TBI survivors who were employed as managers, professionals, technicians or associate professionals had significantly higher community integration compared to clerical support or service work, sales, and elementary occupations ($p = .01$). Similarly, Pugh et al. (2018) conducted a study among TBI veterans and found that a higher rank of employment was associated with a higher level of community integration ($p < .05$). Likewise, Hall et al. (2018) also found that returning to work was positively associated with community integration ($r = .46$, $p < .01$). Furthermore, TBI survivors who were employed before the injury showed a high level of community integration compared to the unemployed TBI survivors ($p \leq .05$) (Forslund et al., 2013).

Injury related factors. Similarly, an injury related factor is also associated with community integration and TBI survivors. Injury related factors include causes of injury, severity of injury, area of head injury, GCS score, Glasgow Outcome Scale (GOS) score, previous health history, previous head trauma, length of stay in a rehabilitation/hospital, post-traumatic amnesia, loss of consciousness, alteration of consciousness, symptoms after injury, and the person's capacity to adjust to their physical and cognitive defects (Andelic, et al., 2016; Khan et al., 2016; Mollayeva et al., 2015; Pugh et al., 2018; Shaikh et al., 2018).

Cause of injury. The evidence explained cause of injury as fall, motor vehicle accident, and assault/violence (Khan et al., 2016; Mollayeva et al., 2015). Moreover, the studies showed no any significant difference in the level of community integration with respect to the cause of injury (Khan et al., 2016; Mollayeva et al., 2015).

Severity of injury. There are inconsistent findings between the severity of injury and the level of community integration. According to Sandhaug et al. (2015), TBI survivors who had suffered from moderate to severe injury had lower community integration compared to mild TBI survivors. Similarly, Pugh et al. (2018) found that the higher the severity of injury, the lower the level of community integration ($p < .05$). However, Andelic et al. (2016) reported no significant difference in the relationship between severity of injury and community integration.

Area of head injury. The evidence that reveals the area of head injury is a CT brain scan report (Andelic et al., 2016). Sandhaug et al. (2015) reported no significant difference between the area of head injury and community integration, but rather the severity of injury influenced the level of community integration. However, Andelic et al. (2016) showed that the area of head injury, when visible in a CT brain scan, was negatively associated with community integration (β = -.04, *p* = .89).

Glasgow Outcome Scale score (GOS). A high GOS score was associated with a high level of community integration. The study conducted among moderate to severe TBI in Australia showed that a high level of community integration was associated with a higher GOS score (*p* = .00) (Khan et al., 2016). Similarly, another study conducted among TBI survivors also reported that a high GOS score was associated with a high level of community integration (Fraga-Maia et al., 2014).

Glasgow Coma Scale (GCS) score. Sandhaug et al. (2015) stated that a high GCS score was positively associated with community integration (β = .43, *p* = .02). Similarly, Seagly et al. (2017) studied the GCS score as one of the predictors for long-term functional outcome in post-TBI using the Craig Handicap Assessment and Reporting Technique (CHART) as a tool for community integration assessment and the study found that the GCS score accounted for 5% variance (*p* = .02) in the mobility subscale of CHART.

Previous health history. Previous clinical health conditions, such as arthritis, diabetes mellitus, and heart diseases, were found to negatively influence community integration among TBI survivors (Mollayeva et al., 2015 & Pugh et al., 2018). The studies reported that TBI survivors with previous health conditions had a low level of community integration compared to those who did not have any co-morbid conditions (Mollayeva et al., 2015 & Pugh et al., 2018).

Previous head trauma. Mollayeva et al. (2015) conducted a study among mild TBI survivors and reported that previous head trauma was one of the injury related factors not associated with community integration. Similarly, the studies conducted among moderate to severe TBI survivors did not reported any association of previous head trauma and community integration (Nalder et al., 2016; Pugh et al., 2018).

*Length of stay in rehabilitation/hospital***.** An association was found between the length of stay in rehabilitation/hospital and the level of community integration. According to Sandhaug et al. (2015), TBI survivors who had a longer length of stay in a rehabilitation center were found to have a high level of community integration because the rehabilitation center enhanced independency among the TBI survivors ($\beta = .13$, $p < .05$). Similarly, Forslund et al. (2013) reported that a longer length of stay in rehabilitation promoted community integration ($p \leq .05$). Moreover, Ashley (2018) found that the length of stay in a rehabilitation center and community integration had a significant relationship for moderate disability in comparison to mild and severe disability ($R^2 = .02$, $p < .05$). However, Nalder et al. (2016) reported that length of hospitalization among TBI survivors was not significantly associated with community integration.

Post-traumatic amnesia. Post-traumatic amnesia is one of the injury related factors that showed an inconsistent direction with community integration. Some studies among TBI survivors reported no significant association of post-traumatic amnesia and community integration (Mollayeva et al., 2015; Nalder et al., 2016). However, other studies showed that a longer duration of post-traumatic amnesia among TBI survivors was associated with a low level of community integration ($\beta = -.06$, $p < .00$; $\beta = -.09$, $p < .00$) (Andelic et al., 2016; Sandhaug et al., 2015). The researchers argued that a shorter period of post-traumatic amnesia promoted participation in activities around the home and community.

Loss of consciousness and alteration of consciousness. Mollayeva et al. (2015) explained that the loss of consciousness was one of the injury related factors among mild TBI and the study showed no association between loss of consciousness and community integration. Pugh et al. (2018) discussed loss of consciousness and alteration of consciousness to categorize the severity of TBI and the study found a significant association between the severity of TBI and community integration.

Activities after injury. The capacity to perform activities, such as dressing, grooming, bathing, mobility, and toilet use, among persons after TBI was found to influence the level of community integration. Gerber et al. (2016) found that the activities of daily living was moderately to strongly associated with the total score of community integration and the home subscale (r = -.51, -.53, p = .00). Similarly, Sandhaugh et al. (2015) explained that a better functional level after injury was related with better community integration (p < .05).

Symptoms after injury. Symptoms after injury have shown a negative relationship with community integration. The studies have shown that injury related symptoms such as pain (β = -.25, p < .00, p = .02), fatigue (β = -.25, -.47, p < .05) headache (p = .00), insomnia (β = -.25, p < .001), depression (r = -.38, p < .01; r = - .44, p < .01), and anxiety (r = -.27, p < .05) were associated with a low level of community integration among TBI survivors (Buunk, et al., 2015; Hall et al., 2018; Mollayeya et al., 2015; Zeng et al., 2016).

Social factors. Social factors include interactions with friends, family, and significant others (Shaikh et al., 2018; Zimet et al., 1988). Evidence showed that social support influences community integration (Donker-Cools et al., 2018; Forsulnd et al., 2013; Pugh et al., 2018). A further description of social factors is explained in the social support section.

Environmental factors. Environmental factors include the nature of the environment such as temperature, terrain, climate, lighting, noise and crowds, physical arrangement of the home, workplace and community, availability of transportation, and access to service, technology, and information (Fleming et al., 2014, Lefebvre & Levert, 2014; Shaikh et al., 2018). A further description of environmental factors is described in the physical environment section.

Assessment of community integration. The literature review revealed that the measurements of community integration mostly included these instruments: the Community Integration Questionnaire (CIQ), the CHART, and the Community Integration Measure (CIM).

Community Integration Questionnaire (CIQ). The CIQ was developed by Willer et al. (1993). It consists of 15 items that relate to three main areas of community integration: 1) home integration; 2) social integration; and 3) integration into productive activities. Of the 15 items of the CIQ, 12 items are scored by a 3-point scale and the remaining three items are related to employment, school, and volunteer activities in a productivity scale that is scored on a 6-point scale. The overall score ranges from 0 to 29. A higher score indicates a higher level of community integration. The instrument was tested in TBI patients and the test-retest reliability coefficient was found to be .91 for individuals with TBI and .97 for family members or caregivers (Willer et al., 1993).

Craig Handicap Assessment and Reporting Technique (CHART). The CHART was developed by Hall et al. 1998 to assess the WHO dimensions of handicap. The instrument describes the six dimensions of a person's handicap as: 1) physical independence; 2) cognitive independence; 3) mobility; 4) occupation; 5) social integration; and 6) economic self-sufficiency. All six domains have 32 items. Instructions and a specific guideline are provided for the score computation in each dimension. The total CHART score ranges from 0 to 600. Each subscale score ranges from 0 to 100 and a score of 100 indicates no handicap. The inter-rater reliability among disabled persons, especially in spinal cord injury, is *r* = .83 and .84 (Shirley Ryan Ability Lab - Formerly RIC, 2013).

Community Integration Measure (CIM). The CIM was developed by McColl et al. (2001) to assess subjective perception of belonging and participating. The instrument was developed for brain injury and other disabilities following a literature review and qualitative studies including 9 themes: (1) know the rules and how to follow them; (2) know their way around; (3) are accepted for who they are; (4) have people in the community with whom they feel close; (5) have relationships with different kinds of people in the community; (6) find things to do in their leisure time; (7) have something to do that makes them feel productive and worthwhile; (8) have some degree of independence; and (9) have a suitable place to live. The CIM tool includes 10 items on a checklist and 5 response options from 5 = always agree to 1 = always disagree. The scores for each item are summed giving a total score between 10 and 50. A total score of 50 represents a high level of community integration. The internal consistency (Cronbach's alpha) of the CIM is .87 and it was reported that the CIQ is most commonly used in comparison to the CIM (McColl et al., 2001).

From the above descriptions of the community integration measurement tools, the CHART and CIM were found to be unrelated with the main concept of community integration in this study and included many more items whereas the CIQ defined the concept of community integration based on the conceptual framework of the study and has good reliability in the TBI population. Hence, the CIQ was used to measure community integration in this study.

Existing evidence of community integration. Some studies have described community integration in TBI survivors but the existing evidence is inconsistent with the level of community integration and variations in the findings were possibly due to different severities, times, and settings of the studies. Some evidence showed high levels of community integration and some evidence showed low levels of community integration among TBI survivors.

One study reported a high level of community integration among TBI survivors. Andelic et al. (2016) explored community integration in terms of CIQ that included home integration, social integration, and productive activities among 133 TBI patients at one, two, and five years post-injury. The study found that the overall CIQ score across the three points of time had increased from 18.1 at one-year follow-up to 19.1 at the two-year follow-up and further to 20.1 at the five-year follow-up which indicated a higher level of community integration. Likewise, a longitudinal study among 25 TBI women at one, three, and six months after sentinel events from hospital to home reported a high level of community integration in terms of return to meaningful work ($p = .02$) (Nalder et al., 2016). Moreover, Sandhaugh et al. (2015) studied community integration among 57 moderate to severe TBI at two years post-injury based on the CIQ and reported that the overall level of community integration was found to be high ($p < .00$).

Other studies showed low levels of community integration among TBI survivors. A study from Migliorini et al. (2016) explored the low level of community integration among TBI survivors compared with no TBI. The research stated that TBI survivors with high support needs were five times more likely to report poor home integration, 2.8 times poor social integration, and 4.2 times poor productivity. Moreover, Mollayeva et al. (2015) studied community integration among 94 workers with delayed recovery from mild TBI and found a low level of community integration. Similarly, a finding in a study by Pugh et al. (2018) among 2,023 TBI veterans with at least 3 years of post-injury also showed a low level of community integration ($R^2= .09$, $p < .00$). Furthermore, Fleming et al. (2014) studied 135 moderate to severe TBI at one, three, and six months post-discharge also reported a low level of community integration ($\beta = -.37$, $p < .01$). Likewise, Gretschal, Visagie, and Inglis (2016), who studied the level of community integration among 59 disabilities including TBI, reported a low level of community integration in terms of community mobility and participation in social and meaningful work activities among TBI survivors.

In summary, the current studies revealed inconsistent findings in the level of community integration among TBI survivors.

Social Support of Persons After TBI and Its Assessment

This section includes definitions, factors related to social support, and assessment of social support of TBI.

Definitions of social support. Social support is the social or interpersonal factor that is highly associated with community integration among disabled persons including TBI survivors (Donker-Cools, et al., 2018; Mcrae et al., 2016; Umeasiegbu et al., 2013). According to Cohen (2004), social support includes the physiological and material resources provided by the social network to promote the capability of the individual to cope with a stressful situation. Support is often described as three types of resources: (1) instrumental support that involves material, financial, or tangible help; (2) informational support that is related to providing information, advice, or guidance; and (3) emotional support that involves expression of caring, trust, empathy, reassurance, and providing an opportunity to ventilate feelings and emotions (House & Khan as cited in Cohen, 2004). Moreover, social support can be perceived or received and the perceived social support is highly associated with community integration based on the literature review (Zeng et al., 2016). Zimet and colleagues (1988) argued that subjective or perceived social support needs to be assessed from different specific sources that include support from family, friends, and significant others. Significant others are those persons whom the recipients consider as special persons who are close to him/her in the time of need (Zimet et al., 1988).

Therefore, the definition of social support in this study is defined as an individual’s perception of support received from family, friends, and significant others (Zimet et al., 1988). Significant others could be professionals, neighbors, co-workers, students, supervisors, and teachers who are close at the time of need (Nicholas & Kosciulek, 2014; Zimet et al., 1988).

Assessment of social support. According to the literature review, the measurements of social support include the National Institute of Health (NIH) Social Relationship Scales, the Interpersonal Support Evaluation List (ISEL), and the Multidimensional Scale of Perceived Social Support (MSPSS).

***National Institute of Health (NIH) Social Relationship Scales*.** The NIH Social Relationship Scales include a survey of perceived social support developed by Cyranowski et al. (2013). The scale measures social support based on emotional and instrumental support and consists of eight items. Each item is measured on a Likert-type scale and the responses range from (1) never to (5) always. A higher mean score indicates a higher level of support. Cronbach's alphas among the brain injury population were found to be .96 for instrumental support and .97 for emotional support (Batchos et al., 2018).

Interpersonal Support Evaluation List (ISEL). The ISEL was developed by Cohen and Hoberman in 1983 and further revised by Cohen, Mermelstein, Kamarck, and Hoberman in 1985. The ISEL consists of a 12-item questionnaire used to assess three types of perceived social support that include tangible (i.e., material support), appraisal (i.e., information support), and belonging (i.e., people one can do things with). The score is based on a four-item Likert scale ranging from definitely false to definitely true. The ISEL has shown good reliability with a Cronbach's alpha of .91 in the adult population (Cohen et al., 1985; Cohen & Wills,1985).

Multidimensional Scale of Perceived Social Support (MSPSS). The MSPSS is a self-report subjective assessment tool for social support developed by Zimet, et al. (1988). It consists of 12 items of questions based on three sources of social support: (1) family; (2) friends; and (3) significant others. It has a 7-point Likert scale from 1 = very strongly disagree to 7 = very strongly agree. The total possible scores range from 12 to 84 and a high score indicates greater perceived social support and vice versa. In addition, the MSPSS has also shown good internal consistency by Cronbach coefficients that range from .85 to .94 for total and individual scale scores (Kazarian & McCabe, 1991). Moreover, the MSPSS has a Nepali version and the internal reliability by Cronbach’s alpha for the total MSPSS-N was found to be .90 for the total scale and .86, .84, and .80 for the subscales of family, friends, and significant others, respectively (Tonsing, Zimet, & Tse, 2012). Furthermore, the MSPSS-N was used to assess social support in the spinal cord injury population (Bhattarai, Maneewat, & Sae-Sia, 2018).

In summary, the MSPSS tool will be used in this study to assess social support because the tool well defines the concept of social support related to the study in comparison to ISEL and NIH Social Relationship Scales. In addition, the reliability of MSPSS has an acceptable Cronbach’s alpha and the MSPSS also has a Nepali version which has been used successfully among Nepalese disabled persons.

Physical Environment of Persons After TBI and Its Assessment

This section includes definitions, factors related to physical environment, and an assessment of the physical environment of TBI survivors.

Definition of physical environment. Physical environment is one of the sensitive aspects in community integration among TBI survivors. Merriam-Webster's Dictionary broadly defines the environment as "the conditions that surround someone or something; the conditions and influences that affect the growth, health, progress, etc., of someone or something". Similarly, environment is broadly conceptualized as "the complex, integrated and overlapping social structures and economic systems that are responsible for most health inequities which include the social environment, physical environment, health services, and structural and societal factors" (CDC, 2014).

Likewise, the ICF model described the environment based on personal factors that influence the experience of disability and participation within society including five broad categories of environmental factors: products and technology; natural environment and human made changes to the environment; support and relationships; attitudes; and service system and policies (WHO, 2001). In addition, Hammel et al. (2015) and Heinemann et al. (2015) explained that environment for disabled persons including TBI is based on functional needs that include: built and natural environment; transportation; assistive technology; services, system and policies; and access to information and technology. Furthermore, Lefebvre and Levert (2014) described environment in TBI as the physical environment that includes accessibility of public transit, environmental condition as light, noises and crowds, and geographical environment as location, climate. Similarly, Shaikh et al. (2018) also explained that the environment for acquired brain injury includes: nature and structure of surrounding environment and community; physical barriers or facilitators such as the physical arrangement of home, work or community; availability of transport; financial status; access to services and information.

Therefore, from the review, physical environment in this study included: nature of the environment as temperature, terrain, climate; physical arrangement or design of home, work or community; other aspects of the surrounding environment and community that include lighting, noise, crowds; and availability of transportation.

Assessment of physical environment. The literature review revealed the instruments that are commonly used to assess physical environmental factors in rehabilitation which are the Craig Hospital Inventory of Environmental Factors (CHIEF), the Measure of the Quality of the Environment (MQE), and the Built and Natural Environment (BNE).

Craig Hospital Inventory of Environmental Factors (CHIEF). The CHIEF is an environmental measurement tool developed by Whiteneck et al. (2004) for the measurement of the subjective experiences of the environment of people living with disability including TBI. The CHIEF includes a 25-item questionnaire related with five factors labeled as 1) attitude and support barriers, 2) services and assistance barriers, 3) physical and structure barriers, 4) policy barriers, and 5) work and school barriers. All of the five factors are included in the 3-7 items of the questionnaire in the tool. The items in the physical and structure barriers relate to problems caused by the design and layout of buildings, the natural environment, availability of technology, or other aspects of one’s surroundings such as crowds or noise. Items in the service and assistance barriers include availability of transport, availability of information, and education and training services. Items in the attitude and support barriers ask respondents to rate how often the attitudes of others and a lack of support from others in the home, community, or work environment cause problems, as well as the presence of discrimination or prejudice. Items in the policy barriers relate to service availability and policies of governments or businesses. Items in the work and school barrier include access to help and support, as well as the attitudes of others in the workplace or school. Scores are calculated by multiplying each of the 25 items with the frequency score (range: 0 to 4) by magnitude (range: 1 to 2) to yield an overall “impact” score (range: 0-8).

After the CHIEF was developed, its validity was tested through a study to test the psychometric properties of the CHIEF (Whiteneck et al., 2004). Furthermore, the CHIEF was found to have high test-retest reliability (intraclass correlation coefficient [ICC] = .93) and high internal consistency (Cronbach alpha = .93), but lower participant-proxy agreement (ICC = .62) among disabled persons including traumatic brain injury. Moreover, the CHIEF also has a short form version with 12 items within the original five subscales.

Measure of the Quality of the Environment (MQE). The MQE is a 109-item self-administered questionnaire developed by Fourgeyrollas et al. (1999) to evaluate the environment’s influence on a person’s daily activities in relation to their abilities and limitations. The MQE assessed factors such as: support and attitudes; income, jobs, and income security; government and public services; physical environment and accessibility; aids, devices, and technology; equal opportunity; and political orientation. It is scored on a seven-point scale that ranges from -3 to +3. The tool is not free and it is most effective among disabled persons after a stroke (Rochette, Desrosiers, & Noreau, 2001).

Built and Natural Environment (BNE). The BNE is an 18-item tool developed by Heinemann et al. (2015) based on the ICF that covers barriers in the home, outdoors, and community settings. The BNE includes five domains namely: architectural features of buildings; land development; environmental features such as noise, crowds and indoor air quality; and cognitive and sensory cues. It is scored on a five-point rating scale (1 = none, 2 = a little, 3 = somewhat, 4 = a lot, and 5 = extreme). A higher score indicates a higher level of barrier or difficulty and vice versa. The tool was tested among disabled persons including TBI and found an item reliability of .70 among disabled persons and the known-groups validity was supported by wheelchair users who reported a higher level of barriers than the ambulatory respondents (Heinemann et al., 2016). However, the BNE showed lower reliability compared to the CHIEF. Also, the BNE 18-item questionnaire does not include a workplace structure questionnaire; however, the tool mentions visiting stores and other community settings.

Hence, the CHIEF components appropriately cover the concept of physical environment for this study and it has good validity and high internal consistency for traumatic brain injury patients. Therefore, the CHIEF was used for the measurement of physical environment in this study.

Fatigue of Persons After TBI and Its Assessment

This section includes definitions, factors related to fatigue, and an assessment of fatigue in TBI survivors.

