

**HEALTH RELATED QUALITY OF LIFE IN PATIENTS  
WITH TRAUMATIC SPINAL CORD INJURY**

**KANG BEE LEE**



**UMS**

**THESIS SUBMITTED IN FULFILLMENT FOR THE  
DEGREE OF MASTER OF SCIENCE**

**FACULTY OF MEDICINE AND HEALTH SCIENCES**

**UNIVERSITY MALAYSIA SABAH**

**2018**

## UNIVERSITI MALAYSIA SABAH

## BORANG PENGESAHAN TESIS

JUDUL : \_\_\_\_\_

\_\_\_\_\_

IJAZAH : \_\_\_\_\_

\_\_\_\_\_

SAYA : \_\_\_\_\_ SESI PENGAJIAN : \_\_\_\_\_

(HURUF BESAR)

Mengaku membenarkan tesis \*(LPSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Universiti Malaysia Sabah dengan syarat-syarat kegunaan seperti berikut:-

1. Tesis adalah hak milik Universiti Malaysia Sabah.
2. Perpustakaan Universiti Malaysia Sabah dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (/)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

\_\_\_\_\_  
(TANDATANGAN PENULIS)

Alamat Tetap: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TARIKH: \_\_\_\_\_

\_\_\_\_\_  
(TANDATANGAN PUSTAKAWAN)\_\_\_\_\_  
(NAMA PENYELIA)

TARIKH: \_\_\_\_\_

## Catatan:

\*Potong yang tidak berkenaan.

\*Jika tesis ini SULIT dan TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis ini perlu dikelaskan sebagai SULIT dan TERHAD.

\*Tesis dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah dan Sarjana Secara Penyelidikan atau disertai bagi pengajian secara kerja kursus dan Laporan Projek Sarjana Muda (LPSM).

## DECLARATION

I hereby declare that the material in this thesis is my own except for quotations, excerpts, equations, summaries and references, who have been duly acknowledged.

13<sup>th</sup> September 2018

---

Kang Bee Lee  
MM1221003T



UMMS  
UNIVERSITI MALAYSIA SABAH

# CERTIFICATION

NAME : **KANG BEE LEE**

MATRIC NO. : **MM1221003T**

TITLE : **HEALTH RELATED QUALITY OF LIFE IN PATIENTS  
WITH TRAUMATIC SPINAL CORD INJURY**

DEGREE : **MASTER OF SCIENCE (MEDICAL SCIENCE)**

VIVA DATE : **11<sup>TH</sup> JULY 2018**



**CERTIFIED BY:**

**1. SUPERVISOR**  
Assoc. Prof. Dr. Khin Nyein Yin

Signature

**2. CO-SUPERVISOR**  
Prof. Dr. Shahril Yusof

**3. CO-SUPERVISOR:**  
Assoc. Prof. Dr. Chua Bee Seok

Three handwritten signatures are written on horizontal lines. The first signature is in black ink and appears to be 'K. B. Lee'. The second signature is in black ink and appears to be 'Shahril Yusof'. The third signature is in black ink and appears to be 'Chua Bee Seok'. The background features a large, faint watermark of 'UMS UNIVERSITI MALAYSIA SABAH'.

## ACKNOWLEDGEMENT

My greatest appreciation and gratitude to my supervisor Associate Professor Dr. Khin Nyein Yin, co-supervisor Professor Dr. Shahril Yusof, and Associate Professor Dr. Chua Bee Seok of School of Psychology for providing me with combinations of knowledge, guidance and challenges throughout my master's program. Thanks for the encouragements over the past years, which has always helped me persevere.

I would also like to thank Dr. Aza Sharin, Dr. Sylvia Daim and Dr. Rahmawati Pare of Faculty of Medicine and Health Sciences, University Malaysia Sabah (UMS) for their encouragement and kind assistance in academic and non-academic issues.

