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Predictive Factors for Health-Related Quality of Life among Thai Traumatic Brain Injury Patients

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Factors related to health-related quality of life (HRQoL) have been studied widely but there is limited research about traumatic brain injury (TBI) survivors living in low and middle income countries where social context and care environment are different. This cross-sectional study aimed to determine the factors predicting HRQoL among Thai TBI survivors. Sample included 200 people who had TBI and were selected through purposive sampling at least 1 month after discharge based on their medical records from two tertiary care hospitals in southern Thailand. They were interviewed using the Quality of Life after Traumatic Brain Injury (QOLIBRI) instrument. The selected factors examined as independent variables included Glasgow coma scale (GCS), functional and disability, anxiety/ depression, social support and community integration, and some demographic factors. Results revealed that the significant positive relationships existed between HRQoL and GCS, community integration and social support; while a negative relationship with anxiety and depression was reported. A hierarchical multiple regression analysis indicated that all of five factors could significantly predict HRQoL at 58.3%. In conclusion, five important factors (GCS, social support, anxiety, depression, and community integration) predicted HRQoL which required comprehensive interventions. For improving patient's HRQoL after discharge, it is suggested to provide more support, strengthen their involvement in the community, and reduce the patient's anxiety and depression in particular to those without social support at home.

Keywords: quality of life, traumatic brain injury, predictive factors

Traumatic brain injury (TBI) is a common worldwide problem and is the leading cause of mortality and disability. It is estimated that around 10 million people are affected annually by TBI, and have to bear the burden of living with a long term disability with TBI (Dillahunt Jorgensen, Ehlke, Sosinski, Monroe, & Thor, 2013; Tabish & Syed, 2015). In Thailand, the mortality rate of TBI was 12,767 cases per 100,000 of the population in 2015 (Bureau of Non Communicable Disease of Thailand, 2016). National figures for Thailand show the rate of 38.1 road fatalities per 100,000 cases per year, and 118.8 road fatalities per 100,000 motor vehicles (WHO, 2016).

Although advances in medical and nursing practice can enhance survival of TBI victims, the effects of TBI can significantly develop impairment, disabilities and different degree of dependence. Long-term physical, cognitive, psychological and emotional outcomes following TBI can affect capacity to engage in meaningful work, relationships and leisure activity (Thomas, Skilbeck, & Slatyer, 2009) and result in limitation of daily-life activities. Moreover, TBI can affect the person's self-image, coping strategies and ultimately their quality of life (HRQoL) (Maas, Stocchetti, & Bullock, 2008; Nichol et al., 2011).

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An individual's quality of life (QoL) is recognized as a critical indicator of health outcome following TBI. Numerous studies have documented low levels of both objective and subjective QoL after TBI. For example, Kliangta (2010) found Thai patients with mild TBI had lower than expected HRQoL. Low level QoL in patients with TBI occurs after discharge to one year after TBI) (Upadhyay, 2007) and remains low even after one year (Anderson, Bedics, & Falkmer, 2011; Hawthorne, Gruen, & Kaye, 2009; Hu, Feng, Fan, Xiong, & Huang, 2012; Nestvold & Stavem, 2009). Quality of life is a broad-ranging concept, incorporating the complexity of physical and psychological health; level of independence; social relationships; and relationship to salient features of environment. HRQoL is a subset of the QoL concept and specific to health (von Steinbuechel at al., 2005) which explicitly relates to those aspects of life affected by health (von Steinbuechel et al., 2010). To reduce the impacts or improve HRQoL of those with TBI, it is important to gain a greater understanding about modifiable influences on HRQoL.

Based on the conceptual model of the HRQoL assessment developed by von Steinbuechel at al. (2005), both physical and psychosocial dimensions of HRQoL are classified. Severity of injury and functioning/disability is classified as a determinant within the physical dimension; depressive moods social support, and community integration (included anxiety and depression) are classified as determinants within the psychosocial dimension. Several studies have shown an association between the severity of TBI with QoL (Lin et al., 2010; Truelle et al., 2010). Lin et al (2010) found that the domain of QoL at discharge was significantly associated with disability status. The trajectory of long-term life satisfaction was significantly associated with functional impairment (Resch et al., 2009). After the first year TBI, patients showed that depressive status was significantly associated with QoL (Lin et al., 2010). Anxiety, worry, or depression significantly contributes to poor QoL (Hawthorne, Gruen, & Kaye, 2009). The studies of Lin et al. (2010) and Tomberg, Toomela, Ennok and Tikk (2007) found that social support was correlated for QoL and general health. Social support and community integration were significantly associated with QoL score when using a general QoL instrument (Kalpakjian, Lam, Toussaiant, & Merbitz, 2010).