Definition of fatigue. Defining and therefore operationalizing fatigue is challenging because there are many confounding factors associated with it (Malley et al., 2014). However, fatigue has been described in various ways. In the most general terms, fatigue is described as a subjective awareness of a negative balance between available energy and the mental and physical requirements of activities (Aaronson et al., 1999; Dijkers & Bushnik, 2008). Similarly, fatigue is described as a complex, multidimensional, and multifactorial phenomenon (Artom, Moss-Morris, Caskey, & Chilcot, 2014). Likewise, Ream and Richardson (1997) defined fatigue as a subjective, unpleasant feeling that ranges from tiredness to exhaustion and interferes with the person's ability to function normally. It has been reported that fatigue is one of the worst symptoms experienced after a TBI (Beaulieu-Bonneau & Morrin, 2012) and it is referred to as post-TBI fatigue that is "associated with a felt sense of disproportionate exertion and associated mental or physical exhaustion and inability to perform" (Cantor, Gordon, & Gumber, 2013). Generally, it has been estimated that the prevalence of fatigue among TBI survivors is between 45% and 73% (Kluger, Krupp, & Enoka, 2013). Furthermore, studies have shown that fatigue is one of the most common disabling symptoms among TBI survivors (Lequerica et al., 2016; Schonberger, Herrberg, & Ponsford, 2014).

Therefore, from the review, fatigue in TBI can be described as a subjective phenomenon that can be expressed as a sense of disproportionate exertion and it is associated with physical or mental exhaustion that interferes with the person's ability to perform (Cantor et al., 2013; Ream & Richardson, 1997).

Assessment of fatigue in TBI. The literature review revealed that the instruments commonly used to assess fatigue in TBI persons are the Fatigue Severity Scale (FSS), Modified Fatigue Impact Scale (MFIS), and the Barrow Neurological Institute Fatigue Scale (BNIFS).

Fatigue Severity Scale (FSS). The FSS is a unidimensional scale developed by Krupp, Larocca, Muir-Nash, and Steinberg (1989) for the measurement of fatigue in chronically ill people as well as to differentiate fatigue from clinical depression. The scale consists of a self-report nine-item questionnaire. Each item consists of statements that are scored on a seven-point Likert type scale ranging from 1 "strongly disagree" to 7 "strongly agree". The mean score of the items is used as the FSS score. Some studies have calculated an FSS score as the sum of all nine items.

The validity of the FSS was tested among chronically ill and disabled persons including stroke and spinal injury patients (Lerdal & Kottorp, 2011; Werlauff, Hojberg, Firla-Holme, Steffensen & Vissing, 2013). Furthermore, the FSS was found to have a high internal consistency (Cronbach alpha = .86 and .92, respectively).

Modified Fatigue Impact Scale (MFIS). The MFIS is a multidimensional scale and it is a modified form of the Fatigue Impact Scale developed by Fisk et al. (1994). The MFIS reports physical, cognitive, and psychosocial aspects of fatigue. The scale consists of 21 items in which physical fatigue includes 9 items, cognitive fatigue includes 10 items, and psychosocial fatigue includes 2 items. Each item of the scale is rated on a 5-point Likert scale where "0" indicates never and "4" indicates always. A total summed score is derived ranging from 0 to 84 with higher scores indicating greater fatigue. A cut-point of equal to or greater than 38 in the total score indicates clinically significant fatigue.

The MFIS has been validated among the TBI population (LaChapelle & Finlayson, 1998). Furthermore, the MFIS was found to have good test-retest reliability (ICC = .86) among disabled persons including TBI persons and was also found to be more highly reliable for monitoring fatigue for a duration of six months or longer among disabled persons compared to the FSS (Learmonth et al., 2013).

Barrow Neurological Institute Fatigue Scale (BNIFS). The BNIFS is a self-report fatigue assessment tool developed by Borgaro, Gierok, Caples, and Kwasnica (2004) for the assessment of fatigue in a neurological rehabilitation setting for the acute phase of brain injury patients. The BNIFS consists of 10 items that are rated on a 7-point scale ranging from 0 to 7 (0–1, rarely a problem; 2–3, occasional problem, but not frequent; 4–5, frequent problem; 6–7, a problem most of the time). The BNIFS has shown good reliability among brain injury patients when tested in acute neurological patients (Malley et al., 2014). However, the BNIFS has several questions that assess the aspects of sleep, attention, and alertness rather than fatigue and it is more useful in the acute stage of brain injury in acute settings rather than community settings.

Hence, the MFIS appropriately covered the concept of fatigue in this study and it has good validity and reliability among TBI persons living in the community for six months or longer. Therefore, the MFIS was selected for the measurement of fatigue in this study.

The Relationships Between Social Support, Physical Environment, Fatigue, and Community Integration Among Persons After TBI

This part presents the association between the main variables of the study consisting of social support, physical environment, fatigue, and community integration. Studies that focused on examining the relationships among TBI survivors are limited. Therefore, the literature review for this part was extended to disabilities in general.

Social support and community integration. Social support is evidenced as one of the strongest antecedents of community integration. Batchos et al. (2017) studied the relationships of social support and social integration among acquired brain injury persons and found that social support had a positive relationship with social integration ($r = .43$, $p < .001$). Likewise, Douglas (2013) found that social support from family and friends enhanced self-conceptualization among TBI survivors thereby increasing the level of community integration. In addition, Ditchman et al. (2016) found that social support had the strongest correlation with social integration ($r = .50$, $p < .01$) among brain injury survivors. Similarly, Nichols and Kosciulek (2014) conducted a study to better understand social interactions of the individual with TBI by exploring how individuals with TBI describe their social interaction experiences. The study provided four themes: family; peer group; friendship; and others. Others in the study were described as teachers, professionals, co-workers, and supervisors. The study found that support from the family and peer group enhanced community integration after TBI (Nichols & Kosciulek, 2014). In addition, Mcrae, Hallab, and Simpson (2016) also found that family support was positively associated with community integration. Moreover, a study by Forslund et al. (2013) among moderate to severe TBI found that support from friends contributed to a high level of community integration (*OR* = 3.5, $p = .07$). Furthermore, Donker-Cools et al. (2018), who conducted a study among acquired brain injury patients, stated that a high level of active participation/involvement was related with support from the employer and family.

Some studies showed that a negative relationship existed between community integration and social support. Min and Wong (2015) reported that a low level of support from a health team was associated with a low level of social participation ($\beta = -.15$, $p < .01$). Similarly, Donker-Cools et al. (2018) found that a low level of support from health professionals led to a low level of community integration. Moreover, Nichols and Kosciulek, (2014) found that support from friends and others was associated with a low level of community integration. Likewise, Mcrae, Hallab, and Simpson (2016) reported that support from significant others was negatively associated with community integration. Here, the significant others were considered to be employers and co-workers. Similarly, a study conducted by Wilson et al. (2015) among moderate to severe TBI reported that a low level of support from the family and friends resulted in reduced participation that showed difficulty in community integration after moderate to severe TBI.

Physical environment and community integration. Physical environment is one of the important antecedents of community integration among TBI persons. Forslund et al. (2013) studied environmental influence in productive activities among moderate to severe TBI at 1 and 2 years post-injury. The study found that patients who drove a vehicle were more likely to be employed (*OR* = 8.4, $p < .001$) and showed a positive relation between community integration and physical environment. Moreover, automatic doors, visiting stores in the morning, and provisions of assistance for TBI persons to access direction and route information at a bus station were found to promote a high level of community integration among TBI persons (Lefebvre & Levert, 2014).

However, Fleming et al. (2014) found that physical environment showed a negative effect with community integration among TBI persons (β = -.37, $p < .01$). The researcher added that physical environment, especially the structure, lighting, temperature, and weather, showed a larger impact compared to service, information, and technology in community participation. Likewise, Pappadis et al. (2012), who also studied environmental influence and community integration among TBI persons, also found that physical structure, temperature, terrain, lighting, and availability of transportation had greater impacts than service, information, and technology in community integration (β = -.42, $p < .03$). Wong et al. (2017) studied physical environment and community participation among disabled persons including TBI and also found a negative correlation between physical environment and community integration (r = - .40, $p < .001$). The study suggested that the difficulties in accessing service, polices, information, and technology were associated with physical structure/layout of the home, work–place, and community and negatively influenced community participation among TBI survivors. Similarly, Lefebvre and Levert, (2014) explained that the height of a bus, distance between bus stops, and difficulty in identifying signs and signals to get transportation as well as the crowds, noise, lighting in public places such as shopping centers, and difficulty in accessing information for orientation reduced the level of community participation among TBI persons. Nalder et al. (2016) found that the difficulty in accessing therapy services reduced the level of community integration among severe TBI persons.

Furthermore, a survey among the disabled population in the community of Nepal found unavailability of equipment, personnel, and facilities in community settings, lack of transportation, and financial burden as barriers to access health care (Gupta et al., 2015). However, there is still a lack of appropriate data with regard to community integration and physical environment among TBI survivors in the context of Nepal.

Fatigue and community integration. Fatigue is one of the distressing symptoms that can have an impact on community integration (Juengst et al., 2017). Buunk et al. (2015) studied social integration and post-injury symptoms among acquired brain injury persons living in the communities. The study found that fatigue was one of the predictors for social integration among acquired brain injury persons ($\beta = .25$, $p < .05$). Likewise, Donker-Cools et al. (2018) performed a qualitative study among acquired brain injury patients to identify the factors related to returning to work and the authors found that fatigue was one of the related factors that acted as a barrier for productive activities among brain injury persons.

Moreover, Juengst et al. (2013) conducted a study among 50 TBI persons living in the community to determine the contribution of fatigue in community participation and the researchers found that fatigue was the strongest predictor of community participation among TBI survivors ($\beta = .47$, $p < .001$). Similarly, Lefebvre and Levert (2014) performed a qualitative study among TBI persons in community participation by identifying the facilitating factors and obstacles. The authors identified fatigue as one of the injury related factors among TBI persons that acted as a barrier or obstacle to community integration. Furthermore, Juengst et al. (2017) conducted a study among TBI persons living in a community from 6 months after injury concerning the contribution of fatigue in community participation. The study found that physical fatigue was highly correlated with community participation in comparison to cognitive fatigue ($r = .81$, $p < .01$) and also showed that physical fatigue was a statistically significant independent predictor of participation ($\beta = -.38$).

In summary, social support, physical environment, and fatigue were found to be important factors for successful community integration among TBI survivors. The evidence showed an inconsistent relationship of perceived social support from family, friends, and significant others among TBI survivors. Similarly, most studies showed a negative relationship between physical environment and community integration among TBI survivors. Furthermore, most studies showed fatigue as one of the strongest predictors of community participation among TBI persons.

Summary of the Literature Review

TBI is one of the most common causes of disability and has profound negative consequences in physical as well as psychological aspects of an individual. Despite the negative consequences, TBI survivors adapt with bio-physiological and social activities when they could achieve successful community integration. Community integration is the active participation of an individual in home integration, social integration, and work or productive activities. This process of integration includes certain factors that act as facilitators and barriers for the achievement of community integration among persons after TBI.

The existing evidence from the literature review showed that community integration among TBI survivors was usually associated with social support, physical environment, and fatigue. However, community integration and its predictors vary according to cultural beliefs, geographical structure, infrastructure, and the health care system.

To date, the published literature has not demonstrated predictors for community integration among persons after TBI in Nepal. Moreover, previous studies related to community integration among TBI persons were conducted in developed or Western countries which are different in the context of Nepal.

Chapter 3

Research Methodology

This chapter describes the research design, settings, population and sample, research instruments, data collection procedure, ethical considerations, and the data analysis.

Study Design

A predictive research study was conducted to illustrate the predictive factors for community integration among persons after TBI.

Study Setting

The study was conducted in all of the thirteen districts of province number three of Nepal. In this province there are five major neuro-hospitals: the National Trauma Center, Shree Birendra Hospital, Dirghayu Guru Hospital, Annapurna Neurological Institute & Allied Sciences, and Upendra Devkota Memorial National Institute of Neurological and Allied Sciences.

The National Trauma Center is the first and only public trauma hospital with 200 beds located in Kathmandu Valley of province number three. Similarly, Shree Birendra Hospital is the only tertiary level Nepal Military Hospital for the Nepalese army and their family members with 400 beds located in Kathmandu district of province number three. Likewise, Dirghayu Guru Hospital and Upendra Devkota Memorial National Institute of Neurological and Allied Sciences, which have 55 and

100 beds, respectively, are widely known private neuro-hospitals in Nepal located in Kathmandu district of province number three. Moreover, Annapurna Neurological Institute & Allied Sciences has a 55 bed private hospital with rehabilitation services for neuro patients located in province number three.

Province number three is divided into thirteen districts: Bhaktapur, Chitwan, Dhading, Dolakha, Kathmandu, Kavrepalanchok, Lalitpur, Makwanpur, Nuwakot, Ramechhap, Rasuwa, Sindhuli, and Sindhupalchok. The Province also includes three metropolitan cities, one sub-metropolitan city, and 41 municipalities. There are 74 rural municipalities in this province.

Kathmandu Valley has three districts, namely Kathmandu, Bhaktapur, and Lalitpur located in the hills of province number three at an average altitude of 1350 meters above sea level. Kathmandu Valley is surrounded by four mountain ranges: Shivapuri (at an elevation of 2,800 meters or 9,200 feet), Phulchowki (2,795 meters or 9,170 feet), Nagarjun (2,825 meters or 9,268 feet), and Chandragiri (2,551 meters or 8,369 feet). The major river flowing through the Kathmandu Valley is the Bagmati River. Five major climatic regions are found in Nepal. The warm temperature zone and cool temperature zone are found in the Kathmandu Valley. The summer temperature varies from 28 to 30 °C (82 to 86 °F) whereas the average winter temperature is 10.1 °C (50.2 °F) in the Kathmandu Valley. It has been reported that sometimes winter temperatures can drop to 1 °C (34 °F) or less. Moreover, the valley has a climate with warm days followed by cool nights and mornings. The valley also has a monsoon season from June to August. Furthermore, the built structure of housing in the Kathmandu Valley differs from rural and urban areas. The rural areas have mostly “Kachhi” houses that are built of non-durable materials such as wooden flakes, bamboo, straw/thatch, mud, and unbaked bricks which are used for both the walls and roof. However, the “Pakki” houses in the urban area have both the walls and roof made of permanent construction materials like cement, bonded brick, concrete, stone, slate, tile, and galvanized sheet (Kayastha & Shrestha, 2009). The public transportation facilities are poor and inefficient. The schedules are not well-defined and the vehicles are generally poorly maintained and lack cleanliness. They are also overcrowded and uncomfortable and the vehicles compete with one another for passengers. Speeding is often a major concern for passenger safety and the vehicles wait for a longer time at stops which results in traffic jams and congestion (Manav-Kendrit Yatayat Abhiyan, 2014).

Kavrepalanchok is also one of the districts situated in the mid-hilly area of province number three. The Kavrepalanchok district includes thirteen municipalities out of which six are urban and seven are rural municipalities. The Arniko Highway links Kavrepalanchok with the Kathmandu Valley. The Kavrepalanchok district is also surrounded by mountainous features with a sub-tropical climate with temperatures ranging from -1 °C to 33 °C. The monsoon starts from early June and ends in the latter half of September (Environment Planning Document, 2010). Moreover, the built structure of houses in Kavrepalanchok is different in urban and rural areas. In the urban area, mostly “Pakki” houses are found, whereas in the rural area “Kachhi” houses are usually built. Furthermore, the public transportation facility is poor and limited in number in comparison to Kathmandu Valley as most of the road passes through hill area and road distances of 200 meters are more prone to landslides and erosion (Environment Planning Document, 2010). Similarly, Dhading, Dolakha, Nuwakot, Ramechhap, Rasuwa, Sindhuli, and Sindhupalchok are situated in the hilly areas of province number three. There are upper tropical, sub-tropical, temperate, and sub-alpine climatic zones in these seven districts of province number three. Likewise, the public transportation facilities are poor and limited in number in comparison to Kathmandu Valley since most of the roads pass through hill area and road distances of 200 meters are more prone to landslides and erosion (Environment Planning Document, 2010). In addition, the built structures of houses are mostly “Kachhi” houses and some of them are “Pakki” houses in those seven districts of province number three.

Moreover, Chitwan and Makawanpur are plain and hilly land districts in province number three where lower, upper, and sub-tropical climatic zones exist. In this district as well, the public transportation facilities are poor and limited in number compared to Kathmandu Valley. The built structures of houses are “Pakki” in the urban areas and “Kachhi” in the rural areas. Figure 3 is a map of province number three.

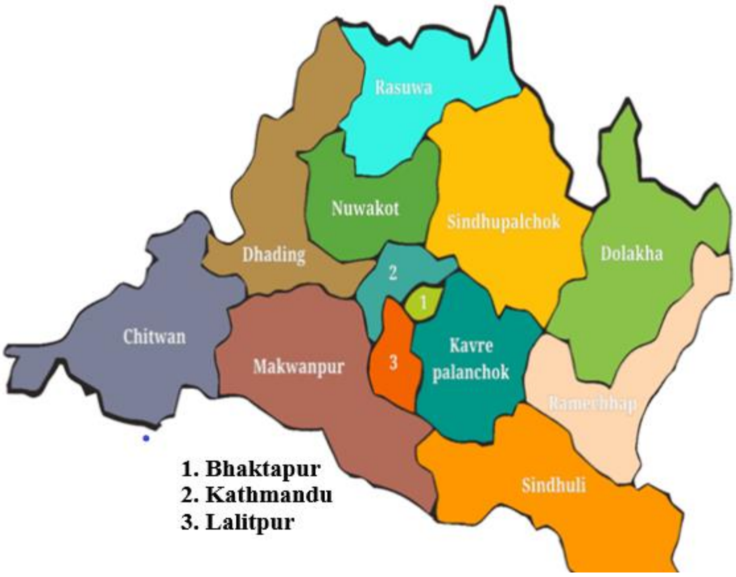

Figure 3. Map of Province Number Three

Population and Sample

The population of this study consisted of TBI survivors in province number three.

Target population. The target population of the study was TBI survivors who were discharged from five neuro-hospitals: Shree Birendra Hospital, National Trauma Center, Dirghayu Guru Hospital, Annapurna Neurological Institute & Allied Sciences, and Upendra Devkota Memorial National Institute of Neurological and Allied Sciences and living in the communities of province number three. The number of patients in the target population obtained from statistical records of the year 2018 from the respective five hospitals were 23 cases at the Annapurna Neurological Institute & Allied Sciences, 60 cases at the Dirghayu Guru Hospital, 125 cases at the National Trauma Center, 85 cases at Upendra Devkota Memorial National Institute of

Neurological and Allied Sciences, and 34 cases at the Shree Birendra Hospital. The total population was 327 TBI survivors from the five hospitals.

Sample and Sampling Procedure

The recruited subjects were TBI survivors living in the communities of province mumber three and were discharged from the five selected hospitals. The subjects met the inclusion criteria and agreed to participate in the study.

The inclusion criteria were: (1) those who were diagnosed as TBI and living in the community for ≥ 6 months up to 12 months after discharge from hospital/rehabilitation center; (2) males and females who agreed to participate in the study; (3) 18 years old or older; (4) able to communicate and understand the Nepali Language; (5) good consciousness at the time of the interview with a GCS score of 15; and (6) answer “Yes” to question “Do you feel fatigue?”

Sample size estimation. The sample size was calculated based on the sample size calculation technique of multiple regression proposed by Green (1991). According to Green (1991), the sample size for a multiple regression analysis should be equal to or greater than 50 + (8 times the number of predictors). Since this study had three predictors, 74 participants were required for inclusion in this study. Moreover, to overcome the anticipated low response rate, the researcher added an extra 20% to the estimated sample size (Polit & Beck, 2017) for a total of 89 participants. Finally, a total of 120 TBI survivors participated in this study.

Sampling technique. A stratified sampling procedure was used to select the participants (Table 1). This technique was employed to ensure a fairly equal representation of the variables for the study (Polit & Beck, 2017). The stratification was based on the five neuro-hospitals, Annapurna Neurological Institute, Dirghayu Hospital, National Trauma Center, Upendra Devkota Memorial National Institute of Neurological and Allied Sciences, and Shree Birendra Hospital. After receiving permission from the hospitals, the contact details of the TBI cases were listed based on the hospital number. Selection of the participants was done following these steps.

1. The researcher contacted and screened the participants for the inclusion criteria based on the list prepared from each strata.
2. If the participant met all of the inclusion criteria, the researcher included them in the sample and moved to the next subject and followed the same steps until the researcher selected the calculated number of samples from each strata.
3. If the inclusion criteria of the first participant were not met, the researcher moved to the second participant until the total number of participants was met from each strata.

Table 1

Proportions of the Sample Size Calculations of the Study

Name of hospital	Target population	Proportion from target population (327)	Proportion from total sample size (120)
1. National Trauma Center	125	(125x 100)/ 327 = 38%	38% of 120 = 46
2. Upendra Devkota Memorial National Institute of Neurological and Allied Sciences	85	(85x 100)/ 327 = 26%	26% of 120 = 32

Table 1 (Continued)

Name of hospital	Target population	Proportion from target population (327)	Proportion from total sample size (120)
3. Dirghayu Hospital	60	(60x 100)/ 327 =18%	18% of 120 = 22
4. Shree Birendra Hospital	34	(34x 100)/ 327 =10%	10% of 120 = 12
5. Annapurna Neurological Institute	23	(23x 100)/ 327 =7%	7% of 120 = 8

Instrumentations

Four instruments were used in this study for data collection: (1) Demographic Questionnaire; (2) Community Integration Questionnaire (CIQ); (3) Multidimensional Scale of Perceived Social Support (MSPSS-N); (4) Craig Hospital Inventory of Environmental Factors (CHIEF); and (5) Modified Fatigue Impact Scale (MFIS).