My sincere thanks to Dr. Syahiskandar Sybil Shah, the Head of Rehabilitation Medicine Department, Queen Elizabeth Hospital; Dr. Jack Wong Siew Yu, the Hospital Director and Head of Clinical Research Centre (CRC), Miri Hospital; and Dr. Stephanie Ann, CRC Queen Elizabeth Hospital.

Last but not least, my gratitude goes to my beloved family members who have given me much needed support and encouragement throughout my study.

Kang Bee Lee  
13<sup>th</sup> September 2018



UMS  
UNIVERSITI MALAYSIA SABAH

## ABSTRACT

Traumatic spinal cord injury (SCI) is a devastating trauma that can cause temporary or permanent disabilities. The objectives of this study were to determine the health related quality of life, level of handicap/participation restriction and satisfaction of life, and to identify the correlation of demographic and clinical data with the quality of life, level of handicap and life satisfaction of the persons with traumatic SCI, and correlation among three questionnaires. This was a cross sectional study. It includes 54 patients with traumatic spinal cord injury with more than six months post-injury and 18 years of age and above, who attended Rehabilitation Medicine Specialist Clinic, Queen Elizabeth Hospital, Kota Kinabalu. Patients with traumatic SCI with history of traumatic brain injury and psychiatric illness were excluded. World Health Organization Quality of Life - BREF (WHOQOL-BREF), Craig Handicap and Assessment Reporting Technique - Short Form (CHART-SF) and Satisfaction with Life Scale (SWLS) were used to assess quality of life, handicap/participation restriction level and life satisfaction of these patients. Thirty-one patients with paraplegia and 23 tetraplegia were included. The descriptive results for WHOQOL-BREF domains of physical health (Mean=12.06, *SD* =2.85), psychological (Mean=11.93, *SD* =2.72), social relationship (Mean=12.59, *SD* =2.80) and environment (Mean=13.31, *SD*=2.80) showed that patients with traumatic SCI have lesser quality of life. Handicap/participation restriction in physical independence dimension was found in 59.3% of participants, 81.5% in mobility; 75.9% in occupation and 46.3% in social integration. The SWLS revealed that 75.4% of the patients was not satisfied with their life ranged from slightly dissatisfied (16.7%), dissatisfied (42.6%) and extremely dissatisfied (16.7%). There is a significant negative linear relationship of patients' age with physical health, psychological and social relationship domains in WHOQOL-BREF. There was a significant relationship of clinical data (type of impairment, completeness of injury, duration of post injury, presence of pressure ulcers and history of urinary tract infection) with handicap/participation restriction level measured by CHART-SF. There was a significant relationship of WHOQOL-BREF domains with CHART-SF dimensions and SWLS. Prevention program of causes of traumatic SCI, team-based care approach, psychosocial rehabilitation, return to work program in accordance with patients' level of education aimed at improving health related quality of life and life satisfaction, and to increase level of participation in activities of daily living, work and community reintegration of patient with traumatic SCI. Special attention to rehabilitation program for older adults with traumatic SCI, and training to improve clinical competency in rehabilitation professionals.