In addition, some studies showed poorer outcome e.g. in QoL and greater morbidity for older people with TBI (Hu et al., 2012; Nestvold & Stevern, 2009; Truelle et al., 2010). Due to the complexity of TBI and the lengthy process of rehabilitation, the rate of recovery may vary depending on time after injury (Pagulayan, Temkin, Machamer, & Dikmen, 2006). The relationship between time after injury and QoL in people with TBI has been well documented in several studies (Hu et al., 2012; Lin et al., 2010; Pagulayan et al., 2006). So, income, age and severity of injury of admission, time after injury disability, social support, anxiety, depression, and community integration were selected because there were associated with QoL as above mention in previous studies.

However, the majority of the studies mentioned have been conducted in western countries. These results may not be generalized to Thai TBI patient's HRQoL because of diverse sociocultural situations and available health care services after discharge. In addition, research of HRQoL in Thai patients with TBI after hospital discharge was limited. Therefore, the purpose of this study was to examine the predictive factors (including age, income, severity of injury of admission, time after injury, disability, social support, anxiety, depression, and community integration) of HRQoL.

Methodology

Research Design

A cross-sectional design was used to examine factors influencing HRQoL among Thai TBI survivors. The research question was that what were the most important factors (physical and psychosocial factors and key demographic characteristics (namely age, income and time after injury) could affect HRQoL, the outcome variable. The hypothesis of this study were 1) physical factors (severity of injury and disability) have a direct effect on HRQoL; and 2) psychological factors (depressive moods social support, and community integration) have a direct effect on HRQoL.

Population and Sample

The participants were adult patients with TBI recruited during 2013-2014 from two hospitals recognized as referral centers in southern Thailand. The inclusion criteria were: (1) age 18 - 65 years; (2) at least 1 month post-discharge and able to follow-up; (3) diagnosed with mild to severe TBI, but oriented to time, place and person at the time of study start, (4) no spinal cord injury, history or current psychiatric disease or terminal illness. TBI patients with other major organ injuries were excluded. In this study, a power analysis was used to determine the sample size. Since little was known about HRQoL of Thai patients with TBI, a moderate effect size (R^2 = 0.13) (Cohen, 1988:413) and table of Cohen (1988: 445) was used. The minimum sample was estimated to be 200 to have a power at .80 with a significance level of .05 (Cohen, 1988: 445).

Ethical Considerations

Approval was obtained from the Research Ethics Review Committee of the Faculty of Nursing, Prince of Songkla University, and the Ethics Committee of two Thai tertiary care hospitals (EC 56-441-15-7). Participants were given written information explaining the purpose of the study, procedures and plans to maintain confidentiality. Participants were also informed about their right to withdraw from the study at any time without losing health service benefits. Consent was provided verbally or in writing.

Instrumentation

Each of the measures is addressed below. Permission for use was obtained for all copyrighted questionnaires. Some were translated into Thai, using the back translation technique (LaPlante, 2007).

Demographic and health information. It was developed by researchers which included gender, age, religion, marital status, educational level, average income, employment status before and after injury, time after injury, history of readmission, current health problems and outcome status at discharge as measured by the Glasgow Outcome Scale (GOS). Most of these variables provided descriptive information except for age, income and time after injury derived from literature review were included as potential predictors of HRQoL.

Glasgow Coma Scale (GCS). It enabled classification of the TBI as mild (GCS 13-15), moderate (GCS 9-12), and severe (GCS 3- 8) (Vos et al., 2002). The GCS has high inter-observer reliability and generally good prognostic capabilities (Narayan et al., 2002). It is used to represent the severity of injury in this study.

Glasgow Outcome Scale (GOS). It is a 5-point scale that generally assesses the status of disability at a given point in time. The five categories are: good recovery, moderate disability, severe disability, persistent vegetative state, and death (Jennett & Bond, 1975).

Disability Rating Scale (DRS). It is an 8 item measure which designed to assess changes in recovery in adults with TBI, where total scores reflect a level of impairment. The total score is a sum of the 8 items with different scoring weights for items (ranging from 0-3 to 0-5). Total scores (0-29) are used to describe different clinical levels of disability as none to extreme vegetative state (Bellon, Wright, Jamison, & Kolakowsky-Hayner, 2012).