Demographic Questionnaire. This questionnaire was developed by the researcher based on the literature review. This questionnaire consisted of two parts: a) demographic data and b) clinical characteristics of the participants after TBI. The demographic data included information on age, gender, level of education, marital status, religion, ethnicity, employment status, address, number of family members and residing with whom, medical payment of the hospitalization, monthly income, and relationship with the caregivers. The clinical characteristic data included cause of TBI, diagnosis, type of surgery during hospital admission, area of head injury, associated injury, severity of injury based on the GCS score at admission and discharge, length of hospitalization, most common symptoms after head injury, past illnesses, current medication history, activities of daily practices including grooming, feeding, dressing, bathing, stairs, toilet use, mobility, transfer, bowels, and bladder (Appendix B). The researcher collected some of the clinical characteristic data from the medical records of the participants.

Community Integration Questionnaire (CIQ). The CIQ was developed by Willer et al. (1993) and was used to collect information on community integration among persons after TBI. The CIQ consisted of 15 short-form questions related to: (1) home environment (5 items); (2) integration into a social network (6 items); and (3) integration into productive activities (4 items) (Willer et al., 1993).

Out of 15 items, 12 items are scored on a 3-point scale (0 to 2) where “0” is activity performed by someone, “1” is activity performed with someone else and “2” is activity performed alone for the first six items of questionnaire and then for the seven to nine items interpretation of a 3-point scale score where “0” was activity not performed in the past month, “1” was activity performed 1-4 times in the past month, and “2” was activity performed 5 or more times in the past month.

For item 10, interpretation on a 3-point scale included “0” = mostly alone, “1” = mostly with friends who have had head injury or with family, and “2” = mostly with friends without head injury or combination of family and friends. Likewise, for item 11, interpretation on a 3-point scale included “0” = no response and “2” = yes response. For item 12, interpretation on a 3-point scale included “0” = seldom/never, “1” = almost every week, and “2” = almost every day.

The remaining three items of 13, 14, and 15 were related to employment, school, and volunteer activities which are scored on a 6-point scale (0 to 5). The 6-

point scale scoring system for the last three items of the CIQ for “Job School” is different for the retired age group and non-retired age group. The scoring system for Job School items 13-15 are “0” if the participant answered the following questions as: Item 13) not working, not looking for work; Item 14) not going to school; and Item 15) no volunteer activities. The answer is “1” if the participant answered the following questions as: Item 13) not working, not looking for work; Item 14) not going to school; and Item 15) volunteers 1 to 4 times. The answer is “2” if the participant answered the following questions as: Item 13) actively looking for work AND/OR Item 15) volunteers 5 or more times per month. The answer is “3” if the participant answered the following questions as: Item 13) working part-time OR Item 14) attends school part-time. The answer is “4” if the participant answered the following questions as: Item 13) working full-time OR Item 14) attends school full-time. The answer is “5” if the participant answered the following questions as: Item 13) working full-time AND Item 14) attends school part-time OR Item 13) works part-time AND Item 14) attends school full-time. However, if the participant is retired due to age, then item 15 is used to score the JOBSCHOOL variable as: 5 or more receives “4”; 1-4 times receives “2”; and never receives “0” (Appendix C).

Therefore, the overall CIQ score from the individual questions ranges from 0 to 29. A higher score indicates a greater integration and the lower score indicates less integration. Grove and Cipher explained that the scores should be presented as interval levels of measurement (as cited in Gray, Grove, & Sutherland, 2017). Therefore, the level of community integration is categorized as;

Score	Level
0-9.67	Low
9.68-19.33	Moderate
19.34-29.0	High

In addition, the mean percentage (*M*%) was used to differentiate the levels among the subscales of community integration. The mean percentage in this study was obtained by dividing the mean score of the subscale from its highest score and multiplied by 100 (Edward, 2018).

Multidimensional Scale of Perceived Social Support Questionnaire-Nepali version (MSPSS-N). Social support in this study was measured by the MSPSS questionnaire developed by Zimet et al. (1988). It is a self-report scale that consists of 12 items of questions related to support from family, friends, and significant others. The MSPSS-Nepali version of the original MSPSS was translated and validated among the Nepalese by Tonsing, Zimet, and Tse (2012). Each item is rated on a 7-point Likert scale ranging from “1” = very strongly disagree to “7” = strongly agree (Appendix D). The total possible score ranges from 12 to 84 and a high score indicates greater perceived social support and vice versa.

Craig Hospital Inventory of Environmental Factors (CHIEF). The CHIEF is a tool to measure environmental factors. The tool was developed by Whitneck et al. (2004) and consists of 25 items of five domains: a) service/assistance; b) physical/structure; c) work/school; d) attitude/support; and e) policy (Whiteneck et al., 2004). Each of the 25 items with the frequency score range from “0” to “4” to indicate the frequency with which barriers were encountered (0 = never, 1 = less than monthly, 2 = monthly, 3 = weekly, and 4 = daily). The questionnaire also included a magnitude score on a scale of “1” to “2” indicating the size of the problem which the barrier typically presented (1 = a little problem and 2 = a big problem). A frequency-magnitude product score of 0-8 calculated as the product of the frequency score and the magnitude score, with a higher score indicating a greater impact of the environmental barrier (Appendix E). After getting permission, the researcher modified the tool and included only six items of the physical/structure domain that would be appropriate as the study variable, namely physical environment.

Modified Fatigue Impact Scale (MFIS). The MFIS is a multidimensional scale. The modified form of the fatigue impact scale was developed by Fisk et al. (1994). MFIS reports physical, cognitive, and psychosocial aspects of fatigue. The scale consists of 21 items in which physical fatigue includes 9 items, cognitive fatigue includes 10 items, and psychosocial fatigue includes 2 items. Each item of the scale is rated on a 5-point Likert scale where “0” = never, “1” = rarely, “2” = sometimes, “3” = often, and “4” = almost always (Appendix F). The total score ranges from 0–84 with higher scores indicating greater fatigue. A cut-point of 38 and greater indicates clinically significant fatigue (Juengst et al., 2013; Juengst et al., 2017) (Appendix F).

The MFIS has shown good validity and reliability in the TBI population. Cronbach’s alphas in the TBI population were reported as .97 for all 21 items, .95 for the 11 items (including items 1 and 11) of the cognitive subscale, and .96 for the 10 items of the physical and psychosocial subscale (Schiehser et al., 2015). In this study, higher scores were interpreted as high fatigue and lower scores as low fatigue.

Translation of Instruments

Out of the five questionnaires, four of the questionnaires (i.e., demographic questionnaire, CIQ, CHIEF, and MFIS) were in English and were translated into the Nepali language whereas the MSPSS-N was in the Nepali version. The original questionnaires were translated into the Nepali language by the process postulated by Brislin (as cited in Polit & Beck, 2012). According to Brislin, the steps for back translation include (1) selecting and preparing translators, (2) understanding an iterative process, and (3) testing the translated version (as cited in Polit & Beck, 2012).

In the first step the researcher selected two bilingual translators and one bilingual reviewer who were familiar with both the English and Nepali languages as well as capable of understanding the study variables based on their qualifications and experience (Appendix L). The first translator who had obtained a master's degree in English was selected to translate the instruments from the English versions into the Nepali versions. The second translator, who was working as a lecturer and had obtained a master's degree in English, did a back translation of the instruments from the Nepali versions into the English versions.

The second step is the iterative process which involves a comparison of the translated Nepali and English versions of the instruments by an expert or reviewer to identify any discrepancy and clarify that both versions have similar meanings with the original. Therefore, the third translator, who was a Ph.D. scholar in the humanities and majored in English, detected and clarified minor differences and ensured that the translated instruments were the same in meaning with the original version. Finally, the translated versions of the instruments were tested.

Quality of Research Instruments

Validity of the instruments. The content validity of the instruments was confirmed by consultation with a panel of five experts. The panel of experts included: (1) a lecturer from the Faculty of Nursing (Adult and Elderly Nursing Department), Prince of Songkla University; (2) a nurse who was experienced in trauma at Hat Yai Hospital, Songkhla; (3) a public health nurse from Nepal working in a community setting; (4) a government hospital nurse from Nepal who had experience in trauma and neurosurgery; and (5) a private hospital nurse from Nepal who had experience in neurosurgery (Appendix K).

The content validity of the data collection tools was independently rated by five experts for the relevance of each item to the objectives using a 4-point rating scale. Each item was evaluated for the appropriateness, accuracy, and congruency with the construct of the current study. A scale content validity index (S-CVI) greater than .80 only reassured the content validity of the instruments (Polit & Beck, 2012). In this study, the S-CVI scores were .98, .98, .98, and .93 for the CIQ, MSPSS, CHIEF, and MFIS respectively. The instruments were revised according to the recommendations of the experts and cultural context of Nepal.

Reliability of the instruments. The reliability of the instruments refers to the consistency of the measurement of the construct the tool intends to measure (Polit & Beck, 2012). Cronbach’s alpha coefficient was used to evaluate the internal consistency of each item of the instruments to estimate the extent to which each item could reliably measure the intended construct (Polit & Beck, 2012). According to Radhakrishna (2007), a pre-test of the instrument can be performed among 15-30 samples having the same characteristics as the research samples. Hence, the researcher conducted pre-tests of the instruments among 20 TBI survivors after assuring the validity of the instruments. Cronbach's alpha coefficients for the CIQ, MSPSS-N, CHIEF, and MFIS were .75, .92, .90, and .93 respectively. These values could be regarded as acceptable since a Cronbach's alpha of more than .70 is considered to indicate adequate reliability of an instrument (Polit & Beck, 2012). Among the 120 TBI survivors, Cronbach's alpha coefficients for the CIQ, MSPSS-N, CHIEF, and MFIS were .72, .96, .78, and .97 respectively.

Ethical Considerations

Ethical approval was obtained from the Center for Social and Behavioral Sciences Institutional Review Board, Prince of Songkla University, Thailand and The National Health Research Council in Nepal and from the directors of the five neuro-hospitals before the data collection (Appendix I). Each participant was provided with a written informed consent and they were free to withdraw from the study at any time without any effect on their work or relationship with the researcher. The researcher protected the privacy of the participants by ensuring the anonymity and confidentiality by removing the participant's name and replacing it with a coded term or number. All information obtained from participants was kept confidential and was used only for the purposes of the study. All of the paper based information was kept secure by the researcher and the data in electronic form were secured with a protected password that was accessible only to the researcher. The researcher ensured the participants there would be no life threatening events during the process of data collection that would affect patient safety.

Data Collection Methods

After obtaining ethical approval from the Center for Social and Behavioral Sciences Institutional Review Board, Prince of Songkla University, Thailand and The National Health Research Council in Nepal as well as permission from the directors of the five hospitals, data collection was conducted according to these steps.

1. The researcher contacted the medical records center of each of the five hospitals to obtain the detailed information of the TBI survivors who were discharged from the hospital.
2. A brief explanation was provided to the potential participants regarding the objective, purpose, and procedure risks and benefits of the study via telephone. Moreover, the researcher asked the participants about fatigue based on the definition of the term and if they experienced fatigue or not via telephone to ensure they met the inclusion criteria.
3. If the participant agreed to participate, an appointment was made to set the place and time for a home visit. However, 10 participants (8.3%) were interviewed by the researcher via telephone due to weather conditions and unavailability of transportation.

4. The researcher asked each eligible participant to sign an informed consent form (Appendix A). If the participant could not sign, the researcher asked his/her family member to sign the informed consent based upon agreement by the participant. A copy of the consent form was provided to the participants. For the 10 participants interviewed via telephone, the researcher read and explained the informed consent (Appendix A) and asked for verbal consent via telephone.
5. The participants were administered the questionnaire. In some participants who could not write the answers on their own, the researcher helped them to fill the answers. The researcher used the MFIS to assess fatigue. For the assessment of common symptoms such as headache, restlessness/anxiety, or depression. The researcher used open-ended question as in the demographic data form (Appendix B).
6. The researcher checked the completion of the questionnaire at the end of the individual data collection and requested the participants to complete the questionnaire in case of any missing responses.

Data Analysis of the Study

Computer software was used for the data analysis. Descriptive and inferential statistics were used to analyze the data in order to answer the research questions. The following steps were included in this study.

1) Descriptive statistics were used to describe the demographic and clinical characteristics of the participants in terms of frequency, percentage, range, mean, and standard deviation.

2) The community integration, social support, physical environment, and fatigue were analyzed and presented in terms of mean, standard deviation, and range after ensuring the normality of the four instruments which is explained below under the heading of normality.

3) The assumption of normality, linearity, homoscedasticity, and multicollinearity of the variables were tested before performing the multiple regression analysis (Appendix G). The test of assumptions used in this study is explained below.

Normality. The values of skewness and kurtosis were used to test the normality of two instruments, namely CIQ and MFIS. The distribution of data was considered normal if the values of skewness and standard error (SE) ratio and kurtosis and SE ratio were in the range of ±3.29 (Kim, 2013). Since the scores were found within the range, all of the data were normally distributed.

Linearity. The linearity of the variables was tested through a scatterplot between dependent and independent variables. The overall shape of the scatterplot should be rectangular (Tabachnick & Fidell, 2013). The result of the study met the assumption of linearity since the scatterplot showed a rectangular shape.

Homoscedasticity. Homoscedasticity assumption was determined by a scatterplot. If a scatterplot of residuals shows roughly a rectangular shape then the data meet the assumption of homoscedasticity (Tabachnick & Fidell, 2013). In this study, the data met the assumption.

Multicollinearity. Multicollinearity was determined using tolerance and variance inflation factor (VIF). A tolerance value less than .10 or a VIF more than 10 is considered a problem of multicollinearity (Pallant, 2016). The results in the study showed tolerance values more than .10 and VIF values less than 10 which indicated no problem of multicollinearity and met the assumption of the present study.

Autocorrelation. The value of Durbin-Watson statistics for correlation should be between 1.5 and 2.5 for non-autocorrelation (Tabachnick & Fidell, 2013). In the present study the value was 2.0 which indicated non-autocorrelation.

Chapter 4

Results and Discussion

This study aimed to describe the level of community integration and to determine the predictive factors for community integration among persons after TBI. This chapter presents the results and discussion of the study.

Results

The results of the study are categorized into demographic characteristics, clinical characteristics, level of community integration, and predictive factors for community integration.

Demographic characteristics. The study obtained data from 120 participants. The mean age of the participants was 34.46 (*SD* = 11.69) years. The majority of the participants were male (79.2%). Most of the participants were Hindu (61.7%) and married (71.7%). Around 38% of the participants attended higher education and 75.0% of the participants were working inside the home after TBI. Forty-three percent of the participants had a monthly family income of 25,001 to 40,000 Nepalese Rupees (NPR) (1 NPR = 110 USD) (Table 2).

Table 2

Frequency and Percentage of the Participants Classified by Demographic Characteristics (N = 120)

Characteristics	*n*	%
Age (*M*=34.46, *SD*= 11.69, Min= 18, Max= 64)		
18-30	54	45.0
31-45	37	30.8
46-60	28	23.4
>60	1	0.8
Gender		
Male	95	79.2
Female	25	20.8
Religion		
Hindu	74	61.7
Buddhist	38	31.7
Christian	4	3.3
Muslim	4	3.3
Marital status		
Married	86	71.7
Single	29	24.1
Widow/widower	2	1.7
Divorced	3	2.5
Education level		
Illiterate	21	17.5
Primary level	23	19.2
Secondary	30	25.0
Higher	46	38.3
Workplace before TBI		
Inside home	68	56.7
Outside home	52	43.3
Workplace after TBI		
Inside home	90	75.0
Outside home	30	25.0
Average monthly income (NRS)*		
10,000-25,000	44	36.7
25,001-40,000	52	43.3
>40,000	24	20.0

Note. *1 USD = 110 Nepalese Rupees

Clinical characteristics. Motorcycle accident was found to be the most common cause of TBI that accounted for 41.7% of all participants. More than half (64.2%) of the participants had GCS scores of 13-15 at the time of admission. Most of the participants (82.5%) scored 13 to 15 on the GCS at the time of discharge. Most participants (68.3%) were hospitalized for 1-10 days. The vast majority of the participants (96.7%) were totally independent for their activities of daily living (Table 3).

Table 3

Frequency and Percentage of the Participants Classified by Clinical Characteristics (N = 120)

Characteristics	*n*	%
Cause of TBI		
Motorcycle accident	50	41.7
Car/bus collision	8	6.7
Fall	39	32.5
Body assault	22	18.3
Sports	1	0.8
GCS		
At admission		
3-8	5	4.1
9-12	38	31.7
13-15	77	64.2
At discharge		
3-8	2	1.7
9-12	19	15.8
13-15	99	82.5
Length of hospital stay (days)		
1-10	82	68.3
11-20	25	20.8
>20	13	10.9
Activities of daily living (Modified Barthel Index)		
Total dependence (0-20)	0	0.0
Severe dependence (21-60)	0	0.0
Moderate dependence (61-90)	1	0.8
Slight dependence (91-99)	3	2.5
Independence (100)	116	96.7

Level of community integration. The study found that the total score of community integration among the participants was at the moderate level (*M* = 15.99, *SD* = 3.32). The sub-scale social integration showed a higher level (*M* = 7.93, *SD* = 1.34) than the sub-scale productive activities (*M* = 3.68, *SD* = 2.45) and the sub-scale home integration (*M* = 4.37, *SD* = 1.41) (Table 4).

Table 4

Possible Range, Minimum, Maximum, Mean, Standard Deviation, Mean Percentage, and Level of the Community Integration (N = 120)

Variables	Possible range	Min-Max	*M* (*SD*)	*M*%	Level
Community Integration Total	0-29	8-25	15.99 (3.32)		Moderate
1. Home Integration	0-10	0-10	4.37 (1.41)	43.7	
1.1. Buy household items	0-2	0- 2	1.03 (0.37)		
1.2. Prepare meals at house	0-2	0-2	1.00 (0.34)		
1.3. Everyday housework	0-2	0-2	1.00 (0.32)		
1.4. Caring for children	0-2	0-2	0.29 (0.51)		
1.5. Social arrangement at home	0-2	0-2	1.06 (0.29)		
2. Social integration	0-12	4-12	7.93 (1.34)	66.1	
2.1. Personal finances	0-2	0-2	1.06 (0.67)		
2.2. Going market per month	0-2	0-2	1.08 (0.33)		
2.3. Leisure activities per month	0-2	0-2	1.00 (0.39)		
2.4. Visit friends or relatives per month	0-2	0-2	1.09 (0.39)		
2.5. Participate leisure activities	0-2	1-2	1.73 (0.44)		
2.6. Best friend	0-2	0-2	1.97 (0.26)		
3. Integration into productive Activities	0-7	0-7	3.68 (2.45)	52.6	
3.1. Travel outside home	0-2	0-2	0.59 (0.67)		
3.2. Productive variables	0-5	0-5	3.09 (1.99)		

Social support, physical environment and fatigue. In this study, social support, physical environment and fatigue were selected to determine the predictive factors for community integration. The mean score of social support, physical environment, and fatigue of participants were 64.79 (*SD* = 8.02), 3.16 (*SD* = 1.24), and 49.93 (*SD* = 11.77), respectively (Table 5).

Table 5

Possible Range, Minimum, Maximum, Mean, Standard Deviation of Social Support, Physical Environment, and Fatigue (N = 120)

Variables	Possible range	Min-Max	*M*	*SD*
Social support	12-84	51-81	64.79	8.02
Physical environment	0-8	1-6	3.16	1.24
Fatigue	0-84	16-83	49.93	11.77

Predictive factors for community integration. Initially, the relationship between community integration and predictors were measured and then the significant predictor was entered for the linear regression in this study. The details are explained under the headings below.

***Relationship between community integration and predictors*.** In this study, the relationship between community integration and other measured variables were sought to determine the predictive factors. The relationship among the study variables were analyzed using Pearson’s correlation. The study showed that fatigue had a significant negative relation with community integration total ($r = -.31$, $p < .01$) and subscale. Furthermore, physical environment showed a non-significant relationship with community integration total. However, physical environment revealed a significant relationship among home integration sub-scale (*r* = -.19, *p* < .05) and productive activities sub-scale (*r* = -.19, *p* < .05). In addition, social support showed a non-significant relation with community integration and its sub-scale (*p* >.05) (Table 6).

Table 6

Pearson's Correlation Coefficient Between Community Integration Total, Subscale, Social Support, Physical Environment, and Fatigue (N = 120)

Variables	Community integration Total	Subscales of community integration		
		Home integration	Social integration	Productive activities
1. Social support	-.03	-.07	-.00	.00
1.1. Family	-.08	-.01	-.04	.00
1.2. Friend	.06	.01	-.03	.09
1.3. Significant others	-.06	-.06	.09	-.07
2. Fatigue	-.31**	-.20*	-.19*	-.19*
2.1. Physical fatigue	-.25**	-.06	-.18*	-.21*
2.2. Cognitive fatigue	-.28**	-.29**	-.12	-.15
2.3. Psychosocial fatigue	-.30**	-.13	-.32**	-.16
3. Physical environment	.02	-.19*	-.12	-.19*

Note. **p* < .05; ***p* < .01

Predictors of community integration. The study variable fatigue was used for linear regression after the assumption was met (Appendix G). The analysis revealed 9.6% ($R^2 = .096$) of the variance in the community integration among persons after TBI was due to fatigue. Fatigue (β = -.31, *p* < .00) that could statistically predict community integration among persons after TBI. The linear regression equation for the study using the information from regression analysis is

R^2 community integration = 20.96 + (-.09) (Fatigue).