## **ABSTRAK**

### **KUALITI KEHIDUPAN BERKAITAN DENGAN KESIHATAN BAGI PESAKIT KECEDEeraan SARAF TUNJANG TRAUMATIK**

*Kecederaan saraf tunjang traumatik merupakan trauma yang boleh menyebabkan kecacatan sementara atau kekal. Objektif kajian ini adalah untuk menentukan tahap kualiti hidup berkaitan dengan kesihatan, ketidakupayaan (sekatan penyertaan) dan kepuasan hidup serta untuk mengenalpasti korelasi data demografi dan klinikal dengan kualiti hidup, tahap ketidakupayaan dan kepuasan hidup bagi orang yang mengalami kecederaan saraf tunjang traumatik. Korelasi antara tiga jenis borang soal selidik juga telah dibincangkan. Ini merupakan kajian keratan rentas. Kajian ini melibatkan 54 pesakit kecederaan saraf tunjang traumatik yang mempunyai kecederaan melebihi enam bulan, berusia 18 tahun dan keatas yang hadir ke Klinik Pakar Perubatan Rehabilitasi, Hospital Queen Elizabeth, Kota Kinabalu. Pesakit saraf tunjang traumatik dengan sejarah kecederaan otak traumatik dan penyakit psikiatri adalah dikecualikan. "World Health Organization Quality of Life - BREF (WHOQOL-BREF)", "Craig Handicap and Assessment Reporting Technique - Short Form (CHART-SF)" dan "Satisfaction with Life Scale (SWLS)" telah digunakan untuk menilai kualiti hidup, tahap ketidakupayaan dan kepuasan hidup pesakit ini. Subjek adalah terdiri daripada 31 pesakit "paraplegia" dan 23 pesakit "tetraplegia". Hasil kajian deskriptif untuk domain kesihatan fizikal dalam WHOQOL-BREF adalah (Mean = 12.06, SD = 2.85), psikologi (Mean = 11.93, SD = 2.72), hubungan sosial (Mean = 12.59, SD = 2.80), dan persekitaran (Mean=13.31, SD=2.80) menunjukkan pesakit saraf tunjang traumatik mempunyai kualiti kehidupan yang lebih rendah. Didapati 59.3% subjek mempunyai ketidakupayaan dalam dimensi keberdikarian fizikal, 81.5% dalam mobiliti, 75.9% dalam pekerjaan dan 46.3% dalam integrasi sosial. SWLS menunjukkan 75.4% pesakit adalah tidak berpuas hati dengan kehidupan mereka, iaitu 16.7% kurang berpuas hati, 42.6% idak berpuas hati dan 16.7% yang sangat tidak berpuas hati. Terdapat hubungan linear negatif yang signifikan pada usia pesakit dengan kesihatan fizikal, hubungan psikologi dan hubungan sosial dalam WHOQOL-BREF. Terdapat hubungan yang signifikan dalam data klinikal, iaitu jenis ketidakupayaan, jenis kecederaan, tempoh selepas kecederaan, terdapat kudis tekanan dan sejarah jangkitan saluran air*

*kencing dengan tahap ketidakupayaan yang diukur menggunakan CHART-SF. Terdapat hubungan yang signifikan antara domain WHOQOL-BREF dengan dimensi CHART-SF dan SWLS. Program pencegahan penyebab kecederaan saraf tunjung traumatik, pendekatan penjagaan berasaskan pasukan, pemulihan psikososial, program kembali ke pekerjaan berpandukan kepada tahap pendidikan pesakit bertujuan untuk meningkatkan kualiti hidup berkaitan dengan kesihatan, kepuasan hidup dan meningkatkan tahap penyertaan dalam aktiviti harian hidup, kerja dan reintegrasi komuniti pesakit kecederaan saraf tunjang traumatik. Perhatian khusus kepada program pemulihan bagi pesakit kecederaan saraf tunjang traumatik yang lebih tua, dan latihan untuk meningkatkan kecekapan klinikal ahli profesional rehabilitasi.*