Social support. It was measured by using the Medical Outcomes Study Social Support Survey (MOS-SSS) (Sherbourne & Stewart, 1991) which originally developed for patients with prevalent and treatable chronic conditions. The MOS-SSS consists of 19 items on 5-point scales ranging from 1 – 5 with 4 subscales as follow: (1) emotional/informational support, (2) tangible support, (3) affectionate support, and (4) positive social interaction. A higher score indicates more support.

Depressive mood. It encompasses both anxiety and depression using the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) to assess depressive mood. The HADS is a 14-items self-report measure with seven items forming a depression subscale (HADS-D) and another seven creating an anxiety subscale (HADS-A). Each of these subscales is considered independently in the analyses. Each item of the HADS is rated on a four point scale (0-3), with 3 indicating higher symptom frequency. Total score (0-21) is indicated as mild to severe symptom (Whelan-Goodinson, Ponsford, & Schonberger, 2009).

Community integration (CI). The questionnaire of a 15-item measure consisting of three sub-scales including home integration, social integration, and productivity. The overall score ranges from 0-29; a higher score indicates greater integration (Willer et al., 1993).

Health related quality of life (HRQoL). It was measured by the QOLIBRI which is a new cross-culturally developed instrument for assessing HRQoL after TBI and fulfills standard psychometric criteria (von Steinbuechel et al., 2010). It consists of 37 items to measure a feeling of satisfaction with physical and psychosocial life. In addition, it assesses one's sense of "bother" by emotional and physical problems. Item scores range from 1-5. The QOLIBRI total score ranges from a lowest value of 0 (worst possible) and a highest value of 100 (best possible) quality of life.

Due to no available Thai instruments addressing the specific study variables (DRS, CI and QOLIBRI), original English instruments were used, after first translating into the Thai language and then checked through a back translation technique; others instruments were in available in Thai language. Two bilingual translators, who are literate in both English and Thai languages, conducted the translation/back-translation process to ensure the accuracy of instrument content. All instruments were validated by five Thai persons, who were experts in caring for TBI, for the content validity index (CVI) in the acceptable value (>.80). Prior to conducting the study, all sets of questionnaires were pilot tested with 20 patients with TBI. Cronbach's alpha for the QOLIBRI, and the social support (MOS) measures was .84, .96 respectively. Reliability of the DRS, CI and HADS yielded Cronbach's alpha coefficients of .88, .86, .89 respectively. GCS and GOS are the standard tools and globally used.

Data Collection Procedure

Data were collected from January to August 2014. Communication with hospital units and the outpatient department (OPD) at each hospital enabled acquisition of lists of the patients with TBI who met the inclusion criteria according to the medical records. Participants

were then contacted by telephone or home visit to explain the study details and seek permission for participation. All who agreed to participate were asked about a convenient place and time for data collection. Most participated while in the OPD and some were visited at home. The researchers read each questionnaire verbatim to participants experiencing difficulty in reading. Approximately 60 minutes was required for completion of the questionnaires.

Data Analysis

Prior to analysis, all variables were examined for accuracy of data entry, missing values and fit with the assumptions for multivariate analysis. Descriptive statistics were used to summarize demographic and clinical characteristics. Correlations between the study variables and HRQoL were analyzed followed by hierarchical multiple regression to evaluate the predictive factors. The confounding variable (demographic variable) was entered as the first step of hierarchical multiple regression followed by the physical and psychosocial variables entered as the second step. The assumptions of multiple regression analysis including normality, linearity, homoscedasticity, multicollinearity, and autocorrelation were tested. They have met the assumption tests.

Results

Among 200 TBI participants, the majority of them were male (70.5%), and had sustained their injury in the past year (67.5%). The mean age was 39.85 (*SD* = 17.88) years. About half of the participants were married and had completed secondary school. Most participants had no history of readmission (74.5%) and no current health problems (72.5%). In addition, most were employed before their injury (78.0%) but employment was reduced after their injury (56.0%) and they earned less than 5001 baht/month (approximately $152). Based on the GCS, the majority had sustained a severe or moderate TBI (57%). However, 41.5% reported good recovery (based on the GOS) at discharge. HRQoL score were at moderate level (*M* =69.69, *SD* = 14.85).

The results of the Pearson correlational analysis of HRQoL study variables are displayed in Table 1. The HRQoL was a significantly correlated with all variables except age. A positive correlation was found with income, severity of injury (use GCS), social support, and community integration, while the other variables (time after injury, disability, anxiety, depression) were negatively correlated with HRQoL.