Table 7

Linear Regression Analysis Predicting Community Integration

Variables	*B*	*SE*	*β*	*t*	*Sig*
Fatigue	-.09	.02	-.31	-3.49	.00**
Constant = 20.96	$R = .31$	$R^2 = .096$	$F_{(3,\,116)} = 4.11$		
SE = 3.19	$R^2_{\text{adj}} = .07$		**($p = .00$)		

Note. **$p < .01$

Discussion

The discussion section follows the finding of the study based on the objective and research questions of the study. In this part of the study the findings of the demographic and clinical characteristics of the participants along with the level of the community integration and predictive factors of community integration are discussed.

Demographic and clinical characteristics of the participants. In this study, the mean age of the participants was 34.46 years. The study finding with regard to age was comparable with a previous study conducted among TBI patients where the average age of the participants was 34.91years (Ponsford et al., 2014). Accordingly, a geographical comparative study conducted among TBI persons revealed that people aged 25-58 years old were in a vulnerable group for TBI (Biswas, Kabir, & King, 2017).

The majority of the participants (79.2%) in this study were male, which was consistent with previous studies (Andelic et al., 2016; McClennan & Snide, 2003; Ponsford et al., 2014; Pugh et al., 2018). Accordingly, a systematic review and meta-analysis conducted among TBI persons in developed countries revealed that males were at twice the risk for injury than females (Frost, Farrer, Primosch, & Hedges, 2013). The evidence showed that males were more often involved in risk taking activities than females (Bajracharya, et al., 2010; McClennan, & Snide, 2003).

In this study, the employment status before injury was 66.6%, whereas the employment status after injury was reduced to 59.2%. This finding was similar to the study conducted in Norway by Forslund et al. (2013) where the employment rate fell from 50% to 44%. Most of the TBI persons experienced fatigue or cognitive problems or sensory overloads that resulted in difficulty performing tasks which led to unemployment (Donker-Cools et al., 2018).

It was found that road traffic accident was the cause of TBI in 48.4% which was the most common cause of TBI in this study. This result was consistent with a systematic review on the global incidence of TBI that revealed the highest percentage (56%) of TBI resulted from road traffic accident in Africa and Southeast Asia (Dewan et al., 2018). Similarly, a previous study conducted in Nepal among TBI persons reported that the highest percentage of participants who had TBI was due to road traffic accident (Stenholm & Sharma, 2016).

Level of community integration. Overall, community integration in this study was at a moderate level which was similar to the findings of a previous study among brain injury persons with an overall community integration score of 13.92 at the moderate level (Gerber, Gargaro, & McMackin, 2016). Most of the participants in this study needed minimal help with activities of living, were mild TBI, and were involved in social activities such as participating in leisure activities, visiting friends and relatives, and going shopping or to the market.

Moreover, the sub-scale score in the social integration was high in comparison to sub-scale scores of home integration and productive activities (Table 4). The findings of this study were similar with the findings of previous studies conducted among TBI where the social integration sub-scale scores were 6.0 and 9.0 which were higher than the home integration sub-scale scores of 2.8 and 6.0 and productive activities sub-scale scores of 2.6 and 4.0, respectively (Migliorini et al., 2016; Sandhaugh et al., 2015).

The possible reason for high social integration in this study was because the majority of the participants were working young adults who preferred to visit friends or relatives and participate in leisure activities such as going to a restaurant or a cinema (Table 4). Similarly, Migliorini and team (2016) stated that young adults were usually involved in social activities such as visiting friends and confiding in best friends (Migliorini et al., 2016). In addition, Riches and Green (2003) stressed that working status provided opportunities for social interaction, thereby enhancing social integration.

Furthermore, the study results showed a low score in home integration subscale compared to the other two subscale scores of community integration (Table 4) which was in contrast with the finding of a previous study that showed a high score in the home integration domain (Mollayeva et al., 2015). One of the possible reasons is that in this study most of the participants were male. It was reported that most developing countries still follow the differential roles of male and female where the female role is only for bearing children and housekeeping (Sultana & Zulkefli, 2013). This is similar with the context of Nepal where the men have higher authority and the females are given the responsibility of household activities and they rely on their husbands for financial support (Pokharel, 2008).

In addition, the study showed a low subscale score in the productive activities domain compared with the social integration domain of community integration (Table 4). The productivity sub-scale includes the amount of traveling outside the home, education involvement, paid employment, and volunteer work (Willer et al., 1993). In this study, most of the participants (75.0%) were employed within the home environment because they rarely traveled outside the home. Not surprisingly, the unemployment rate increased from 8.8% to 17.8% after TBI. Only 20% of the participants were involved in education (Appendix H, Table 2).

Most of the participants were not involved in volunteer work. Volunteer work is not a common activity in developing countries (Butt, Hu, & Soomro, 2015). In addition, the average monthly household income of the Nepalese is 30,121.00 NPR (Nepal Rastra Bank, 2015). The participants in this study belonged to the average income group (Table 2). Moreover, the average expenditure for the Nepalese household is 35,944.75 NPR (Center Bureau of Statistics, 2015). This showed that the participants in this study were involved in earning for their livelihood rather than engaging in volunteer activities.

Additionally, the low productive sub-scale score due to symptoms after injury that affected the ability to work or study was reported mostly among mild TBI (Donker-Cools et al., 2018; Hall et al., 2018; Mollayeva et al., 2015), which was similar to the findings of this study. Around 95% of the participants experienced headache, anxiety, sensory impairments, pain, and sleep problems (Appendix H, Table 2).

Furthermore, the moderate level of community integration may be from the physical structure of the environment that exists in Nepal, particularly in terms of the natural environment (i.e., temperature, climate, terrain, lighting, noises, crowds, and the availability of transportation) (Appendix H, Table12). The climate during the data collection period was winter. The temperature ranged from 8 to 12 °C as well as in some parts the temperature fell below 3 °C with snow fall (Department of Hydrology and Meteorology, 2019). The public transportation facilities are poor and inefficient without well-defined schedules and the vehicles are generally poorly maintained, overcrowded, and uncomfortable. Furthermore, they compete with one another for passengers and speeding is often a major concern for passenger safety (Manav-Kendrit Yatayat Abhiyan, 2014).

Similarly, the moderate level of community integration, may be from the cultural context of the caring environment that exists in Nepal, particularly in terms of social support from family, friends, and significant others. The vast majority of the participants were living with family (95.8%) and, in Nepal, family relationship is highly regarded and prestigious for those living in joint/extended families. Relatives usually support and care for each other whenever there is any sick or injured member in the family (Boreson & Askesjo, 2015). In this study most participants perceived and received emotional support from family, friends, and significant others rather than instrumental and informational support because the majority of the participants were capable of doing activities of daily living and belonged in the mild TBI group.

In conclusion, the overall community integration among persons after TBI was at the moderate level. The moderate level of community integration possibly resulted from factors such as gender role, employment status, physical environment, activities of daily living, traveling for productive activities, volunteering, and the number of mild TBI survivors. In addition, the instrument used for the measurement of community integration was developed from Western countries where independency is highly valued (Elfstorm & Kreuter, 2006). Therefore, the scoring system in the questionnaire was high for the activities performed independently.

Predictive factors of community integration. In this study, linear regression analysis was used to analyze the predictive power of fatigue on community integration among persons after TBI. The finding revealed that fatigue accounted for 9.6% variance of community integration (Table 7).

Fatigue. In this study, fatigue was the only significant predictor. A standardized beta weight of -.31 indicated a moderate negative relationship between fatigue and community integration. It was possible that the participants perceived fatigue because they needed to rest more often or for longer periods, felt muscle weakness, had limited activities to do things, and had difficulty organizing thoughts at home or work (Appendix H, Table 13).

In addition, it is not surprising that the participants included in this study experienced fatigue that consequently may: (1) relate either with neuroendocrine abnormalities from brain injury or with co-morbid symptoms such as headache, anxiety, pain, depression, and sleep disturbance; (2) report as a long-term problem among TBI survivors; and (3) increase the likelihood of a poor outcome among TBI survivors. As a result, fatigue among TBI persons interferes with the person's ability to perform (Cantor et al., 2013; Ream & Richardson, 1997). The finding of this study was comparable with previous studies among TBI persons (Brown, Wayne, Gordon & Spielman, 2003; Englander, Bushnik, Oggins, & Katznelson, 2010; Juengst et al., 2013; Ponsford et al., 2013).

Moreover, there exists a small body of evidence on the impact of fatigue on community integration after TBI. In contrast to the finding of this study, a previous study found no association between fatigue and frequency of participation but found an association with quality of life among TBI persons (Cantor et al., 2008). This provided information that fatigue may influence the quality of participation rather than frequency of participation in major activities of living (Cantor et al., 2008). However, another study conducted among TBI persons regarding the frequency of participation showed fatigue as one of the predictors for participation (Juengst et al., 2017) which was similar to the finding of this study.

Social support. In this study social support showed a negative non-significant relationship with community integration. The finding of this study was contrary to previous studies conducted among TBI survivors that revealed a positive significant relationship between social support and community integration (Batchos et al., 2017;

Ditchman et al., 2016). A possible explanation might be that the majority of the participants in this study belonged to mild TBI and they were capable of performing activities of daily living such as bathing, feeding, grooming, and using the toilet independently (Table 3). This showed that social support had less of a role for mild to moderate TBI than severe TBI (Sady et al., 2010). However, in the context of Nepal, social support for sick persons is perceived as helping in activities such as doing household activities and providing emotional support that results in dependency similar to the context of developing and Eastern societies (Lawang, Horey, Blackford, Sunsern, & Riewpaiboon, 2013).

Moreover, the nature of the community integration measurement in this study affected the findings because for each item of the home integration subscale of the CIQ, the person with TBI received the highest number of points if the activity was performed alone with no assistance. When activities were shared with other people, the person achieved a lower number of points. Similarly, in this study the majority of participants worked inside the home environment (Table 4) and achieved fewer points for travel outside home item of the productive subscale. This showed that the participants spent more time within the social support structure of the family, friends, and significant others, thereby showing low contribution in community integration.

In this study the majority of the participants stayed in the hospital for short durations (Table 3) and returned home directly without rehabilitation. Possibly, their caregiver were not trained about activities of daily living support for TBI. Similarly, in a Eastern society, TBI rehabilitation is limited which causes unpreparedness and a lack of knowledge among the caregivers for giving support to their brain-injured relatives (Man, 2002; Tam & Lee, 2011; Yu, Tam, & Lee, 2015). However, in a Western society, rehabilitation among TBI persons after discharge from the hospital encourages the caregivers to motivate TBI survivors to be involved in activities outside the home (Sady et al., 2010). Therefore, due to the contextual differences in the research settings, severity of injury, and dependency in the activities of daily living, there were contradictory findings between the previous studies and this study.

Physical environment. In this study there was no significant relationship between physical environment and community integration. This finding of the study was contrary to previous studies conducted among TBI persons that revealed a negative and significant relationship between physical environment and community integration (Fleming et al., 2014; Wong et al., 2017). A possible explanation might be that majority of the participants in this study rarely travelled outside as they mostly worked within home environment (Table 2) and might have perceived less frequent problem with temperature, climate, terrain (Appendix H, Table 16).The another possible reason could be that few number of the participants had sensory impairments such as; hearing, vision (Appendix H, Table 2). This could have reduced the frequency of barrier with lighting, noises, and crowds (Appendix H, Table 16). Moreover, the studies were conducted in Western and developed countries where the physical setting of the house, workplace, community, natural environment, and availability of transportation were different in comparison to the context of Nepal. Therefore, the perceptions of these factors differ due to the contextual factors which result in non-significant results in this study.

To sum up, fatigue was found to be the only predicting factor to account for 9.6% of the variance in community integration among persons after TBI in Nepal. The non-significant relationship among social support, physical environment, and community integration resulted from the sensitivity of the instruments in the context of Nepal. Moreover, there might be other factors that influenced the remaining 90.4% of variance in community integration which needs further analyses. Therefore, the study findings revealed that fatigue hindered community integration of persons after TBI which caused a decreased level of participation in the home, social activities, and productivity.

Chapter 5

Conclusion and Recommendations

This chapter presents a conclusion of the study findings, strengths and limitations of the study, and recommendations for nursing practice, nursing education, health policy, and future directions.

Conclusion

A predictive cross-sectional study was conducted in the communities of province number three of Nepal to describe the level of community integration and determine the predictive factors for community integration among persons after TBI. The study included a total of 120 participants using the stratified random sampling technique. The strata were based on five neuro-hospitals, namely Annapurna Neurological Institute, Dirghayu Hospital, National Trauma Center, Upendra Devkota Memorial National Institute of Neurological and Allied Sciences, and Shree Birendra Hospital in province number three of Nepal. The data collection was performed from December 2018 to April 2019. The Demographic Questionnaire, Community Integration Questionnaire (CIQ), Multidimensional Scale of Perceived Social Support (MSPSS), Craig Hospital Inventory of Environmental Factors (CHIEF), and the Modified Fatigue Impact Scale (MFIS) were used to collect data regarding demographic and clinical characteristics, community integration, social support, physical environment, and fatigue respectively. The instruments were validated by five experts and the reliability was examined among 20 participants who met the inclusion criteria of the study at Dirghayu and Upendra Devkota Memorial National Institute of Neurological and Allied Sciences. Cronbach’s alpha coefficients for the CIQ, MSPSS-N, CHIEF, and MFIS were .75, .92, .90, and .93 respectively.

Descriptive statistics were used to present the demographic and clinical characteristics, community integration, and predictors. Pearson’s correlation was used to examine the correlation between the study variables. Linear regression was used to identify the predictive role of the fatigue. The study results showed that the majority of the participants were male, married, Hindu, attended higher education, and working after TBI. The major cause of TBI was motorcycle accident with GCS scores of 13 to 15 at the time of admission and most of them were diagnosed as mild TBI. The majority of the participants stayed for 1-10 days in the hospital and had head injuries at the frontal area. The most common symptoms experienced from the participants were headache, restlessness/anxiety, sensory impairments, and pain. More than half of the participants used pharmacological and non-pharmacological management for common symptoms and the majority were totally independent for their activities of daily living.

The study finding revealed a moderate level of community integration among persons after TBI. In addition, the results showed a significant negative relationship between community integration and fatigue. On the other hand, there was a non-significant relationship among community integration, social support, and physical environment. Moreover, linear regression was performed to explain the 9.6% variance in community integration. The study result showed that fatigue ($\beta = -.31$, $p < .00$) could statistically predict community integration among persons after TBI.

Strengths of the Study

This is the first study done in Nepal to explore community integration among persons after TBI. The findings of the study have made a significant contribution for raising awareness among policy makers and health care providers in Nepal to provide better care and services for TBI survivors. In addition, this study was carried out in communities of province number three in Nepal using the stratified random sampling technique and covered a wide range of individuals living in thirteen districts of province number three in Nepal. Therefore, the findings could be generalized among TBI survivors living in the communities in Nepal.

Limitations of the Study

There are some limitations when interpreting the study findings. The evidence regarding a clear cut-point to categorize the level of community integration and fatigue in the Nepalese context is still lacking. Therefore, interpretation of the level of the study findings used from the Western context studies might affect the results showing either an over- or under-estimation of the level of variables among the Nepalese TBI survivors.

Implications and Recommendations

Implication and recommendation provided for nursing practice, nursing education, and nursing research are as follows.

Nursing practice. The study findings showed a moderate level of community integration among the TBI survivors in Nepal. Therefore, to enhance the level of community integration to a higher level in this group, the health care providers, in particular the rehabilitation nurses/community nurses, should plan and implement strategies for TBI survivors such as follow-up appointments or continue rehabilitation at home. In addition, it is necessary for all levels of TBI survivors to have the knowledge and information to manage all types of fatigue after discharge from the hospital or rehabilitation center.

Nursing education. In order to enhance community integration among TBI survivors it is necessary to incorporate a continuing nursing education program that focuses on this issues. It is necessary for the nurses as well as nursing students to acquire the knowledge and awareness regarding community integration as an important aspect of rehabilitation among TBI survivors. Furthermore, the findings of the study showed that community integration can be enhanced by managing the fatigue at all levels of TBI survivors. Therefore, early management of fatigue among TBI survivors should be integrated into the community health nursing program and rehabilitation nursing curriculum.

Nursing research. Future research should be conducted to develop intervention for management of fatigue through cognitive behavioral therapy as TBI survivors usually suffered from thinking related problem thereby affecting community integration in this population. Since this was a cross-sectional study that was conducted in a short period, a longitudinal study is required to assess the changes in the levels of community integration over time. Moreover, the findings of the study showed the necessity to develop community integration instruments based on the context of Nepal.

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APPENDICES

Appendix A

Informed Consent Form

1. **Researcher**

My name is Sumana Lama, I am a Master student in Faculty of Nursing International Program of Prince of Songkla University, I am conducting a study entitled “Predictive Factors for Community Integration Among Persons After Traumatic Brain Injury.” This study is conducted under supervision of major advisor; Assist. Prof. Dr. Jintana Damkliang (major advisor) and Asst. Prof. Dr. Luppana Kitrungrote (co- advisor). The reson I am doing this study is to learn more about how to help persons after TBI to integrate or participate in home setting, social and community activities or role. This study will also help us to learn more about community integration among persons after TBI.

Your participation in this study is voluntary. You have the right to participate or withdraw from this study at any time. Whether, you participate or not, there will be not any consequence on your career or your personal life.

If you agree to participate in this study, you will be asked to answer questions from the set of questionnaires which will take at least 30-40 minutes. You may also stop and discontinue the interview at any time you choose. It is your choice and all of your information will be kept confidential.

The result of this study will be publish, and no one will be able to identify your personal information in the report. Your signature below indicated that you agree to participate in this study. If you have any question about the study, you may directly contact in my cell number +9779841946509 or email at sumana.lama87@gmail.com without any hesitation. You will receive a copy of this informed consent.

And if you have any question about the study, you please contact Miss Chayanit Pudpong, Center for Social and Behavioral Science Institutional Review Board, Prince of Songkla University cellphone number 074286475 and by email at chayanit.p@psu.ac.th

Thank you,

Sumana Lama

(6010420010)

2. Consenting Participant

I am (Mr./ Mrs./ Miss), Name……………………

Surname……………………….

If I have any suspect about this study, I have right to ask any question from the researcher. If the explanation from the researcher is unpleasant.

I also have the right to withdraw my participation at any time during the study without any consequence on my career.

I was informed and understand all information according to the study and to participate in this study.

.... ……………………….…

(Signature of Participant) (Date/ Month/ Year)

…………………………. …………………………

(Signature of Researcher) (Date/ Month/ Year)

……………………….. …………………………

(Signature of Witness) (Date/ Month/ Year)

Appendix B

Demographic Questionnaire

Code ………………..

Date………………..

A: Demographic Data

Instruction: Please answer the following questions by filling in the answer and / or mark in the box

Patient's Initial:

i. Address……………..

ii. Age: …………..years old

iii. Gender: ☐ 1. Male ☐ 2. Female

iv. Religion: ☐ 1. Hindu ☐ 2. Buddhist
☐ 3. Christian ☐ 4. Others (specify)….

v. Ethnicity: ☐ 1. Brahmin ☐ 2. Chhetri
☐ 3. Newar ☐ 4. Others (specify) …..

vi. Education Level: ☐ 1. Illiterate ☐ 2. Primary level
☐ 3. Secondary ☐ 4. Higher Secondary
☐ 5. University

vii. Marital status: ☐ 1. Single ☐ 2. Married
☐ 3. Widow/ widower ☐ 4. Divorce

viii. Employment status before TBI ……………

ix. Employment status after TBI ………………

x. Monthly Income: ☐ 1. No income 2. Average income………Rupees per month

xi. Number of family members……

xii. Stay with whom:☐ 1. Alone ☐ 2. Family ☐ 3. Friends

xiii. Do you have caregiver? ☐ 1. Yes, please specify the relationship…
☐ 2. No

xiv. Medical payment of the treatment ☐ 1. Self ☐ 2. Social welfare
☐ 3. Others (specify)…….