UMS  
UNIVERSITI MALAYSIA SABAH



# TABLE OF CONTENTS

	Page
<b>TITLE</b>	i
<b>DECLARATION</b>	ii
<b>CERTIFICATION</b>	iii
<b>ACKNOWLEDGEMENT</b>	iv
<b>ABSTRACT</b>	v
<b>ABSTRACT</b>	vi
<b>TABLE OF CONTENTS</b>	viii
<b>LIST OF FIGURES</b>	xii
<b>LIST OF TABLES</b>	xiv
<b>LIST OF ABBREVIATIONS</b>	Xviii
<b>LIST OF APPENDICES</b>	xix
<b>CHAPTER 1: INTRODUCTION</b>	
1.1 Introduction and Background	1
1.2 Operational Definitions	5
<b>CHAPTER 2: LITERATURE REVIEW</b>	
2.1 Anatomy of Spine and Spinal Cord	6
2.1.1 Vertebral Column	6
2.1.2 Muscle of Back and Neck	7
2.1.3 The Spinal Cord	8
2.1.4 Vasular Supply to the Spinal Cord	9
2.2 Physiology of Spinal Cord	10
2.3 Pathophysiology of Traumatic Spinal Cord Injury	15
2.4 Disorders of the Spine and Spinal Cord	16
2.5 Traumatic Spinal Cord Injury	17
2.5.1 Incidence and Prevelence of Traumatic Spinal Cord Injury	17
2.5.2 Causes of Traumatic Spinal Cord Injury	20
2.5.3 Injuries of the Spine	21
2.5.4 Injuries to the Cervical Spine	21
2.5.5 Thoracic and Lumbosacral Spine Injuries	28

2.6	Complications of Traumatic Spinal Cord Injury and Rehabilitation Management	35
2.6.1	Pressures Ulcers	35
2.6.2	Neuropathic Pain	36
2.6.3	Bladder Dysfunctions	36
2.6.4	Bowel Dysfunctions	38
2.6.5	Contractures	38
2.6.6	Autonomic Dysreflexia	39
2.6.7	Spasticity	40
2.6.8	Deep Venous Thrombosis	40
2.6.9	Urinary Tract Infection	41
2.6.10	Respiratory Complications	42
2.7	Comorbid Conditions	42
2.8	Psychosocial Adjustment and Management	43
2.9	Sexuality and Fertility Management	45
2.10	Predischarge Planning	46
2.11	Follow-up after Spinal Cord Injury	47
2.12	Neurological Classification of Spinal Cord Injury	47
2.13	Expected Functional Outcomes in relation to Neurological Level of Injury	51
2.14	Spinal Cord Independence Measure III	53
2.15	The International Classification of Functioning, Disability and Health (WHO-ICF)	54
2.16	Team-Based Care in Spinal cord Injury Management	55
2.17	Return to Work after Spinal Cord Injury	60
2.18	Health Related Quality of Life	60
3.18.1	World Health Organization Quality of Life -Abbreviate version (WHOQOL-BREF)	62
3.18.2	Craig Handicap Assessment and Reporting Techniques - Short Form (CHART-SF)	65
3.18.3	Satisfaction with Life Scale (SWLS)	67

### **CHAPTER 3: METHODS**

3.1	Study Design	68
3.2	Sample Size Calculation	68
3.3	Power of the Sample Size	69
3.4	Inclusion Criteria	70
3.5	Exclusion Criteria	70
3.6	Location of Study	70
3.7	Ethical Approval	70
3.8	Informed Consent	70
3.9	Confidentiality	70
3.10	Procedures	71
3.11	Translation Procedures	71
3.12	Pilot Study	72
3.13	Data Analysis	72

### **CHAPTER 4: RESULTS**

4.1	Demographic Data	73
4.2	Clinical Data	79
4.3	Descriptive Results of Questionnaires Analysis	84
4.3.1	World Health Organization Quality of Life – BREF (WHOQOL-BREF)	84
4.3.2	Craig Handicap Assessment and Reporting Techniques – Short Form (CHART-SF)	86
4.3.3	Satisfaction with Life Scale (SWLS)	87
4.3.4	Reliability Test	88
4.3.5	Test for Normality of the Study Questionnaires	89
4.4	Correlation among WHOQOL-BREF, CHART-SF and SWLS	90
4.5	Correlation between demographic and clinical data and WHOQOL-BREF	93
4.6	Correlation between demographic and clinical data and CHART-SF	109
4.7	Correlation between demographic and clinical data and SWLS	124