Hierarchical multiple regression was performed to test the model predicting HRQoL (Table 2). The proposed variables including key demographic data (age, income, time after injury), the physical determinants (severity of injury and disability) and psychosocial determinants (social support, anxiety, depression, and community integration) were entered. The first model/step, QoL was tested simultaneously on demographic variable as confounding variable including age, income, and time after injury. This model was supported (R^2 *adj*. =.04, F = 3.42, p = .02). In this model, the powerful variables that could explain HRQoL significantly were income (β = .18, p = .01). In the second step, the physical factors (severity of injury and disability) and psychosocial factors (social support, anxiety and depression, community integration) were entered. The overall model was supported (R^2 *adj*. = .60, F = 31.98, p = .00). Five of nine determinants of HRQoL; severity of injury, social support, anxiety, depression, and community integration significantly predicted HRQoL at a level of 58% (R^2 *adj*. = .58, p < .01). In this model, social support was the most powerful determinant contributing to HRQoL (β = .32, p <.01), followed by anxiety (β = -.26, p< .01).

Table 1

Correlations Matrix of HRQoL with other variables (N=200)

Variables	1	2	3	4	5	6	7	8	9	10
1. Age	-									
2. Income	.20**	-								
3. Severity of injury (GCS)	.15*	.05	-							
4.Time after injury	-.01	-.02	-.29**	-						
5.Disability	-.06	-.19**	-.18**	-.00	-					
6.Social support	.10	.11	.02	-.17**	.00	-				
7.Anxiety	.01	-.06	-.04	.08	.12*	-.29**	-			
8.Depression	.19**	-.04	-.10	.13*	.24**	-.35**	.61**	-		
9.Community integration	-.19**	.23**	.10	.07	-.52**	.00	-.07	-.35**	-	
10.HRQoL	.06	.19**	.28**	-.12*	-.32**	.49	-.52**	-.60**	.38**	-

Note: * HRQoL -Health related quality of life, $p<.05$, ** $p < .01$

Table 2

Predictors of HRQoL (N=200)

		Unstandardized Coefficients		**Standardized Coefficient**			**95%CI of B**	
	Predictors	B	SE B	β	*t*	*p*	Lower	Upper
Model 1	Age	.02	.09	.02	.28	.78	-.20	-.15
	Income	.00	.00	.18	2.59	.01	.00	.00
	Time after injury	-.09	.05	-.12	-1.65	.10	.19	.02
	Model : R^2 *adj*. = .035, *df* = 3, 199, *F* = 3.424, *p* = .018							
Model 2	Age	.09	.06	.07	1.45	.15	-.03	.21
	Income	6.87	.00	.04	.87	.39	.00	.00
	Time after injury	.02	.04	.03	.60	.55	-.05	.10
	Severity of injury (GCS) [a]	1.10	.28	.20	4.01	.00	.56	1.64
	Disability [b]	-.61	.49	-.07	-1.25	.21	-1.58	.353
	Anxiety	-1.78	.41	-.26	-4.33	.00	-2.59	-.97
	Depression	-1.47	.43	-.23	-3.38	.00	-2.32	-.61
	Social support	.53	.08	.32	6.35	.00	.36	.69
	Community integration	.91	.24	.29	3.78	.00	-.43	1.38
	Model: R^2 adj. = .602, *df* = 8, 199, *F* = 31.975, *p* = .000							

Note: ** $p<.01$. Total R^2=.60, R^2 *adj* = .58, Overall *F*=31.38, R^2 *change* = .57, *df* = 8, 19, *F* change = 31.49, *p* = .000, [a]= square root transformation with constant was used, [b]= log 10 transformation with constant was used.

Discussion

The majority of TBI participants in this study were male and mostly young adults, which is similar to previous studies (Anderson et al., 2011; Eriksson, Kottorp, Borg, & Tham, 2009; Lin et al., 2010; Nestvold & Stavem, 2009; Truelle et al., 2010; von Steinbuechel et al., 2010). This finding also reflected similar phenomenon as in other studies undertaken in Thailand (Kliangta, 2010; Samarkit, Kasemkitvattana, Thosingha, & Vorapongsathorn, 2010). Global data supports that the most common persons with TBI were young adults under the age 45 years (Department of Veterans Affairs, Department of Defense, 2016; Tablish & Syed, 2015). Also the male teenagers and male adults might have higher risk behaviors while driving particularly related to alcohol consumption (Tablish & Syed, 2015).