B: Clinical Characteristics

i. Cause of TBI: ☐ 1. Motorcycle accident ☐ 2. Car accident
☐ 3. Bicycle accident ☐ 4. Fall injury
☐ 5. Body assault ☐ 6. Sport Injury
☐ 7. Others (Specify)…………

ii. Diagnosis …………..

iii. Type of surgery during hospital admission…….

iv. Area of head injury: ………………

v. Associated injuries: ☐ 1.Yes, Specify ☐ 2. No

vi. Severity of Injury: 1. GCS score at the time of admission……
2. GCS score at the time of discharge……..

vii. Length of hospitalization: …………….

viii. Current medication for treatment of head injury: ☐ 1. Yes, specify….
☐ 2. No

ix. Most common symptoms after head injury (any three) ……….

x. Past Illness: a) Medical disease history ☐ 1. Yes, Specify… ☐ 2. No

b) Previous surgery history ☐ 1. Yes, Specify…. ☐ 2. No

c) Previous head trauma ☐ 1. Yes ☐ 2. No

xii. Current medication of medical history: ☐ 1. Yes ☐ 2. No

xiii. Practices of activities of daily living:

a) Grooming
☐ 1. Need help with personal care
☐ 2. Independent

b) Dressing
☐ 1. Dependent ☐ 2. Needs help- can do ½ unaided
☐ 3. Independent

c) Bathing
☐ 1. Dependent ☐ 2. Independent

d) Feeding
☐ 1. Unable ☐ 2. Needs help
☐ 3. Independent

e) Stairs
☐ 1. Unable ☐ 2. Needs help (verbal or physical)
☐ 3. Independent

f) Toilet use
☐ 1. Dependent ☐ 2. Needs some help
☐ 3. Independent

g) Mobility
☐ 1. Immobile ☐ 2. Wheel care independent
☐ 3. Walks with help of 1person (physical/ verbal)
☐ 4. Independent

h) Transfer (bed to chair or back)
☐ 1. Unable, no sitting balance
☐ 2. Major help, can sit
☐ 3. Minor help (verbal/ physical)
☐ 4. Independent

i) Bowels
☐ 1. Incontinent or needs enema
☐ 2. Occasional accident (once/week)
☐ 3. Continent

j) Bladder
☐ 1. Incontinent
☐ 2. Occasional accident (max. once per 24 hours)
☐ 3. Continent (for over 7 days)

Appendix C

Community Integration Questionnaire (CIQ)

Direction: The following are the list of activities that you may have performed in Home, Social activities and Work place/ School. Please tick mark **(√)** the practices you do in your day to day living that help you answer your question.

Home Integration	Tick the answer as per your choice	Score
1) Who usually go to local market/ shops to buy your household necessities?	☐ Yourself alone (2) ☐ Yourself and someone else (1) ☐ Someone else (0)	
2) Who usually prepares meals in your household?	☐ Yourself alone (2) ☐ Yourself and someone else (1) ☐ Someone else (0)	
3) In your home who usually does normal everyday housework?	☐ Yourself alone (2) ☐ Yourself and someone else (1) Someone else (0)	
4) Who usually cares for the children in your home?	☐ Yourself alone (2) ☐ Yourself and someone else (1) ☐ Someone else (0) ☐ Not applicable (score is the average of 1,2,3 and 5)	
5) Who usually plans social arrangements such as get-togethers with family and friends?	☐ Yourself alone (2) ☐ Yourself and someone else (1) ☐ Someone else (0)	
Home Integration Total Score		

Social Integration	Tick the answer as per your choice	Score
6) Who usually looks after your personal finances such as banking or paying bills?	☐ Yourself alone (2) ☐ Yourself and someone else (1) ☐ Someone else (0)	
Can you tell me approximately how many times a month you now usually participate in the following activities outside your home?		
7) going to the local market/ shops per month	☐ 5 times or more (2) ☐ 1 – 4 times (1) ☐ Never (0)	
8) Leisure activities such as movies, sports, restaurants per month	☐ 5times or more (2) ☐ 1 – 4 times (1) ☐ Never (0)	
9) Visiting friends or relatives per month	☐ 5 times or more (2) ☐ 1 – 4 times (1) ☐ Never (0)	
10) When you participate in leisure activities do you usually do this alone or with other?	☐ mostly alone (0) ☐ mostly with friends who have head injuries (1) ☐ mostly with family members (1) ☐ mostly with friends who do not have head injuries (2) ☐ with a combination of family and friends (2)	
11) Do you have a best friend with whom you confide?	☐ Yes (2) ☐ No (0)	
Social Integration Total Score		

Integration Into Productive Activities	Tick the answer as per your choice	Score
12) How often do you travel outside the home?	☐ almost every day (2) ☐ almost every week (1) ☐ seldom/never (less than once per week) (0)	
*13) Please choose the answer below that best corresponds to your current (during the past month) work situation:	☐ Full-time employment (>20 hours/week) ☐ Part Time Employment (< 20 hours/week) ☐ Not working, but actively looking for work ☐ Not working, not looking for work ☐ Not applicable, retired due to age ☐ Volunteer job in the community	
*14) Please choose the answer below that best corresponds to your current (during the past month) school or training program situation	☐ Full-time ☐ Part-time ☐ Not attending school or training program	
*15) In the past month, how often did you engage in volunteer activities?	☐ 5 times or more ☐ 1 – 4 times ☐ Never	
Total Score		

Note: * score system of item 13, 14 and 15;

Scoring for items 13 to 15 – Job School

The patient receives a 0, if answers for the following questions are:

Item 13) not working, not looking for work; Item 14) not going to school and Item 15) no volunteer activities

The patient receives a “1”, if answers for the following questions are:

Item 13) not working, not looking for work; Item 14) not going to school and Item 15) volunteers 1 to 4 times

The patient receives a “2”, if answers for the following questions are:

Item 13) actively looking for work AND/OR Item 15) volunteers 5 or more times per month.

The patient receives a “3”, if answers for the following questions are:

Item 13) working part-time OR Item 14) attends school part-time

The patient receives a “4”, if answers for the following questions are:

Item 13) working full-time OR Item 14) attends school full-time

The patient receives a “5”, if answers for the following questions are:

Item 13) working full-time AND Item 14) attends school part-time OR Item 13) works part-time AND Item 14) attends school full-time

If the patient is retired due to age, use item 15 to score the Job School variable: 5 or more receives “4”; 1 – 4 times receives “2 “; Never receives “0”

Summing Scores: The productivity score = item 12 score + Job School variable. The total CIQ score (0-29) = Home integration score (10points) + social integration score (12 points) + productivity (7points)

Appendix D

Multi-Dimensional Scale of Perceived Social Support (MSPSS)

Instruction: Read each statement carefully and circle in the one column that indicate how you feel about each statement.

Circle the “1” if you very Strongly Disagree

Circle the “2” if you Strongly Disagree

Circle the “3” if you Mildly Disagree

Circle the “4” if you are Neutral

Circle the “5” if you Mildly Agree

Circle the “6” if you Strongly Agree

Circle the “7” if you very Strongly Agree

1)	There is a special person who is around when I am in need	SO	1	2	3	4	5	6	7
2)	There is a special person with whom I can share joys and sorrows	SO	1	2	3	4	5	6	7
3)	My family really tries to help me	Fam	1	2	3	4	5	6	7
4)	I get the emotional help and support I need from my family	Fam	1	2	3	4	5	6	7
5)	I have a special person who is a real source of comfort to me	SO	1	2	3	4	5	6	7
6)	My friends really try to help me	Fren	1	2	3	4	5	6	7

7)	I can count on my friends when things go wrong	Fren	1	2	3	4	5	6	7
8)	I can talk about my problems with my family	Fam	1	2	3	4	5	6	7
9)	I have friends with whom I can share my joys and sorrows	Fren	1	2	3	4	5	6	7
10)	There is a special person in my life who cares about my feelings	SO	1	2	3	4	5	6	7
11)	My family is willing to help me make decisions	Fam	1	2	3	4	5	6	7
12)	I can talk about my problems with my friends	Fren	1	2	3	4	5	6	7

The items are divided into three sources of social support namely; Family (Fam), Friends (Fren) and Significant others (SO). Here family refers to the parents, grand-parents, spouse, children, sibling. Significant others include neighbor, health care professionals and any other persons besides your family and friends.

Scoring Information: to calculate mean scores;

SO subscale: sum across items 1,2,5 & 10 divide by 4.

Family subscale: sum across items 3,4,8, & 11 divide by 4.

Friends subscale: sum across items 6, 7, 9 & 12 divide by 4.

Total scale: sum of across all 12 items then divide by 12.

Appendix E

Craig Hospital Inventory of Environmental Factors (CHIEF)

Description: As a member of society we participate in such things as; working, going to school, taking care of home and being involved with family, friends in social, recreational and civic activities in the community. Many of the factors can act as a facilitators or barrier. So can you please tell me if you have been any of the following activities;

Education: ☐ Yes ☐ No

Employment: ☐ Yes ☐ No

Recreation/ Leisure: ☐ Yes ☐ No

Then please tell me how often each of the following has been a barrier to your own participation. Think about the past 6 months, tell me whether each item on the list below has been a problem daily, weekly, monthly, less than monthly or never. If it occurs, then answer the questions as to how big a problem the item is with regard to your participation in the activities that matter you.

Note: if a question asks specifically about school/ work and you neither work/ attend school, check not applicable.

Items	Daily (4)	Weekly (3)	Monthly (2)	Less than monthly (1)	Never (0)	Not applicable	Big problem (2)	Little problem (1)
1. In the past 6 months, 1.1. How often has the availability of transportation been a problem for you? 1.2. When this problem occurs has it been a big or a little problem?								
2. In the past 6 months, 2.1. How often has the design and layout of your home made it difficult to do what you want or need to do? 2.2. When this problem occurs has it been a big or a little problem?								
3.In the past 6 months, 3.1. How often has the design and lay-out of buildings and places you use at school or work made it difficult to do what you want or need to do? 3.2. When this problem occurs has it been a big or a little problem?								
4. In the past 6 months, 4.1. How often has the design and lay-out of buildings and places you use in your community made it difficult to do what you want or need to do? 4.2. When this problem occurs has it been a big or a little problem?								

Items	Daily (4)	Weekly (3)	Monthly (2)	Less than monthly (1)	Never (0)	Not applicable	Big problem (2)	Little problem (1)
5. In the past 6months, 5.1. How often has the natural environment- temperature, terrain, climate- made it difficult to do what you want or need to do? 5.2. When this problem occurs has it been a big or a little problem?								
6. In the past 6 months, 6.1. How often have other aspects of your surroundings- lighting, noise, crowds etc. made it difficult to do what you want or need to do? 6.2. When this problem occurs has it been a big or a little problem?								
7. In the past 6 months, 7.1. How often has the information you wanted or needed not been available in a format you can use or understand? 7.2. When this problem occurs has it been a big or a little problem								
8.In the past 6 months, 8.1. How often has the availability of the education and training you needed been a problem for you? 8.2. When this problem occurs has it been a big or a little problem?								

Items	Daily (4)	Weekly (3)	Monthly (2)	Less than monthly (1)	Never (0)	Not applicable	Big problem (2)	Little problem (1)
9. In the past 6 months, 9.1. How often has the availability of health care services and medical care been a problem for you? 9.2. When this problem occurs has it been a big or a little problem?								
10. In the past 6 months, 10.1. How often has the lack of personal equipment or special adapted devices been a problem for you. Examples might include hearing aids, eyeglasses. 10.2. When this problem occurs has it been a big or a little problem?								
11. In the past 6 months, 11.1. How often has the lack of computer technology been a problem for you? 11.2. When this problem occurs has it been a big or little problem?								
12. In the past 6months, 12.1. How often did you need someone else’s help in your home and could not get it easily? 12.2. When this problem occurs has it been a big or a little problem?								

Items	Daily (4)	Weekly (3)	Monthly (2)	Less than monthly (1)	Never (0)	Not applicable	Big problem (2)	Little problem (1)
13. In the past 6 months, 13.1. How often did you need someone else's help at school or work and could not get it easily? 13.2. When this problem occurs has it been a big or a little problem?								
14. In the past 6 months, 14.1. How often did you need someone else's help in your community and could not get it easily? 14.2. When this problem occurs has it been a big or a little problem?								
15. In the past 6 months, 15.1. How often have other people's attitude towards you been a problem at home? 15.2. When this problem occurs has it been a big or a little problem?								
16. In the past 6 months, 16.1. How often have other people's attitude towards you have been a problem at school or work? 16.2. When this problem occurs has it been a big problem or a little problem?								
17. In the past 6 months, 17.1. How often have other people's attitude towards you have been a problem in the community?								

Items	Daily (4)	Weekly (3)	Monthly (2)	Less than monthly (1)	Never (0)	Not applicable	Big problem (2)	Little problem (1)
17.2. When this problem occurs has it been a big or a little problem?								
18. In the past 6 months, 18.1. How often has a lack of support and encouragement from others in your home been a problem? 18.2. When this problem occurs has it been a big or little problem?								
19. In the past 6 months, 19.1. How often has a lack of support and encouragement from others at school or work been a problem? 19.2. When this problem occurs has it been a big or little problem?								
20. In the past 6 months, 20.1. How often has a lack of support and encouragement from others in community been a problem? 20.2. When this problem occurs has it been a big or a little problem?								
21. In the past 6 months, 21.1. How often did you experience prejudice or discrimination?								

Items	Daily (4)	Weekly (3)	Monthly (2)	Less than monthly (1)	Never (0)	Not applicable	Big problem (2)	Little problem (1)
21.2. When this problem occurs has it been a big or a little problem?								
22. In the past 6 months, 22.1. How often has a lack of programs and services in the community been a problem? 22.2. When this problem occurs has it been a big or a little problem?								
23. In the past 6 months, 23.1. How often did policies and rules of business and organizations make problems for you? 23.2. When this problem occurs has it been a big or a little problem?								
24.In the past 6 months, 24.1. How often did education and employment programs and policies make it difficult to do what you want or need to do? 24.2. When this problem occurs has it been a big or a little problem?								
25. In the past 6 months, 25.1. How often did government programs and policies make it difficult to do what you want or need to do? 25.2. When this problem occurs has it been a big or a little problem?								

Appendix F

Modified Fatigue Impact Scale (MFIS)

Instruction: Following is a list of statements that describe the effects of fatigue. Please read each statement carefully, the circle the one number that best indicates how often fatigue has affected you in this way during the past 4 weeks. (If you need help in marking your responses, tell the interviewer the number of the best response.) Circle the "0" for Never

Circle the "1" for Rarely

Circle the "2" for Sometimes

Circle the "3" for Often

Circle the "4" for Almost always

1.	I have been less alert	0	1	2	3	4
2.	I have had difficulty paying attention for long periods of time	0	1	2	3	4
3.	I have been unable to think clearly	0	1	2	3	4
4.	I have been clumsy and uncoordinated	0	1	2	3	4
5.	I have been forgetful	0	1	2	3	4
6.	I have had to pace myself in my physical activities	0	1	2	3	4
7.	I have been less motivated to do anything that requires physical effort	0	1	2	3	4
8.	I have been less motivated to participate in social activities	0	1	2	3	4
9.	I have been limited in my ability to do things away from home	0	1	2	3	4

10. I have trouble maintaining physical effort for long Periods 0 1 2 3 4
11. I have had difficulty making decisions 0 1 2 3 4
12. I have been less motivated to do anything that requires thinking 0 1 2 3 4
13. My muscles have felt weak 0 1 2 3 4
14. I have been physically uncomfortable 0 1 2 3 4
15. I have had trouble finishing tasks that require thinking 0 1 2 3 4
16. I have had difficulty organizing my thoughts when doing things at home or at work 0 1 2 3 4
17. I have been less able to complete tasks that require physical effort 0 1 2 3 4
18. My thinking has been slowed down 0 1 2 3 4
19. I have had trouble concentrating 0 1 2 3 4
20. I have limited my physical activities 0 1 2 3 4
21. I have needed to rest more often or for longer periods 0 1 2 3 4

Appendix G

Assumption Testing

Table 8

Assumption of Normality by Skewness and Kurtosis of Study Variables

Variables	Skewness/SE	Z skewness	Kurtosis/SE	Z kurtosis	Distribution
Community Integration (CI)	-.102/.221	-0.46	.091/.438	0.20	Normal
Social support	.285/.221	1.28	-.925/.438	-2.11	Normal
Fatigue	-.115/.221	-0.52	.029/.438	0.06	Normal
Physical Environment (PE)	-.396/.221	-1.79	.231/.438	0.53	Normal

Note. SE = Standard error

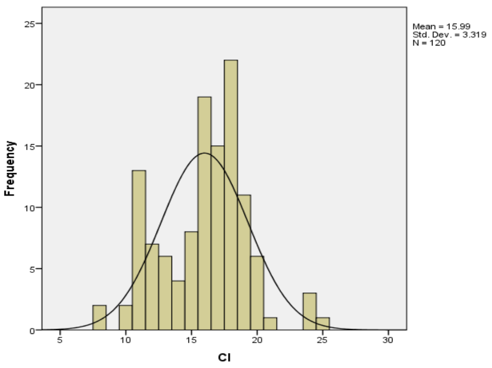


Figure 4. Normality Histogram

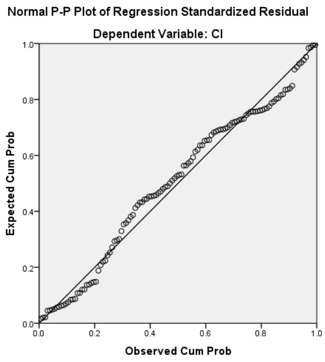


Figure 5. Normality P-P plot

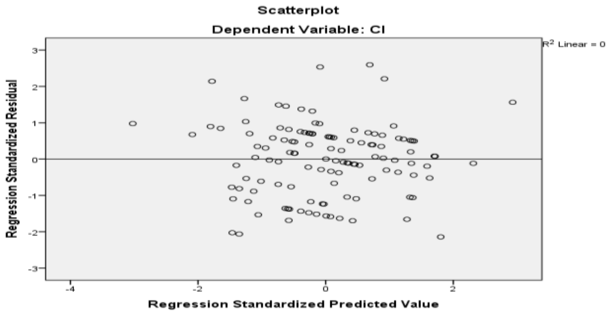


Figure 6. Scatter Plot of Regression Standardized Residual and Regression Standardized Predicted Value

Table 9

Coefficient Table Showing Value of Variance Inflating Factor (VIF)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	20.960	2.791		7.511	.000					
Fatigue	-.087	.025	-.310	-3.494	.001	-.305	-.309	-.308	.992	1.008

a. Dependent Variable: CI

Table 10

Model summary showing the value of Durbin-Watson

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.310[a]	.096	.073	3.196	.096	4.118	3	116	.008	2.035

Appendix H

Additional Results

Table 2 (continued)

Frequency and Percentage of the Participants Classified by Demographic and Clinical Characteristics (N = 120)

Characteristics	*n*	%
Location of stay		
Rural	53	44.2
Urban	67	55.8
Number of family members		
2-4	30	25.0
5-8	74	61.7
9-14	16	13.3
Medical payment		
Self	82	68.3
Social welfare	3	2.5
Health Insurance	18	15.0
Automobile Liability Insurance	17	14.2
Living arrangements		
With family	115	95.8
With friends	5	4.2
Work Place Before TBI		
Inside home	68	56.7
Employee	*(13)*	*(19.1)*
Business	*(20)*	*(29.4)*
Housewife	*(15)*	*(22.1)*
Farmer	*(10)*	*(14.7)*
Retired	*(4)*	*(5.9)*
Unemployed	*(6)*	*(8.8)*
Outside home	52	43.3
Employee	*(20)*	*(38.5)*
Student	*(15)*	*(28.8)*
Army/Police	*(14)*	*(26.9)*
Business	*(3)*	*(5.8)*
Work Place After TBI		
Inside home	90	75.0
Business	*(20)*	*(22.2)*
Unemployed	*(16)*	*(17.8)*
Housewife	*(15)*	*(16.7)*

Table 2 (continued)

Characteristics	*n*	%
Employee	*(12)*	*(13.3)*
Student	*(12)*	*(13.3)*
Farmer	*(11)*	*(12.2)*
Retired	*(4)*	*(4.5)*
Outside home	30	25.0
Employee	*(14)*	*(46.7)*
Army/Police	*(13)*	*(43.3)*
Student	*(2)*	*(6.7)*
Business	*(1)*	*(3.3*
Area of Injury (CT scan)		
Not Identified	30	25.0
Identified	90	75.0
One area		
Frontal	*(22)*	*(24.4)*
Parietal	*(16)*	*(17.8)*
Occipital	*(14)*	*(15.7)*
Temporal	*(1)*	*(1.1)*
Two areas		
Parietal-temporal	*(15)*	*(16.7)*
Parietal- occipital	*(6)*	*(6.7)*
Fronto-temporal	*(4)*	*(4.4)*
Fronto-parietal	*(3)*	*(3.3)*
Occipital-temporal	*(3)*	*(3.3)*
Fronto-occipital	*(1)*	*(1.1)*
Bifrontal	*(1)*	*(1.1)*
Three areas		
Tempo-parietal Occipital	*(4)*	*(4.4)*
Associated injuries		
No	83	69.2
Yes	37	30.8
Abrasion/lesion (e.g., back, neck, extremities, eye, finger, nose, ear)	*(28)*	*(75.7)*
Fractures (e.g., upper & lower extremities, clavicle, ribs)	*(7)*	*(18.9)*
Dislocation of the joints	*(2)*	*(5.4)*

Table 2 (continued)

Characteristics	*n*	%
Type of surgery		
No	102	85.0
Yes	18	15.0
Neuro surgery		
Craniotomy and Cranioplasty	*(10)*	*(55.5)*
Hemi craniotomy	*(2)*	*(11.1)*
Other surgery		
Debridement of wound	*(1)*	*(5.6)*
External ventricular drain	*(1)*	*(5.6)*
Open reduction internal fixation	*(4)*	*(22.2)*
Medical disease history		
No	113	94.2
Yes	7	5.8
Hypertension	*(3)*	*(42.9)*
Diabetes mellitus	*(3)*	*(42.9)*
Thyroidism	*(1)*	*(14.2)*
Current Medication of medical history		
No	113	94.1
Yes	7	5.8
Anti-hypertension drug (Amlod)	*(3)*	*(42.8)*
Anti-DM (Metformin, glipizide)	*(3)*	*(42.8)*
Anti-thyroid (L-thyroxine)	*(1)*	*(14.2)*
Common symptoms experienced		
No	6	5.0
Yes*	114	95.0
Headache	*(29)*	*(25.4)*
Restlessness/ Anxiety	*(28)*	*(24.5)*
Sensory Impairments (hearing, numbness, vision, taste, smell)	*(23)*	*(20.1)*
Pain (neck, shoulder, low back, hip, knee, elbow)	*(16)*	*(14.0)*
Dizziness/Vertigo	*(9)*	*(7.8)*
Sleep problem	*(7)*	*(6.1)*
Forgetfulness	*(5)*	*(4.3)*
Mood swings	*(5)*	*(4.3)*
Depression/Sad	*(4)*	*(3.5)*