## **CHAPTER 5: DISCUSSION**

5.1	Discussion on Objective 1: To study the demographic and clinical data of patients with traumatic spinal cord injury	133
5.2	Discussion on Objective 2: To assess the quality of life and life satisfaction of patients with traumatic spinal cord injury	143
5.3	Discussion on Objective 3: To measure the level of handicap/ participation restriction of patients with traumatic spinal cord injury	145
5.4	Discussion on Objective 4: To correlate among domains of WHOQOL-BREF, Dimension of CHART-SF and items SWLS questionnaires	145
5.5	Discussion on Objective 5: To correlate demographic and clinical data of the patients with quality of life, level of handicap/participation restriction and life satisfaction	148

## **CHAPTER 6: CONCLUSIONS, STUDY LIMITATION AND RECOMMENDATIONS**

6.1	Conclusions	159
6.2	Study Limitation	162
6.3	Recommendations	162

<b>REFERENCES</b>	163
-------------------	-----

<b>APPENDICES</b>	184
-------------------	-----

## LIST OF FIGURES

	Page
Figure 1: Vertebral column	7
Figure 2: Dermatome levels: (A) Anterior, (B) Posterior	9
Figure 3: Vascular supply to spinal cord	10
Figure 4: Cross sectional anatomy of spinal cord	11
Figure 5: Processing of sensory input and motor output by the spinal cord	12
Figure 6: Corticospinal tract	13
Figure 7: Ascending sensory pathways of the spinal cord	14
Figure 8: Three column concept of spine	21
Figure 9: Common mechanism of cervical spine injuries	22
Figure 10: Whiplash injury	23
Figure 11: Cervical spine injuries	25
Figure 12: Mc Affe's Classification-3-Column Classification of thoracolumbar fracture	30
Figure 13: Flowchart of treatment plan for thoracolumbar injuries	34
Figure 14a: The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) - Front page	55
Figure 14b: The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) - Back page	51
Figure 15: International Classification of Functioning, Disability and Health (ICF)	55
Figure 16: Age groups	74
Figure 17: Gender	74
Figure 18: Ethnicity	75
Figure 19: Level of education	76

Figure 20:	Marital status	77
Figure 21:	Case distribution	77
Figure 22:	Employment status	78
Figure 23:	Causes of traumatic spinal cord injury	79
Figure 24:	Duration of post-injury	79
Figure 25:	Type of impairment	80
Figure 26:	ASIA impairment scale	80
Figure 27:	Completeness of Injury	81
Figure 28:	Neurological impairment group	81
Figure 29:	Type of bladder management	82
Figure 30a:	Comorbidity	83
Figure 30b:	Category of comorbidities	83
Figure 31:	Frequency of good and lesser QOL	84
Figure 32:	Overall perception of QOL	85
Figure 33:	Overall perception of health	85
Figure 34:	Frequency of handicap/participation restriction	86
Figure 35:	Ordinal result of SWLS	87

## LIST OF TABLES

	Page
Table 1: Causes of spinal cord compression	17
Table 2: Nerve root involvement	26
Table 3: ASIA Impairment Scale	49
Table 4a: Domain of WHOQOL-BREF	63
Table 4b: Facets incorporated within WHOQOL-BREF	64
Table 5: Craig Handicap and Assessment Reporting Technique - Short Form (CHART-SF)	66
Table 6: Interpretation for score of SWLS	67
Table 7: Representation of the sample size	68
Table 8: Complications of Traumatic SCI	82
Table 9: Descriptive results of WHOQOL-BREF	84
Table 10: Descriptive results of CHART-SF	86
Table 11: Descriptive results of SWLS	87
Table 12: Reliability of Instruments	88
Table 13: Test of Normality in WHOQOL-BREF	89
Table 14: Test of Normality in CHART-SF	89
Table 15: Results of correlation among domains in WHOQOL-BREF	90
Table 16: Result of correlation among domains in CHART-SF	91
Table 17: Result of correlation among SWLS five items	92
Table 18: Result of relationship between SWLS with WHOQOL-BREF	92
Table 19: Result of correlation relationship CHART-SF and WHOQOL-BREF	93
Table 20: Relationship between participants' age and WHOQOL-BREF	94