In general, the overall mean score of HRQoL in TBI patients was higher than in previous studies (Hawthorne et al., 2009; Nestvold & Stavem, 2009). This may be related to the fact that most participants had the ability to work (based on GOS scores) and moderate disability at discharge. In addition, the higher than expected HRQoL scores for patients who had severe TBI on hospital admission may reflect the quality of treatment and care provided at both hospitals. However, severity of injury (the lower GCS, the higher severity of injury) was associated with HRQoL which was similar to a previous study (Arandon, Songwathana, Anumas, Rattichot, Sawatdinarunart, & Cheevarungrod, 2016). This could reflect an important data collected on admission, although it was a retrospective data recorded from the patient's medical records. In spite of GCS on admission, the study findings may need to reconsider with a meta-analysis by Cappa, Congur & Congur (2011) who found that injury severity was most poorly associated with QoL. The GCS on discharge is also recommended.

Results of the hierarchical multiple regression analysis (Table 2) revealed that both physical and psychological factors were significant predictors of HRQoL. The contribution of severity of injury, disability, social support, anxiety and depression, and community integration explained variation of HRQoL for 58% ($p < .01$). Among those physical and psychosocial factors contribute to HRQoL, the strongest predictor of HRQoL was social support. This may be due to a unique culture and care in Thai context. The context of the care environment for TBI patients incorporated Thai family support which may be different from that of TBI patients studied in western society. After discharge, the study participants were living with family. Inherent in traditional Thai culture is the trait of caregiving being provided by the family and more often than not by the women in the family (Kespichayawattana, 1999). This is a common characteristic to many Asian cultures including Japan and Korea (Asai & Kameoka, 2005; Kim, 2000). Family care was regarded as social support which is then a significant factor influencing the HRQoL among TBI participants in this study. In addition, because the majority of participants had good recovery and moderate disability when discharged, less social support was needed, making the care requirements very manageable for family members. This finding was consistent with previous studies that social support made a significant contribution to QoL variance in a sample of TBI patients (Kalpakjian et al., 2004; Lin et al., 2010; Petchprapai, 2007; Tomberg, Toomela, Ennok, & Tikk, 2007). Participants who had higher social support reported higher QoL.

Finally, the study results provide evidence to support the use of the HRQoL model in patients with TBI as purposed by von Steinbuechel et al. (2005). HRQoL is a multidimensional framework that is relevant for social environments in which participants live. This study demonstrated that the TBI patients in this study got more support, and engaged in social or community activities, contributing to higher HRQoL, a finding that is consistent with other studies (Kalpakjian, Lam, Toussaint, & Merbitz, 2004; Petchprapai, 2007; Surakey, Songwathana & Sae-Sia, 2014; Tomberg et al., 2007).

Although participant age, income and time after injury did not predict HRQoL, the study findings should be cautiously considered in age range (the homogeneity) of the sample with a history of injury less than 1 year which may have limited generalization. In addition, family should be a significant resource which needs to be empowered and required a support for generating income for those with poverty (Surakey, Songwathana & Sae-Sia, 2014). The alternative care arrangement or management in a Thai family context in particular should be sought to ensure healthy lives of persons both for TBI caregivers and TBI patients which would achieve at least one of seventeen in sustainable development goal (UNESCO, 2017) related to health and well-being in the future.

Limitation

Although the HRQoL measurement used in this study was specific for TBI patients, the tool had been developed in English and had originated in a western context, so that there may have been some differences in interpretation attributable to either different health cultures or translation differences among the items. In addition, the subjects were recruited from only two tertiary hospitals in southern Thailand and the study design was a cross sectional survey. The findings may therefore have limited generalizability.

Conclusion and Recommendation

The findings offer greater insight into factors that predict HRQoL among TBI survivors in Thailand. The assessment of physical and psychological factors especially severity of injury, social support, anxiety, depression, and community integration which influences HRQoL would assist health professionals for improving HRQoL among TBI survivors. Although contributed to HRQoL, the most important predictor was social support. The design an appropriate intervention should be targeted to help those without family or caregivers or adequate resources at home. In addition, it is essential to provide employment for income generation and strengthen their involvement in the community after discharge to improve QoL, especially for younger adults. Addressing this issue may help to not only improve HRQoL, but also reduce the family's burden. The future research is required by incorporating 1) a longitudinal design and follow up outcomes, and 2) recruitment of subjects from different settings or geographical areas. A deeper understanding of the factors that contribute to support that allows for higher than expected QoL scores could be accomplished with a qualitative study such as Ethnographic study.

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