Note: *one participant reported more than one health problem

Table 11

Mean, Standard Deviation, and Level of the Social Support (N = 120)

Social Support	*M (SD)*
Social support overall	64.79 (8.02)
1. Family	23.11 (2.66)
1.1.My family really tries to help me	5.81 (0.76)
1.2. I get the emotional help and support I need from my family	5.82 (0.72)
1.3.I can talk about my problems with my family	5.63 (0.71)
1.4. My family is willing to help me make decision	5.85 (0.74)
2. Friends	21.70 (2.73)
2.1.My friends really try to help me	5.40 (0.72)
2.2. I can count on my friends when things go wrong	5.43 (0.74)
2.3. I have friends with whom I can share my joys and sorrows	5.38 (0.77)
2.4. I can talk about my problems with my friends	5.49 (0.75)
3. Significant others	19.98 (3.62)
3.1. There is a special person who is around when I am in need	4.97 (0.95)
3.2. There is a special person with whom I can share joys and sorrow	4.91 (0.91)
3.3. I have a special person who is a real source of comfort to me	5.10 (0.97)
3.4. There is a special person in my life who cares about my feeling	5.01 (0.95)

Table 12

Mean, and Standard Deviation of Physical Environment (N = 120)

Physical Environment Items	*M (SD)*
Physical Environment over all	3.16 (1.24)
1. Availability of transportation	3.97(0.33)
2. Design of home	3.09 (0.37)
3. Design of school or work	1.25 (0.93)
4. Design of community	2.17(0.71)
5. Temperature, climate, terrain	4.43 (0.22)
6. Lighting, noises, crowds	3.99 (0.39)

Table 13

Mean, Standard Deviation, and Level of Fatigue (N = 120)

Fatigue	*M (SD)*
Fatigue overall	49.93 (11.77)
1. Physical fatigue	22.74 (5.37)
1.1. I have been clumsy and uncoordinated.	2.23 (0.68)
1.2. I have had to pace myself in physical activities.	2.60 (0.61)
1.3. I have had been less motivated to do physical effort work	2.57 (0.63)
1.4. I have trouble maintaining physical effort for long periods.	2.53 (0.65)
1.5. My muscles have felt weak.	2.62 (0.68)
1.6. I have been physically uncomfortable.	2.58 (0.68)
1.7. I have been less able to complete task that need physical effort	2.46 (0.74)
1.8. I have limited my physical activities.	2.52 (0.74)
1.9. I have needed to rest more often or for longer periods.	2.63 (0.69)
2. Cognitive fatigue	22.10 (6.49)
2.1. I have been less alert.	2.37 (0.65)
2.2. I have had difficulty paying attention for longer periods.	2.16 (0.73)
2.3. I have been unable to think clearly.	2.26 (0.72)
2.4. I have been forgetful.	2.01 (0.86)
2.5. I have had difficulty making decisions.	2.23 (0.77)
2.6. I have had trouble finishing tasks that required thinking.	2.15 (0.74)
2.7. I have had difficulty organizing my thoughts at home or work.	2.47 (0.72)
2.8. I have been less motivated to do anything that need thinking.	2.24 (0.76)
2.9. I have had trouble concentrating.	2.10 (0.77)
2.10. My thinking has been slowed down.	2.11 (0.74)
3. Psycho social fatigue	5.09 (1.34)
3.1. I have been less motivated to participate in social activities.	2.57 (0.70)
3.2. I have been limited in my ability to do things away home.	2.52 (0.71)

Table 14

Frequency and Percentage of the Participants Classified by Community Integration (N = 120)

Items of Community Integration			Frequency *n* (%)
Home Integration	1. Buying household items	-Yourself alone	10 (8.3)
		-Someone else and Yourself	103 (85.8)
		-Someone else	7 (5.8)
	2. Prepare meals at house	-Yourself alone	7 (5.8)
		-Someone else and Yourself	106 (88.3)
		-Someone else	7 (5.8)
	3. Everyday house work	-Yourself alone	6 (5.0)
		-Someone else and Yourself	108 (90.0)
		-Someone else	6 (5.0)
	4. Caring for children	-Yourself alone	3 (2.5)
		-Someone else and yourself	29 (24.2)
		-Someone else	30 (25.0)
		-Not applicable/ no children under 17 years	58 (48.3)
	5. Social arrangement at house	-Yourself alone	9 (7.5)
		-Someone else and yourself	109 (90.8)
		-Someone else	2 (1.7)
Social Integration	6. Personal finances	-Yourself alone	31 (25.8)
		-Someone else and yourself	65 (54.8)
		-Someone else	24 (20.0)
	7. Going to the local market per month	-5 times or more	12 (10.0)
		-1-4 times	106 (88.3)
		-Never	2 (1.7)
	8. Leisure activities per month	-5 times or more	9 (7.5)
		-1-4 times	102 (85.0)
		-Never	9 (7.5)
	9. visit friends or relatives per month	-5 times or more	15 (12.5)
		-1-4 times	101 (84.2)
		-Never	4 (3.3)

Table 14 (continued)

Items of Community Integration			Frequency
			n (%)
Social Integration	10. Participate in leisure activities	-Mostly alone	0 (0.0)
		- Mostly with friends who have head injuries	0 (0.0)
		- Mostly with family members	18 (15.0)
		- Mostly with friends who do not have head injury	14 (11.7)
		- With combination of family and friend	88 (73.3)
	11. Best friend with whom you confide	- Yes	118 (98.3)
		-No	2 (1.7)
Integration into Productive Activities	12. Travel outside home	-Almost every day	12 (10.0)
		-Almost every week	47 (39.2)
		-Never/ less than once a week	61 (50.8)
	13. Productive variable*	-Full time + Part time	42 (35.0)
		-Full time + No school	21 (17.5)
		-Part time + Part time	2 (1.7)
		-Not working + Part time	1 (0.8)
		-Part time + No school	6 (5.0)
		-Not working + Full time school	13 (10.8)
		-Retried due to age + No school + 1-4 times/month	1 (0.8)
		-Not working but looking + No school + 1-4 times/ month	2 (1.7)
		-Not working/ not looking+ No school+ 1-4 times/month	2 (1.7)
		-Not working/ not looking + No school + no volunteering	30 (25.0)

Note. *The scoring of this variable is dependent on the combination of answers to questions 13, 14 and 15.

Table 15

Frequency and Percentage of the Participants Classified by Social Support (N = 120)

Social support domain and its items		Frequency						
		Very strongly disagree *n (%)*	Strongly disagree *n (%)*	Mildly disagree *n (%)*	Neutral *n (%)*	Mildly agree *n (%)*	Strongly agree *n (%)*	Very strongly agree *n (%)*
Family	1.1. My family really tries to help me	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.8)	45 (37.5)	50 (41.7)	24 (20.0)
	1.2. I get the emotional help and support I need from my family	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	44 (36.7)	54 (45.0)	22 (18.3)
	1.3. I can talk about my problems with my family	0 (0.0)	0 (0.0)	0 (0.0)	4 (3.3)	48 (40.0)	56 (46.7)	12 (10.0)
	1.4. My family is willing to help me make decision	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	43 (35.8)	52 (43.3)	25 (20.8)
Friend	2.1. My friends really try to help me	0 (0.0)	0 (0.0)	0 (0.0)	10 (8.3)	58 (48.3)	46 (38.3)	6 (5.0)
	2.2. I can count on my friends when things go wrong	0 (0.0)	0 (0.0)	0 (0.0)	12 (10.0)	51 (42.5)	51 (42.5)	6 (5.0)

Table 15 (continued)

Social support domain and its items		Frequency						
		Very strongly disagree *n (%)*	Strongly disagree *n (%)*	Mildly disagree *n (%)*	Neutral *n (%)*	Mildly agree *n (%)*	Strongly agree *n (%)*	Very strongly agree *n (%)*
Significant others	2.3. I have friends with whom I can share my joys and sorrows	0 (0.0)	0 (0.0)	0 (0.0)	14 (11.7)	53 (44.2)	46 (38.3)	7 (5.8)
	2.4. I can talk about my problems with my friends	0 (0.0)	0 (0.0)	0 (0.0)	9 (7.5)	52 (43.3)	50 (41.7)	9 (7.5)
	3.1. There is a special person who is around when I am in need	0 (0.0)	0 (0.0)	2 (1.7)	45 (37.5)	33 (27.5)	35 (29.2)	5 (4.2)
	3.2. There is a special person with whom I can share joys and sorrow	0 (0.0)	0 (0.0)	2 (1.7)	46 (38.3)	36 (30.0)	33 (27.5)	3 (2.5)
	3.3. I have a special person who is a real source of comfort to me	0 (0.0)	0 (0.0)	2 (1.7)	33 (27.5)	47 (39.2)	27 (22.5)	11 (9.2)
	3.4. There is a special person in my life who cares about my feelings	0 (0.0)	0 (0.0)	1 (0.8)	43 (35.8)	37 (30.8)	32 (26.7)	7 (5.8)

Table 16

Frequency and Percentage of the Participants Classified by Physical Environment (N=120)

Physical environment Items	Frequency of the barrier					Magnitude of barrier		Not applicable
	Daily *n (%)*	Weekly *n (%)*	Monthly *n (%)*	Less than monthly *n (%)*	Never *n (%)**	Big problem *n (%)*	Little problem *n (%)*	*n (%)***
1.1 Availability of transportation	8 (6.7)	18 (15.0)	77 (64.2)	13 (10.8)	4 (3.3)	110 (94.8)	6 (5.2)	0 (0.0)
1.2 Design of home	1 (0.8)	9 (7.5)	70 (58.3)	33 (27.5)	7 (5.8)	106 (93.8)	7 (6.2)	0 (0.0)
1.3 Design of school or work	0 (0.0)	3 (2.5)	49 (40.8)	20 (16.7)	13 (10.8)	70 (97.2)	2 (2.8)	35 (29.2)
1.4 Design of community	1 (0.8)	5 (4.2)	59 (49.2)	31 (25.8)	24 (20.0)	90 (93.8)	6 (6.2)	0 (0.0)
1.5 Temperature, climate, terrain	8 (6.7)	30 (25.0)	70 (58.3)	10 (8.3)	2 (1.7)	116 (98.3)	2 (1.7)	0 (0.0)
1.6 Lighting, noises, crowds	8 (6.7)	27 (22.5)	61 (50.8)	19 (15.8)	5 (4.2)	111 (96.5)	4 (3.5)	0 (0.0)

Note: * the participants who answer “Never” are not asked about magnitude of barrier** Not applicable column score only for those who do not go to school/work place

Table 17

Frequency and Percentage of the Participants Classified by Fatigue (N=120)

Fatigue Domain	Fatigue Items	Frequency				
		Never	Rarely	Sometimes	Often	Almost always
		n (%)	*n (%)*	*n (%)*	*n (%)*	*n (%)*
Physical fatigue	1.1. I have been clumsy and uncoordinated	0 (0.0)	12 (10.0)	73 (60.8)	30 (25.0)	5 (4.2)
	1.2. I have had to pace myself in physical activities	0 (0.0)	3 (2.5)	47 (39.2)	65 (54.2)	5 (4.2)
	1.3. I have been less motivated to do anything that requires physical effort	0 (0.0)	4 (3.3)	49 (40.8)	62 (51.7)	5 (4.2)
	1.4. I have trouble maintaining physical effort for long periods	0 (0.0)	5 (4.2)	52 (43.3)	58 (48.3)	5 (4.2)
	1.5. My muscles have felt weak	0 (0.0)	6 (5.0)	42 (35.0)	64 (53.3)	8 (6.7)
	1.6. I have been physically uncomfortable	0 (0.0)	7 (5.8)	42 (35.0)	65 (54.2)	6 (5.0)
	1.7. I have been less able to complete task that require physical effort	0 (0.0)	11 (9.2)	50 (41.7)	52 (43.3)	7 (5.8)
	1.8. I have limited my physical activities	0 (0.0)	8 (6.7)	51 (42.5)	51 (42.5)	10 (8.3)
	1.9. I have needed to rest more often or for longer periods	0 (0.0)	4 (3.3)	47 (39.2)	58 (48.3)	11 (9.2)
Cognitive fatigue	2.1. I have been less alert	0 (0.0)	8 (6.7)	63 (52.5)	46 (38.3)	3 (2.5)
	2.2. I have had difficulty paying attention for longer periods of time	1 (0.8)	18 (15.0)	65 (54.2)	33 (27.5)	3 (2.5)
	2.3. I have been unable to think clearly	1 (0.8)	14 (11.7)	61 (50.8)	41 (34.2)	3 (2.5)

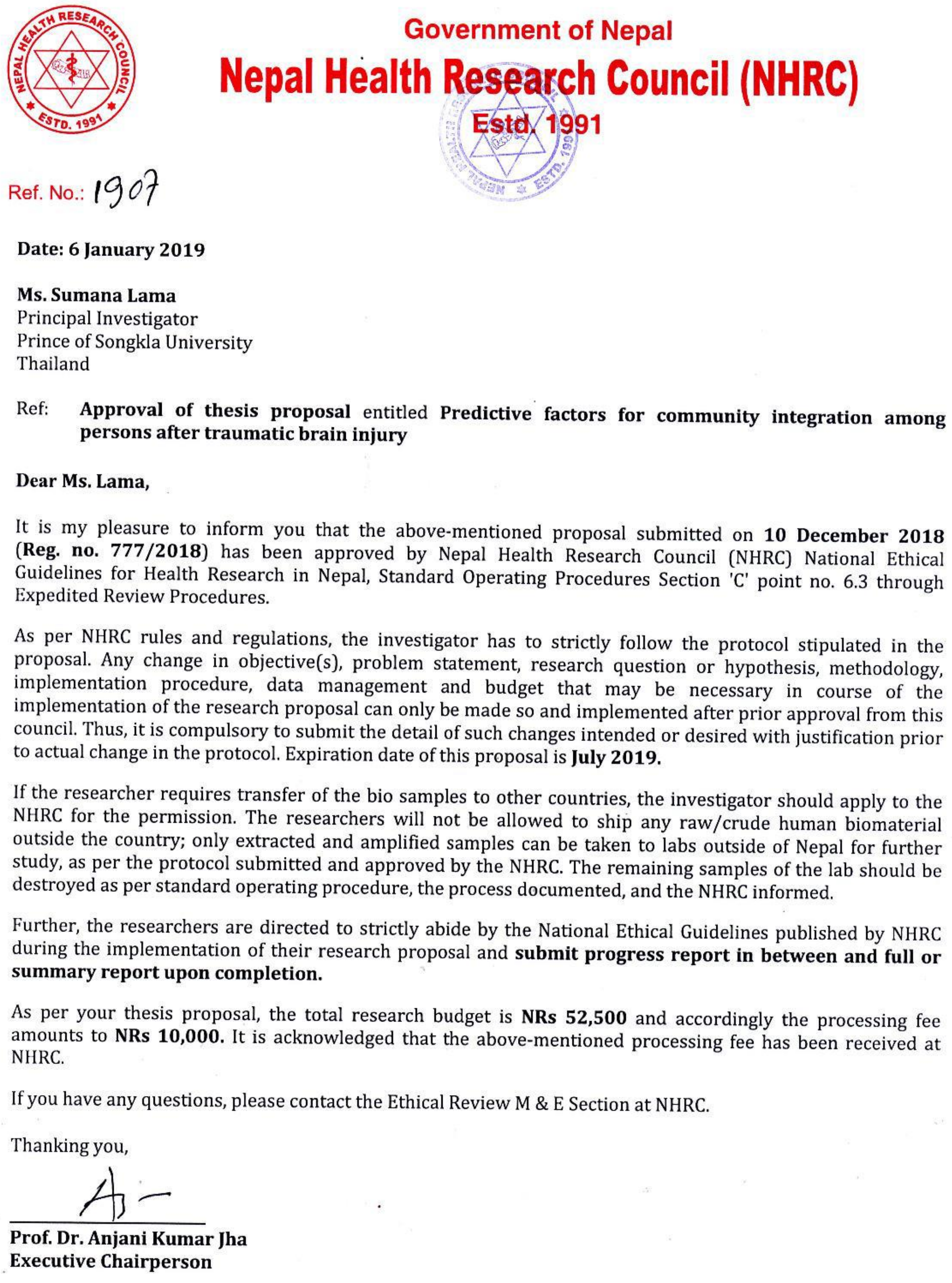
Table 17 (continued)

Fatigue Domains	Fatigue Items	Frequency				
		Never	Rarely	Sometimes	Often	Almost always
		n (%)	*n (%)*	*n (%)*	*n (%)*	*n (%)*
Cognitive fatigue	2.4. I have been forgetful	2 (1.7)	33 (27.5)	51 (42.5)	30 (25.0)	4 (3.3)
	2.5. I have had difficulty making decisions	1 (0.8)	18 (15.0)	57 (47.5)	40 (33.3)	4 (3.3)
	2.6. I have had trouble finishing tasks that required thinking	1 (0.8)	19 (15.8)	64 (53.3)	33 (27.5)	3 (2.5)
	2.7. I have had difficulty organizing my thoughts when doing things at home or at work	1 (0.8)	8 (6.7)	49 (40.8)	57 (47.5)	5 (4.2)
	2.8. I have been less motivated to do anything that requires thinking	1 (0.8)	16 (13.3)	61 (50.8)	37 (30.8)	5 (4.2)
	2.9. I have had trouble concentrating	1 (0.8)	24 (20.0)	60 (50.0)	32 (26.7)	3 (2.5)
	2.10. My thinking has been slowed down	1 (0.8)	21 (17.5)	65 (54.2)	30 (25.0)	3 (2.5)
Psycho-social fatigue	3.1. I have been less motivated to participate in social activities	1 (0.8)	7 (5.8)	40 (33.3)	67 (55.8)	5 (4.2)
	3.2. I have been limited in my ability to do things away from home	1 (0.8)	8 (6.7)	42 (35.0)	65 (54.2)	4 (3.3)

Appendix I

Approval Letters

1. Nepal Health Research Council



Government of Nepal
Nepal Health Research Council (NHRC)
Estd. 1991

Ref. No.: 1907

Date: 6 January 2019

Ms. Sumana Lama
Principal Investigator
Prince of Songkla University
Thailand

Ref: **Approval of thesis proposal** entitled **Predictive factors for community integration among persons after traumatic brain injury**

Dear Ms. Lama,

It is my pleasure to inform you that the above-mentioned proposal submitted on **10 December 2018** (**Reg. no. 777/2018**) has been approved by Nepal Health Research Council (NHRC) National Ethical Guidelines for Health Research in Nepal, Standard Operating Procedures Section 'C' point no. 6.3 through Expedited Review Procedures.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol. Expiration date of this proposal is **July 2019.**

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and **submit progress report in between and full or summary report upon completion.**

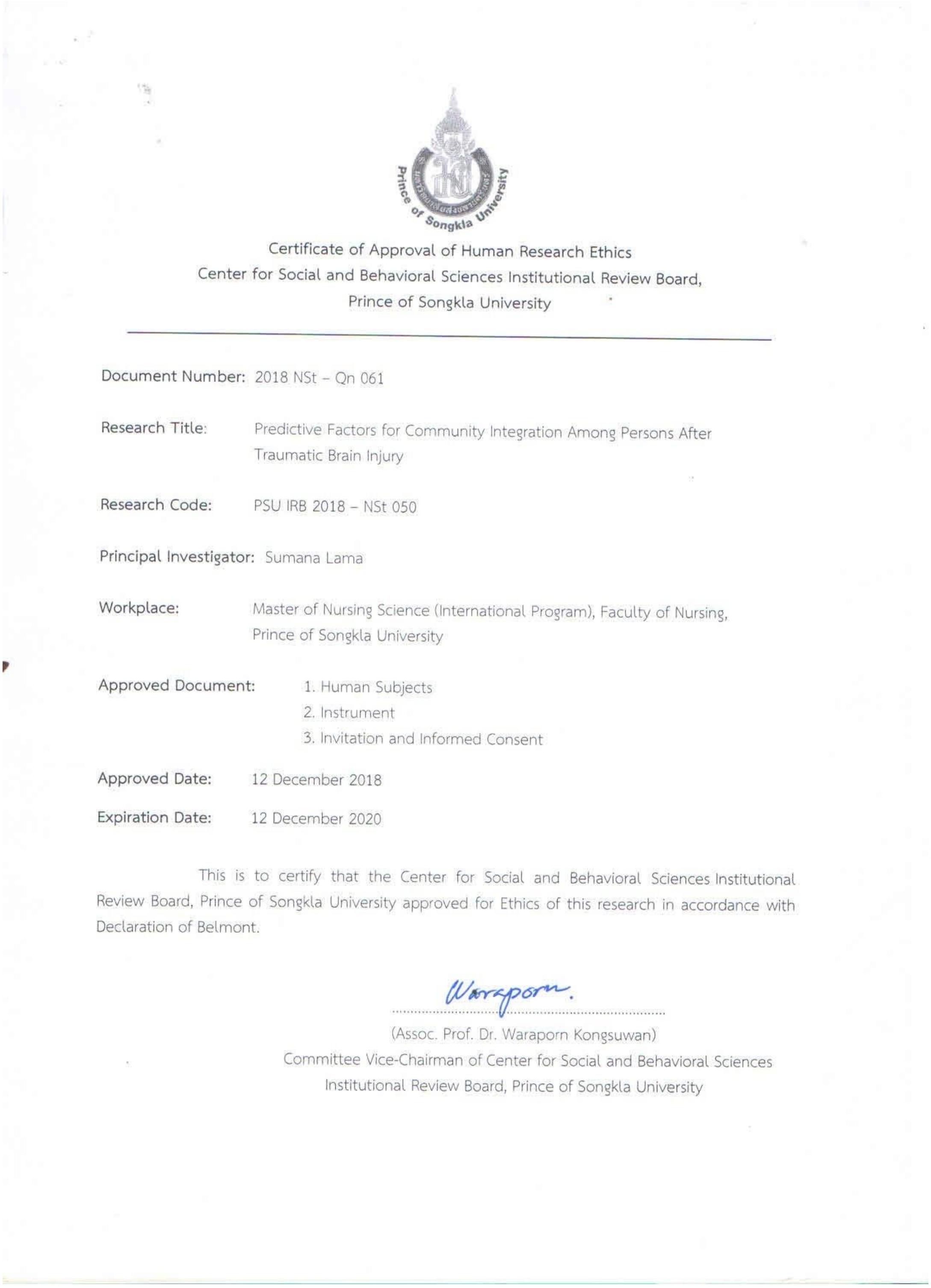
As per your thesis proposal, the total research budget is **NRs 52,500** and accordingly the processing fee amounts to **NRs 10,000.** It is acknowledged that the above-mentioned processing fee has been received at NHRC.