Table 21:	Results of correlation between level of education and WHOQOL-BREF	95
Table 22:	Results of correlation between current marital status and WHOQOL-BREF	96
Table 23:	Results of correlation between impairment group and WHOQOL-BREF	97
Table 24:	Result of correlation of ASIA Impairment Scale and WHOQOL-BREF	98
Table 25:	Results of correlation between completeness of Injury and WHOQOL-BREF	99
Table 26:	Results of correlation between duration post-injury and WHOQOL-BREF	100
Table 27:	Results of correlation between employment status after injury and WHOQOL-BREF	101
Table 28:	Results of correlation between pressure ulcers and WHOQOL-BREF	102
Table 29:	Results of correlation between neuropathic pain and WHOQOL-BREF	102
Table 30:	Results of correlation between spasticity and WHOQOL-BREF	103
Table 31:	Results of correlation between contracture and WHOQOL-BREF	104
Table 32:	Results of correlation between autonomic dysreflexia and WHOQOL-BREF	104
Table 33:	Results of correlation between urinary tract infection and WHOQOL-BREF	105
Table 34:	Results of correlation between comorbidity and WHOQOL-BREF	106
Table 35:	Results of correlation between type of bladder management and WHOQOL-BREF	107
Table 36:	Results of correlation between neurological impairment group and WHOQOL-BREF	108

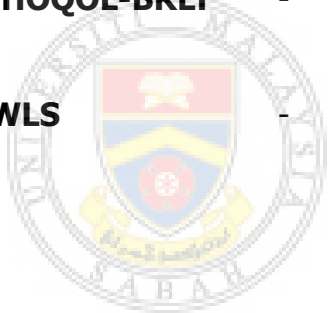


Table 37:	Results of correlation between age of participants and CHART-SF	109
Table 38:	Results of correlation between level of education and CHART-SF	110
Table 39:	Results of correlation between current marital status of the participants and CHART-SF	111
Table 40:	Results of correlation between impairment and CHART-SF	112
Table 41:	Results of correlation between ASIA Impairment scale and CHART-SF	113
Table 42:	Results of correlation between completeness and CHART-SF	113
Table 43:	Results of correlation between duration of post-injury and CHART-SF	114
Table 44:	Results of correlation between employment after injury and CHART-SF	115
Table 45:	Results of correlation between presence of pressure ulcers and CHART-SF	116
Table 46:	Results of correlation between neuropathic pain and CHART-SF	117
Table 47:	Results of correlation between spasticity and CHART-SF	117
Table 48:	Results of correlation between contracture and CHART-SF	118
Table 49:	Results of correlation between autonomic dysreflexia and CHART-SF	119
Table 50:	Results of correlation between urinary tract infection and CHART-SF	120
Table 51:	Results of correlation between comorbidity and CHART-SF	120
Table 52:	Results of correlation between type of bladder management and CHART-SF	122
Table 53:	Results of correlation between neurological impairment group and CHART-SF	123
Table 54:	Results of correlation between age of participants and SWLS	124

Table 55:	Results of correlation between level of education and SWLS	124
Table 56:	Results of correlation between current marital status of the participants and SWLS	125
Table 57:	Results of correlation between impairment and SWLS	125
Table 58:	Results of correlation between ASIA Impairment scale and SWLS	126
Table 59:	Results of correlation between completeness of injury and SWLS	126
Table 60:	Results of correlation between duration of post-injury and SWLS	127
Table 61:	Results of correlation between employment after injury and SWLS	127
Table 62:	Results of correlation between presence of pressure ulcer and SWLS	128
Table 63:	Results of correlation between neuropathic pain and SWLS	128
Table 64:	Results of correlation between spasticity and SWLS	128
Table 65:	Results of correlation between contracture and SWLS	129
Table 66:	Results of correlation between autonomic dysreflexia and SWLS	129
Table 67:	Results of correlation between urinary tract infection and SWLS	130
Table 68:	Results of correlation between comorbidity and SWLS	130
Table 69:	Results of correlation between type of bladder management and SWLS	131
Table 70:	Results of correlation between neurological impairment group and SWLS	131
Table 71:	Comparison of relative handicap in CHART-SF with other studies	145

## LIST OF ABBREVIATIONS

- ADL** - Activities of daily living
- AIS** - ASIA Impairment Scale
- ASIA** - American Spinal Injury Association
- CHART-SF** - Craig Handicap and Assessment Reporting Technique - Short Form
- ICF** - International Classification of Functioning, Disability and Health
- SCI** - Spinal Cord Injury
- WHO** - World Health Organization
- WHOQOL-BREF** - World Health Organization Quality of Life - Abbreviated Version
- SWLS** - Satisfaction with Life Scale



UMS  
UNIVERSITI MALAYSIA SABAH

## LIST OF APPENDICES

Appendix A	: Medical Research Ethics Committee, Ministry of Health	184
Appendix B	: Borang Maklumat Subjek (Patient's Information Sheet)	185
Appendix C	: Borang Kebenaran Subjek (Informed Consent Form)	188
Appendix D	: Socio-Demographic Profile and Clinical Data Form	189
Appendix E	: World Health Organization Quality of Life (WHOQOL-BREF) – English Version	192
Appendix F	: World Health Organization Quality of Life (WHOQOL-BREF) – Malay Version	196
Appendix G	: Craig Handicap and Assessing Reporting Technique (CHART-SF) – English Version	200
Appendix H	: Craig Handicap and Assessing Reporting Technique (CHART-SF) – Malay Version	204
Appendix I	: Satisfaction With Life Scale (SWLS) – English Version	208
Appendix J	: Satisfaction With Life Scale (SWLS) – Malay Version	209

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction and Background

Patients with traumatic spinal cord injury (SCI) are living longer than before with the advancement of medical care and rehabilitative management that leads to delayed mortality and improved morbidity. There is also a trend towards an increasing number of incomplete lesions, possibly the result of changes in causes and improved treatment at the site of injury by the emergency response team and subsequent immediate care (Sisto *et al.*, 2009).

A longitudinal investigation showed that as the life span of the population increases, causes of morbidity and mortality had moved away from the traditional SCI related causes of death, such as kidney disease, and begin to parallel those of the able-bodied population. However, for patients with traumatic SCI, illnesses that lead to deaths, still occur at an earlier age than would be expected in the general population (Whiteneck, 1992).

Extended life spans and living with a disability can lead to multitude of complications associated with morbidity and mortality. Persons with SCI probably experience varying degree of impairment due to loss of body function that may result in handicap/participation restriction and activity limitations that will affect their quality of life [QOL] (Charlifue *et al.*, 2012).

Traumatic SCI affects the conduction of motor and sensory impulses along the site of the lesion, as well as the autonomic nervous system. SCI can affect the motor, sensory or autonomic functions such as breathing, and bowel and bladder control. Therefore, SCI do not only affect on the physical aspect of the patients, but also affects on their psychological and social wellbeing that lead to significantly impaired in patients' ability to perform activities of daily living, resulting in 53.2% of

## CHAPTER 2

### LITERATURE REVIEW

Comprehension of basic anatomy of the vertebral column, the spinal cord and its associated nerves is crucial to understanding the mechanisms of SCI. In addition, knowledge of the autonomic nervous system is essential to recognize the impairments to the multiple body system that is controlled by the spinal cord (Sisto *et al.*, 2009).