If you have any questions, please contact the Ethical Review M & E Section at NHRC.

Thanking you,

Prof. Dr. Anjani Kumar Jha
Executive Chairperson

2. Ethical Approval from Prince of Songkla University



Certificate of Approval of Human Research Ethics
Center for Social and Behavioral Sciences Institutional Review Board,
Prince of Songkla University

Document Number: 2018 NSt – Qn 061

Research Title: Predictive Factors for Community Integration Among Persons After Traumatic Brain Injury

Research Code: PSU IRB 2018 – NSt 050

Principal Investigator: Sumana Lama

Workplace: Master of Nursing Science (International Program), Faculty of Nursing, Prince of Songkla University

Approved Document:

1. Human Subjects
2. Instrument
3. Invitation and Informed Consent

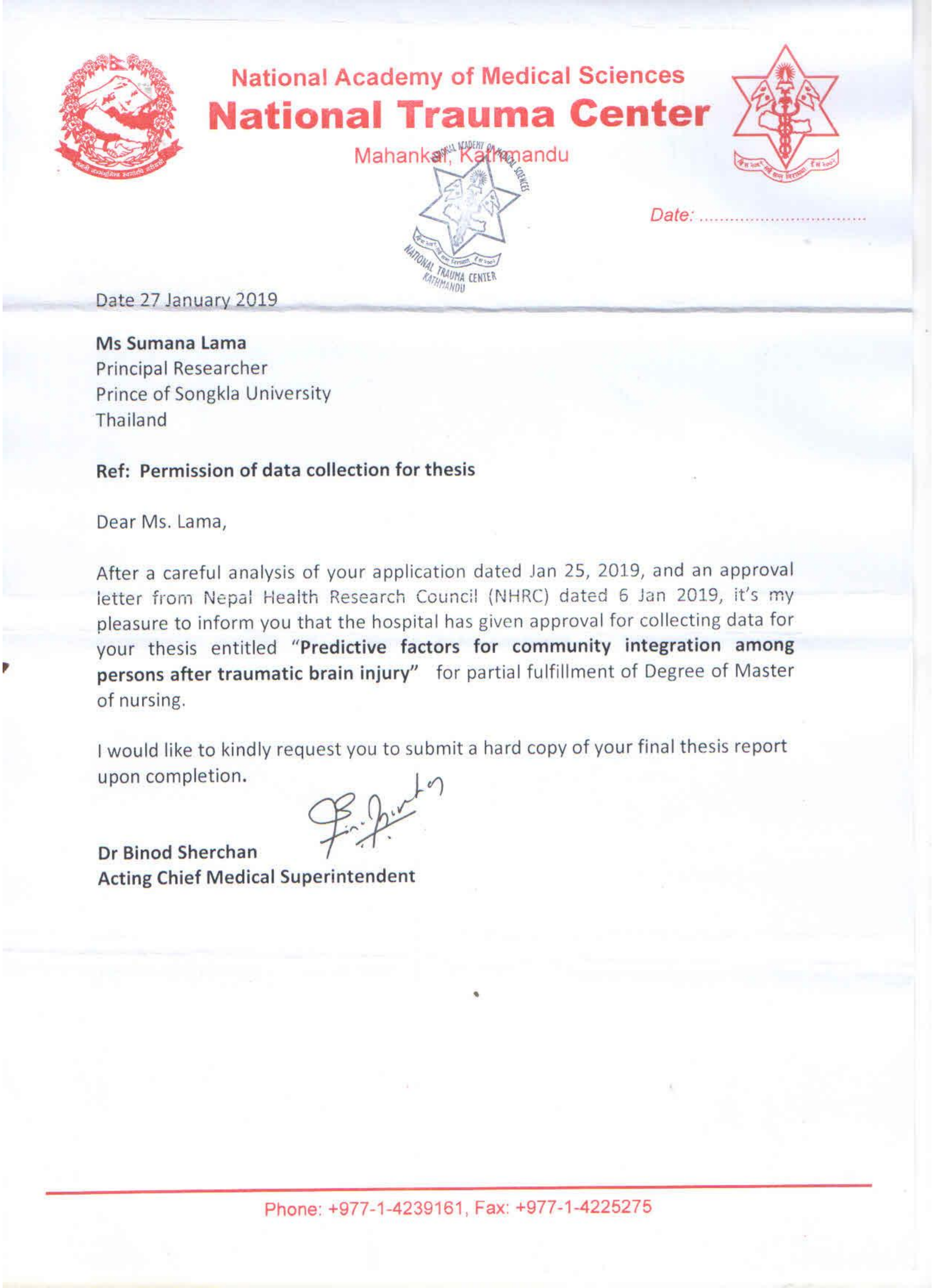
Approved Date: 12 December 2018

Expiration Date: 12 December 2020

This is to certify that the Center for Social and Behavioral Sciences Institutional Review Board, Prince of Songkla University approved for Ethics of this research in accordance with Declaration of Belmont.

Waraporn.
....
(Assoc. Prof. Dr. Waraporn Kongsuwan)
Committee Vice-Chairman of Center for Social and Behavioral Sciences
Institutional Review Board, Prince of Songkla University

3. Permission from Hospitals



National Academy of Medical Sciences
National Trauma Center
Mahankal, Kathmandu

Date: ....

Date 27 January 2019

Ms Sumana Lama
Principal Researcher
Prince of Songkla University
Thailand

Ref: Permission of data collection for thesis

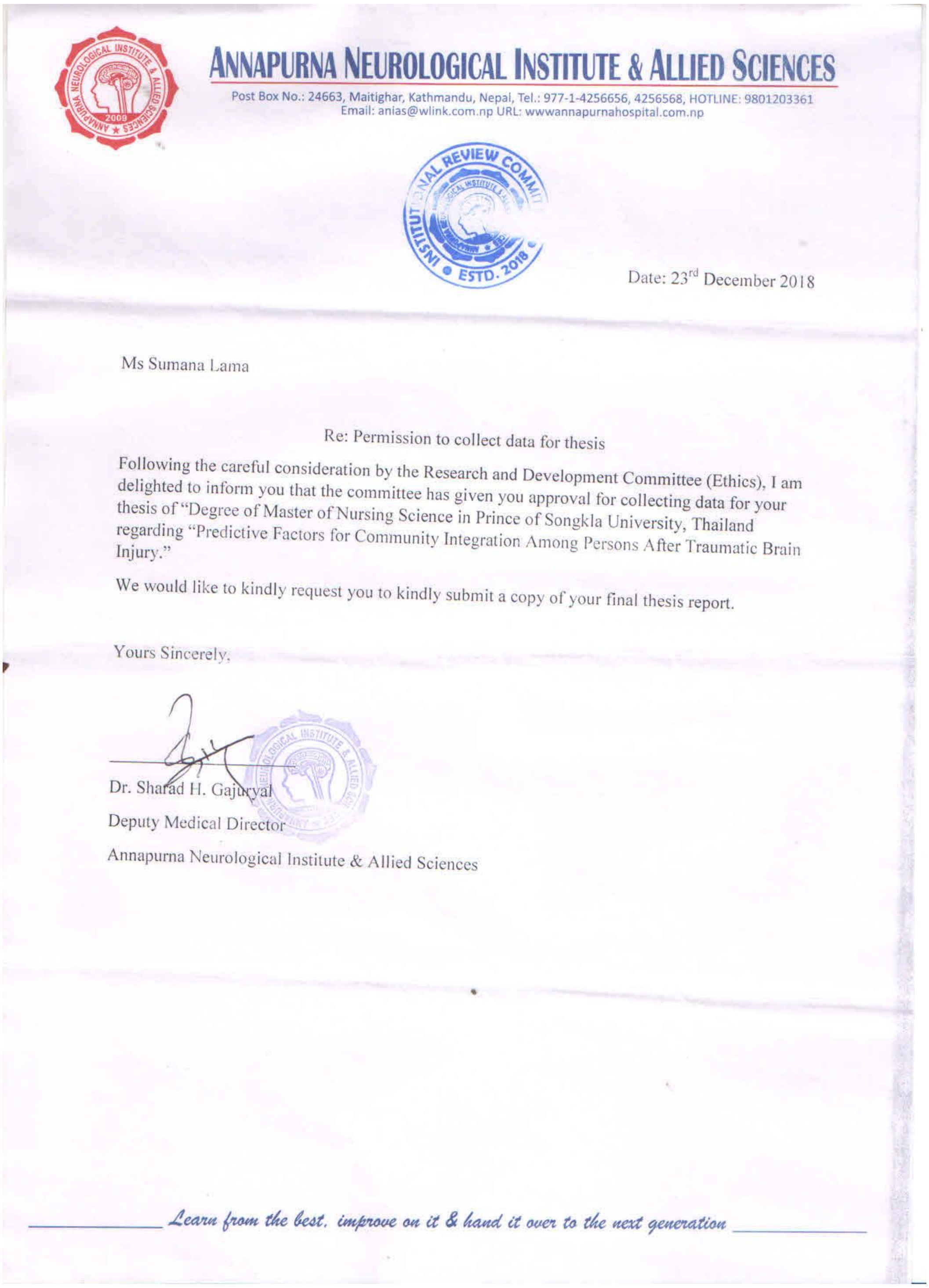
Dear Ms. Lama,

After a careful analysis of your application dated Jan 25, 2019, and an approval letter from Nepal Health Research Council (NHRC) dated 6 Jan 2019, it's my pleasure to inform you that the hospital has given approval for collecting data for your thesis entitled **"Predictive factors for community integration among persons after traumatic brain injury"** for partial fulfillment of Degree of Master of nursing.

I would like to kindly request you to submit a hard copy of your final thesis report upon completion.

Dr Binod Sherchan
Acting Chief Medical Superintendent

Phone: +977-1-4239161, Fax: +977-1-4225275



ANNAPURNA NEUROLOGICAL INSTITUTE & ALLIED SCIENCES
Post Box No.: 24663, Maitighar, Kathmandu, Nepal, Tel.: 977-1-4256656, 4256568, HOTLINE: 9801203361
Email: anias@wlink.com.np URL: wwwannapurnahospital.com.np

INSTITUTIONAL REVIEW COMMITTEE
ESTD. 2018

Date: 23rd December 2018

Ms Sumana Lama

Re: Permission to collect data for thesis

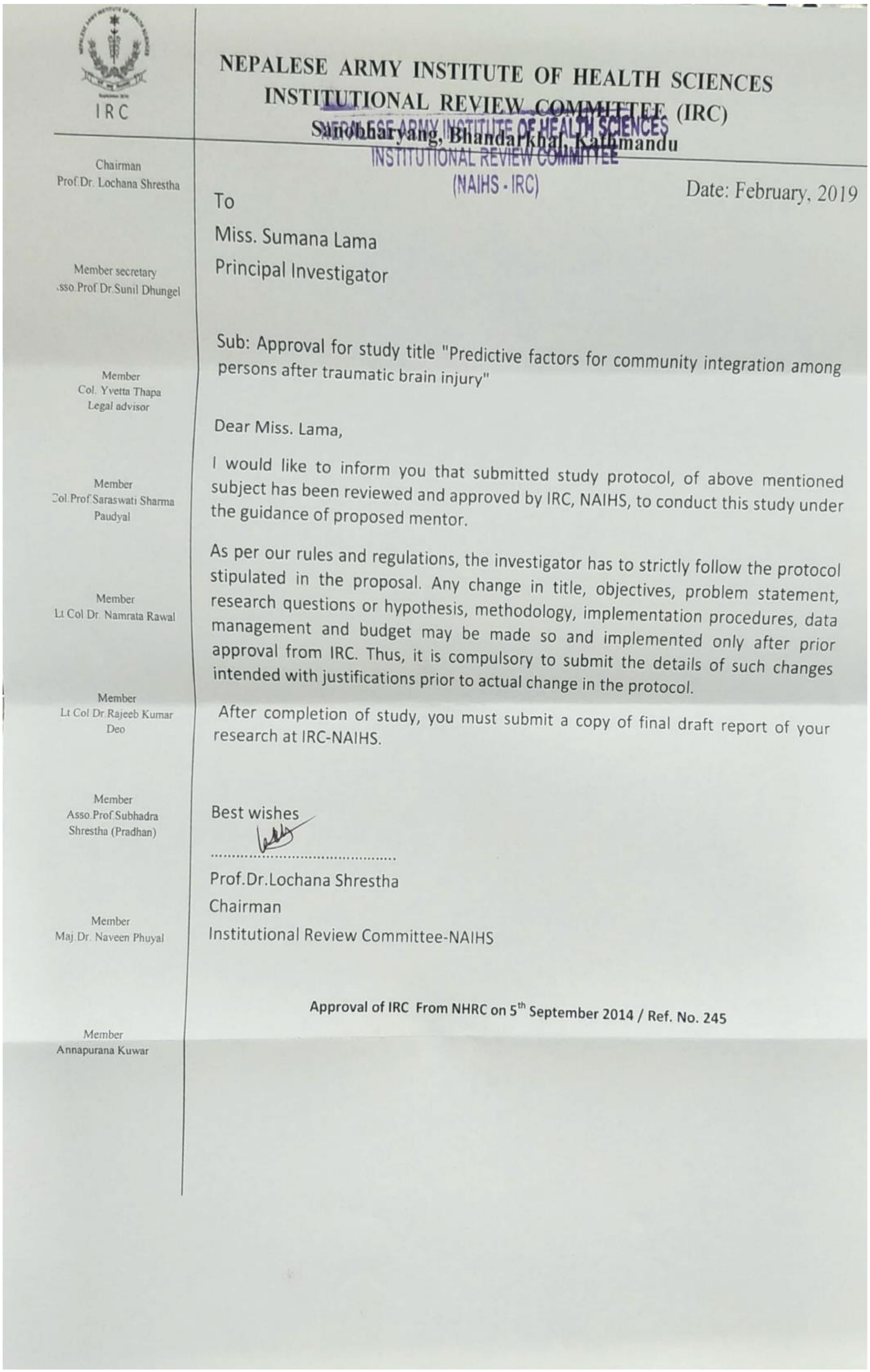
Following the careful consideration by the Research and Development Committee (Ethics), I am delighted to inform you that the committee has given you approval for collecting data for your thesis of "Degree of Master of Nursing Science in Prince of Songkla University, Thailand regarding "Predictive Factors for Community Integration Among Persons After Traumatic Brain Injury."

We would like to kindly request you to kindly submit a copy of your final thesis report.

Yours Sincerely,

Dr. Sharad H. Gajuryal
Deputy Medical Director
Annapurna Neurological Institute & Allied Sciences

Learn from the best, improve on it & hand it over to the next generation



IRC

NEPALESE ARMY INSTITUTE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW COMMITTEE (IRC)
Sanobharyang, Bhandarkhal, Kathmandu

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Prof.Dr. Lochana Shrestha

Member secretary
Asso.Prof.Dr.Sunil Dhungel

Member
Col. Yvetta Thapa
Legal advisor

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Col.Prof.Saraswati Sharma Paudyal

Member
Lt Col Dr. Namrata Rawal

Member
Lt Col Dr.Rajeeb Kumar Deo

Member
Asso.Prof.Subhadra Shrestha (Pradhan)

Member
Maj.Dr. Naveen Phuyal

Member
Annapurana Kuwar

NEPALESE ARMY INSTITUTE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW COMMITTEE
(NAIHS - IRC)

Date: February, 2019

To
Miss. Sumana Lama
Principal Investigator

Sub: Approval for study title "Predictive factors for community integration among persons after traumatic brain injury"

Dear Miss. Lama,

I would like to inform you that submitted study protocol, of above mentioned subject has been reviewed and approved by IRC, NAIHS, to conduct this study under the guidance of proposed mentor.

As per our rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in title, objectives, problem statement, research questions or hypothesis, methodology, implementation procedures, data management and budget may be made so and implemented only after prior approval from IRC. Thus, it is compulsory to submit the details of such changes intended with justifications prior to actual change in the protocol.

After completion of study, you must submit a copy of final draft report of your research at IRC-NAIHS.

Best wishes

....
Prof.Dr.Lochana Shrestha
Chairman
Institutional Review Committee-NAIHS

Approval of IRC From NHRC on 5th September 2014 / Ref. No. 245

दीर्घायु गुरु हस्पिटल एण्ड रिसर्च सेन्टर प्रा. लि.
Dirghayu Guru Hospital & Research Center Pvt. Ltd.
[Dedicated to Neurosurgery Services]

Date : December, 2018

Ms. Sumana Lama

Re: Permission to collect data for thesis.

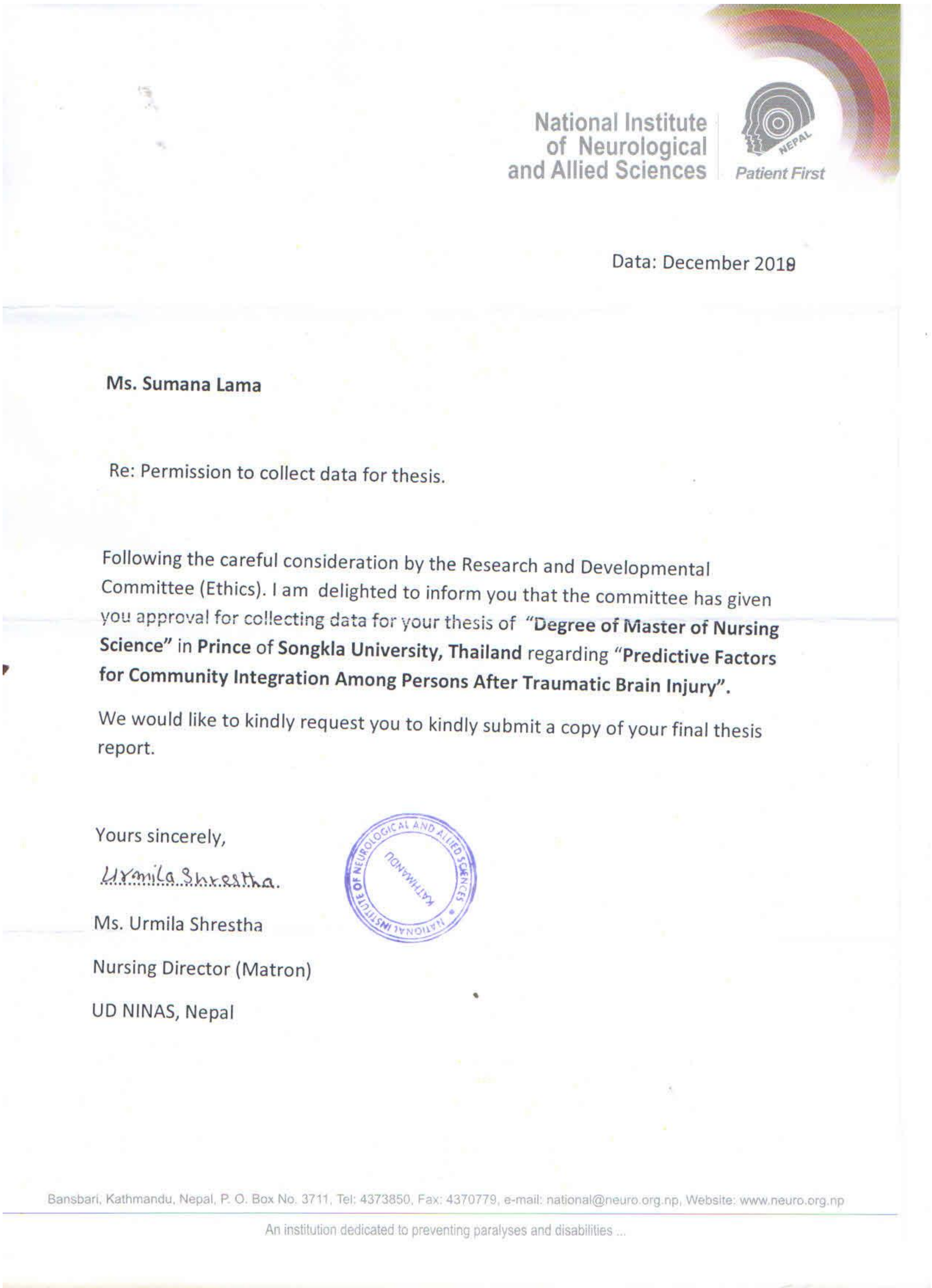
Following the careful consideration by the Research and Developmental Committee (Ethics). I am delighted to inform you that the committee has given your approval for collecting data for your thesis of **"Degree of Master of Nursing Science"** in **Prince of Songkla University, Thailand** regarding **"Predictive Factors for Community Integration among Persons after Traumatic Brain Injury.**

We would like to kindly request you to kindly submit a copy of your final thesis report.