#### 2.1 Anatomy of Spine and Spinal Cord

##### 2.1.1 Vertebral Column

The vertebral column and the skull are part of the axial skeleton and (Figure 1) is divided into 5 segments: cervical (C), thoracic (T), lumbar (L), sacral (S), and coccygeal. These segments comprising of seven cervical vertebrae (C1 - C7), twelve thoracic vertebrae (T1 - T12), five lumbar vertebrae (L1 - L5), five fused sacral vertebrae and four coccygeal vertebrae that are fused together (Derrickson *et al.*, 2016).

The vertebral column functions as a strong, flexible structure than allowed forward, backward, lateral, and rotation movement. Vertebrae in the different regions of the column vary in size, shape, and detail. A vertebra typically comprises of a vertebral body, located anteriorly, a vertebral arch, and seven processes (Figure 3). The cervical, thoracic, and lumbar vertebrae are separated by the intervertebral discs, and are connected and stabilized by the ligaments. Injuries to any of these ligaments or bony structure will result in vary degree of instabilities of the spine. The vertebral foramina encompass the spinal cord, the intervertebral foramina provide spaces through which spinal nerves exit the vertebral column (Derrickson *et al.*, 2016).

## CHAPTER 3

### METHOD

#### 3.1 Study Design

This was a cross sectional hospital based analytical study.

#### 3.2 Sample size calculation

Sample size for this study was calculated by Epi-Info version 3.4.3. The study population, traumatic SCI who were admitted to Queen Elizabeth Hospital, Kota Kinabalu during 2011 - 2013 were about 108 patients. Assuming 67.0% of the patients with SCI will return to work (based on experience) with the worst acceptable level 57% and level of precision (95.0% confidence interval + or - 10.0%), the calculated sample size is 48 patients. However, in order to increase precision, we decided to collect the data from all patients with 54 traumatic SCI who attended rehabilitation medicine specialist clinic, Queen Elizabeth Hospital, Kota Kinabalu in the period of data collection (2014 - 2016) and fulfilled the selection criteria.

During the study period, there were 54 eligible patients with traumatic SCI falls into inclusion and exclusion criteria of this study. The investigator had taken all of the patients (Table 7).

**Table 7: Representation of the sample**

Total number of SCI patients reviewed in the Rehabilitation Medicine Clinic (2014 - 2016)	:	<b>105</b>
Traumatic SCI	:	<b>54</b>
Non-traumatic and paediatric SCI	:	<b>44</b>
Patient refused to participate	:	<b>1</b>
Patients excluded from study	:	<b>6</b>

## CHAPTER 4

### RESULTS

A total of 54 persons with traumatic spinal cord injury (SCI) participated in this study (Table 6). Descriptive analysis was used to analyze the demographic and clinical data, World Health Organization Quality of Life - Bref (WHOQOL-BREF), Craig Handicap assessment and Reporting Technique - Short Form (CHART-SF) and Satisfaction with Life Scale (SWLS) and was tabulated using SPSS version 23.0 (for Windows). Reliability analysis was done to determine the internal consistency (Cronbach's alpha coefficient [ $\alpha$ ]) of WHOQOL-BREF, CHART-SF and SWLS. Shapiro-Wilk test was used to test for normality for the three-dependent variable, namely WHOQOL-BREF, CHART-SF and SWLS. Pearson's correlation was used to determine relationship among the four domains of WHOQOL-BREF. Spearman's correlation coefficient was used to determine the level of agreement among different dimensions of CHART-SF and SWLS due to the results was not normally distributed. Nonparametric method using Mann-Whitney U-Test and Kruskal Wallis H-Test was used to determine correlation between the independent variables, and three dependent variables because of small sample size and the data was not normally distributed.

#### 4.1 Demographic Data

##### 4.1.1 Age

The age range was 19 to 70 years old with the mean of 39.8 years old and standard deviation of 12.87. Participants were categorized by age into adolescents (10 to 19 years), adults (20 to 39 years), middle age (40 to 64 years) and older adults (65 years and more) [Figure 16].