Thank you

Badhikari
Ms. Bhabani Adhikari
Matron
Dirghayu Guru Hospital
& Research Center Pvt. Ltd.

PAN : 304956715, Regd. No.: 82062/067/068
P. O. Box no. 1050, Mitrapark, Chabahil-7, Kathmandu, Tel. : 01 4469693, 4469979
E-mail: info@dirghayuhospital.com, www.dirghayuhospital.com



National Institute
of Neurological
and Allied Sciences
NEPAL
Patient First

Data: December 2018

Ms. Sumana Lama

Re: Permission to collect data for thesis.

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We would like to kindly request you to kindly submit a copy of your final thesis report.

Yours sincerely,

Urmila Shrestha.

Ms. Urmila Shrestha

Nursing Director (Matron)

UD NINAS, Nepal

Bansbari, Kathmandu, Nepal, P. O. Box No. 3711, Tel: 4373850, Fax: 4370779, e-mail: national@neuro.org.np, Website: www.neuro.org.np

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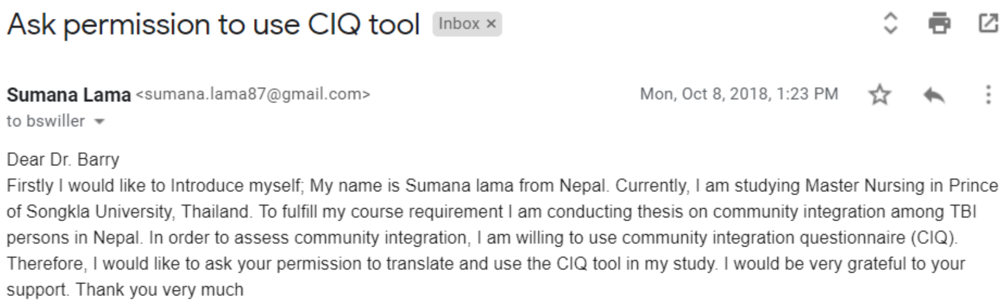
Appendix J

Permission of Research Instruments

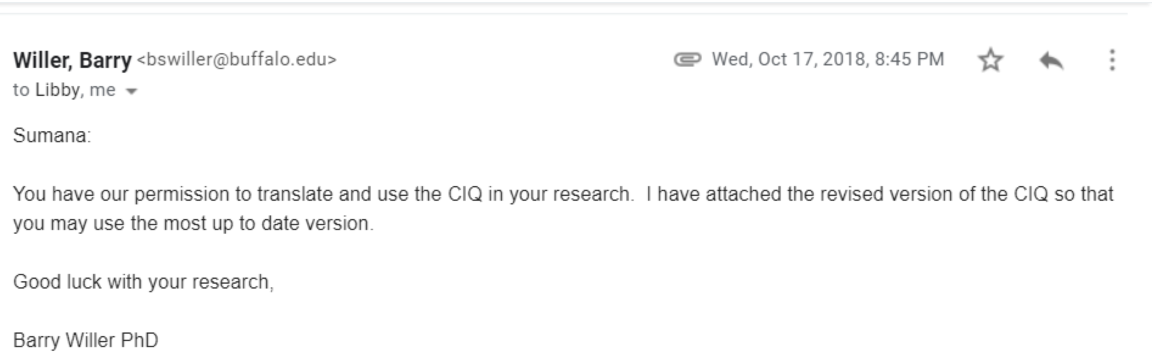
1. Permission to use CIQ



Ask permission to use CIQ tool Inbox ×

Sumana Lama <sumana.lama87@gmail.com> Mon, Oct 8, 2018, 1:23 PM
to bswiller

Dear Dr. Barry
Firstly I would like to Introduce myself; My name is Sumana lama from Nepal. Currently, I am studying Master Nursing in Prince of Songkla University, Thailand. To fulfill my course requirement I am conducting thesis on community integration among TBI persons in Nepal. In order to assess community integration, I am willing to use community integration questionnaire (CIQ). Therefore, I would like to ask your permission to translate and use the CIQ tool in my study. I would be very grateful to your support. Thank you very much



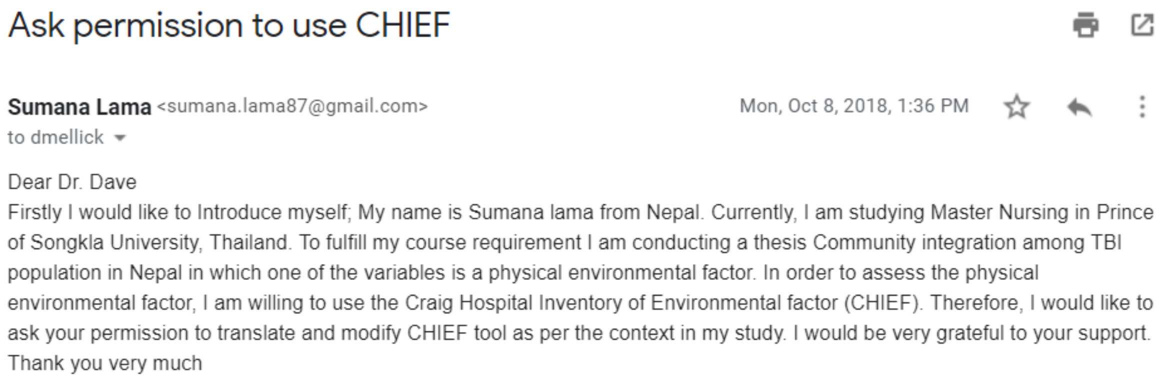
Willer, Barry <bswiller@buffalo.edu> Wed, Oct 17, 2018, 8:45 PM
to Libby, me

Sumana:

You have our permission to translate and use the CIQ in your research. I have attached the revised version of the CIQ so that you may use the most up to date version.

Good luck with your research,

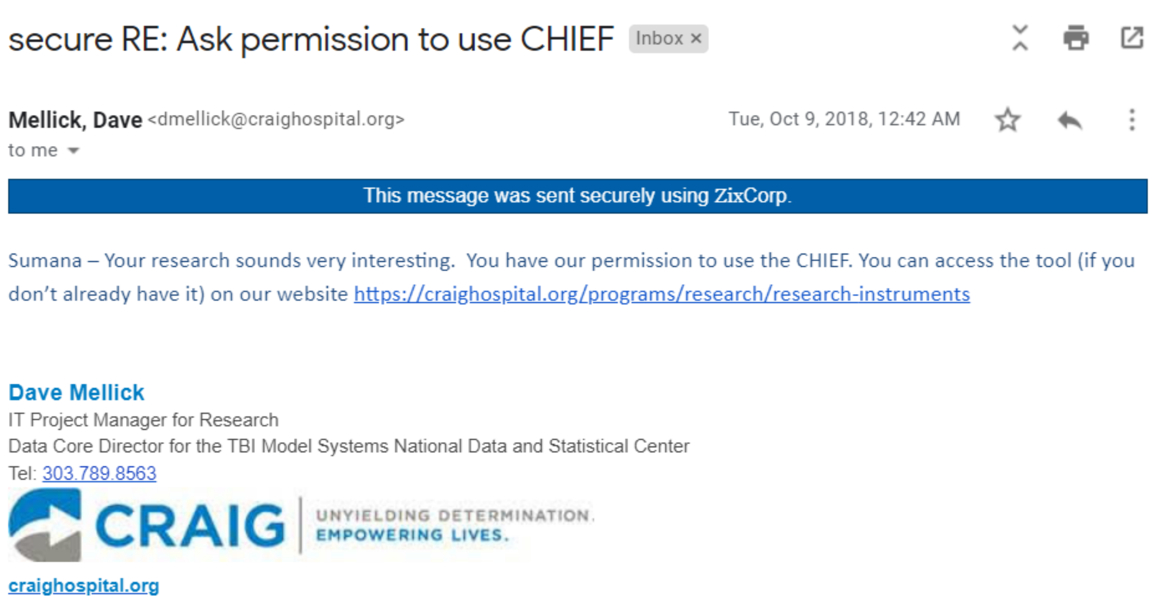
Barry Willer PhD



Ask permission to use CHIEF

Sumana Lama <sumana.lama87@gmail.com> Mon, Oct 8, 2018, 1:36 PM
to dmellick

Dear Dr. Dave
Firstly I would like to Introduce myself; My name is Sumana lama from Nepal. Currently, I am studying Master Nursing in Prince of Songkla University, Thailand. To fulfill my course requirement I am conducting a thesis Community integration among TBI population in Nepal in which one of the variables is a physical environmental factor. In order to assess the physical environmental factor, I am willing to use the Craig Hospital Inventory of Environmental factor (CHIEF). Therefore, I would like to ask your permission to translate and modify CHIEF tool as per the context in my study. I would be very grateful to your support. Thank you very much



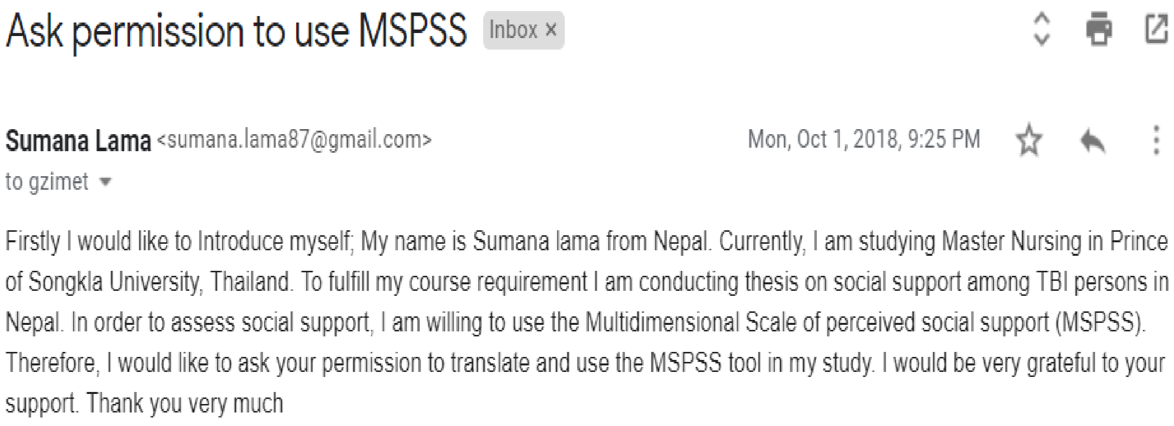
secure RE: Ask permission to use CHIEF

Mellick, Dave <dmellick@craighospital.org> Tue, Oct 9, 2018, 12:42 AM

This message was sent securely using ZixCorp.

Sumana – Your research sounds very interesting. You have our permission to use the CHIEF. You can access the tool (if you don't already have it) on our website https://craighospital.org/programs/research/research-instruments

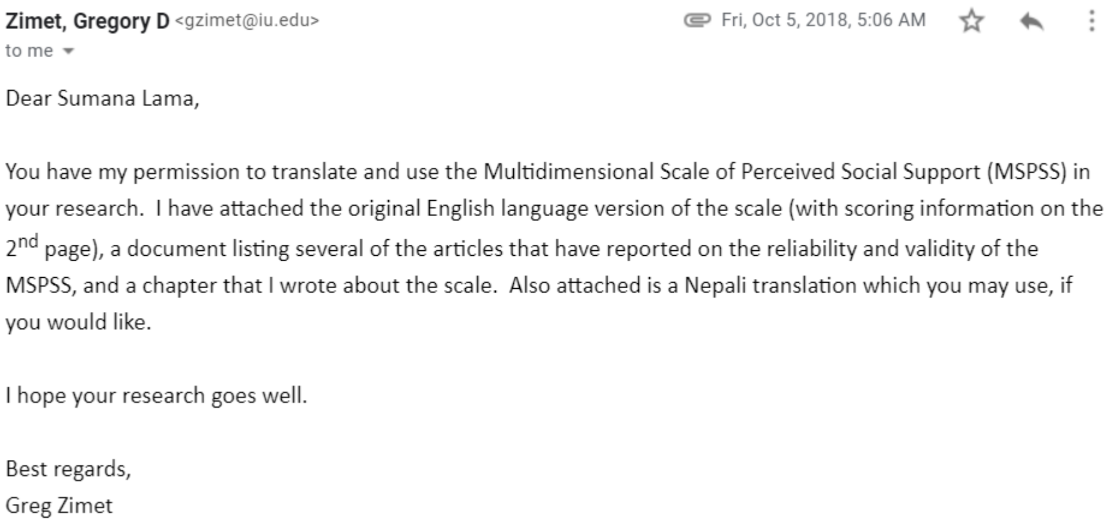
Dave Mellick
IT Project Manager for Research
Data Core Director for the TBI Model Systems National Data and Statistical Center
Tel: 303.789.8563
CRAIG UNYIELDING DETERMINATION. EMPOWERING LIVES.
craighospital.org



Ask permission to use MSPSS

Sumana Lama <sumana.lama87@gmail.com> Mon, Oct 1, 2018, 9:25 PM

Firstly I would like to Introduce myself; My name is Sumana lama from Nepal. Currently, I am studying Master Nursing in Prince of Songkla University, Thailand. To fulfill my course requirement I am conducting thesis on social support among TBI persons in Nepal. In order to assess social support, I am willing to use the Multidimensional Scale of perceived social support (MSPSS). Therefore, I would like to ask your permission to translate and use the MSPSS tool in my study. I would be very grateful to your support. Thank you very much



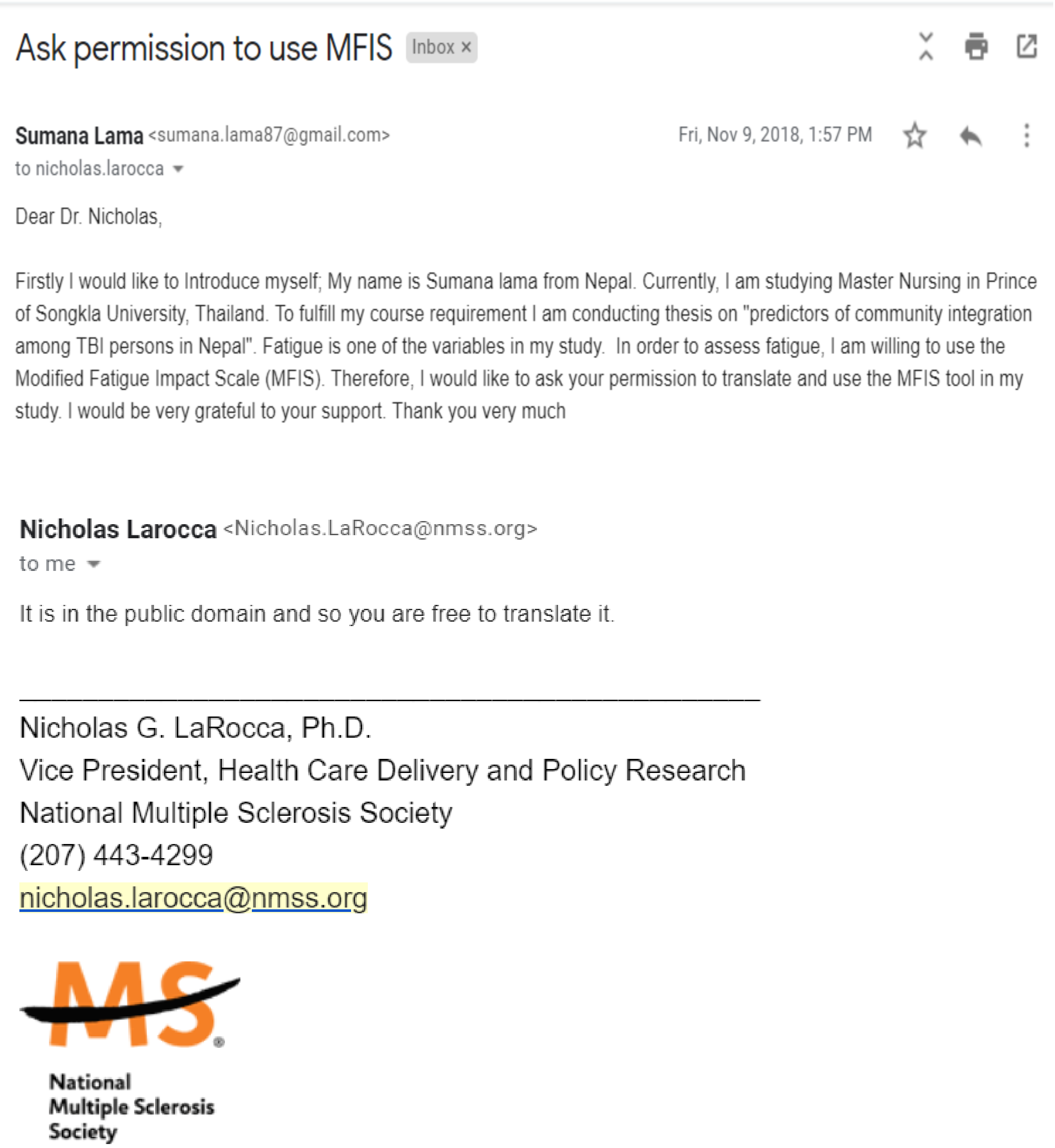
Zimet, Gregory D <gzimet@iu.edu> Fri, Oct 5, 2018, 5:06 AM

Dear Sumana Lama,

You have my permission to translate and use the Multidimensional Scale of Perceived Social Support (MSPSS) in your research. I have attached the original English language version of the scale (with scoring information on the 2nd page), a document listing several of the articles that have reported on the reliability and validity of the MSPSS, and a chapter that I wrote about the scale. Also attached is a Nepali translation which you may use, if you would like.

I hope your research goes well.

Best regards,
Greg Zimet



Ask permission to use MFIS

Sumana Lama <sumana.lama87@gmail.com> Fri, Nov 9, 2018, 1:57 PM
to nicholas.larocca

Dear Dr. Nicholas,

Firstly I would like to Introduce myself; My name is Sumana lama from Nepal. Currently, I am studying Master Nursing in Prince of Songkla University, Thailand. To fulfill my course requirement I am conducting thesis on "predictors of community integration among TBI persons in Nepal". Fatigue is one of the variables in my study. In order to assess fatigue, I am willing to use the Modified Fatigue Impact Scale (MFIS). Therefore, I would like to ask your permission to translate and use the MFIS tool in my study. I would be very grateful to your support. Thank you very much

Nicholas Larocca <Nicholas.LaRocca@nmss.org>
to me

It is in the public domain and so you are free to translate it.

Nicholas G. LaRocca, Ph.D.
Vice President, Health Care Delivery and Policy Research
National Multiple Sclerosis Society
(207) 443-4299
nicholas.larocca@nmss.org

National
Multiple Sclerosis
Society

Appendix K

Lists of Expert for Validation

Content validity of the questionnaires or the study instruments were validity by five experts. They were:

1. Dr. Hathairat Sangchan

   Asst. Professor, Faculty of Nursing, Prince of Songkla University, Thailand

2. Ms. Narumon Anumas

   Advanced Nurse Practitioner, Neuro-ICU, Hat Yai Hospital

3. Ms. Anju Raymajhi

   Sister- Incharge, Neuro-ICU, Shree Birendra Hospital, Nepal

4. Ms. Geeta Shrestha

   Assistant Matron, Neuro- surgery, Chirayu National Hospital, Nepal

5. Ms. Suna Karmacharya

   Community Health Nurse, National Health Training Center, Nepal

Appendix L

Lists of Study Questionnaire Translators

The back translation process of the study instruments or questionnaires involved experts as mentioned below.

1. Mr. Gopal Prasad Tamang

   Masters’ of Humanities and Business Studies

2. Mr. Surendra Subedi

   Masters’ of Humanities (Major English)

3. Mr. Navaraj Basnet

   Ph.D. Scholar of Humanities

VITAE

Name Sumana Lama

Student ID 6010420010

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing	Chinai College of Nursing, Rajiv Gandhi University of Health Sciences, India	2010

Scholarship Awards during Enrolment

Thailand’s Education Hub for Southern Region of ASEAN Countries (TEH-AC) Scholarship, Graduate School, Prince of Songkla University, Thailand.

Work – Position and Address

Nursing Officer, Shree Birendra Hospital, Kathmandu, Nepal