FACTORS ASSOCIATED WITH IMPROVEMENT IN ACTIVITIES OF DAILY LIVING (ADL) IN STROKE PATIENTS POST DOMICILIARY CARE IN KELANTAN

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By

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LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
Adj. OR	Adjusted odds ratio
CI	Confidence interval
LR	Likelihood ratio
MBI	Modified Barthel Index
MOH	Ministry of Health
mRS	Modified Rankin Scale
OR	Odds ratio
SPSS	Statistical Package for Social Sciences
SD	Standard deviation
WHO	World Health Organisation

LIST OF SYMBOLS

=	Equal to
≥	More than and equal to
<	Less than
α	Alpha
β	Beta
%	Percentage
Δ	Precision / Delta

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ABSTRAK

FAKTOR-FAKTOR YANG MEMPENGARUHI PENINGKATAN AKTIVITI KEHIDUPAN SEHARIAN DI KALANGAN PESAKIT STROK SELEPAS PERAWATAN PERKHIDMATAN DOMISILIARI DI KELANTAN

Latar belakang: Rehabilitasi adalah sangat penting untuk membantu individu yang menghidap strok untuk memulihkan aktiviti kehidupan seharian. Selain daripada kaedah rehabilitasi, terdapat faktor-faktor lain yang mempengaruhi pemulihan fizikal pesakit strok. Di Malaysia, perkhidmatan perawatan domisiliari adalah merupakan satu kaedah rehabilitasi di rumah, yang disediakan oleh pasukan rehabilitasi daripada pelbagai jenis disiplin untuk mangsa strok. Walau bagaimanapun, masih tiada kajian yang dijalankan untuk menilai faktor-faktor risiko yang mempengaruhi peningkatan aktiviti kehidupan seharian di kalangan pesakit strok selepas tiga bulan menerima intervensi domisiliari.

Objektif: Kajian ini bertujuan untuk mengenal pasti peratusan pesakit strok yang mempunyai peningkatan aktiviti kehidupan seharian selepas menerima perkhidmatan perawatan domisiliari di Kelantan dan untuk menentukan faktor-faktor demografi dan klinikal yang mempengaruhi peningkatan aktiviti kehidupan seharian.

Kaedah: Kajian secara hirisan lintang telah dijalankan dari bulan Februari sehingga April 2018 dengan menggunakan data sekunder yang diperolehi daripada borang rujukan perkhidmatan perawatan domisiliari, rekod pesakit perkhidmatan perawatan domisiliari (PPD 004 (a)/2014) dan rekod penilaian kes perkhidmatan perawatan domisiliari (PPD 004 (b)/2014) yang digunakan sebagai dokumentasi rasmi untuk perkhidmatan perawatan domisiliari di Malaysia. Data daripada 11 buah klinik yang

mempunyai perkhidmatan perawatan domisiliari di Kelantan telah dikumpulkan dengan menggunakan proforma dan dianalisa menggunakan perisian IBM SPSS Statistik versi 22. Analisa deskriptif dan regresi logistik telah dijalankan. Skor sekurang-kurangnya 30% pada akhir perkhidmatan dianggap mempunyai peningkatan aktiviti kehidupan seharian.

Keputusan: Antara Januari 2015 dan Oktober 2017, terdapat 384 pesakit strok yang telah berdaftar di bawah perkhidmatan perawatan domisiliari di negeri Kelantan, di mana 234 individu memenuhi kriteria kajian. Peratusan pesakit strok yang mempunyai peningkatan aktiviti kehidupan seharian adalah sebanyak 72.2%, di mana 96 (41.0%) adalah lelaki dan 138 (59.0%) adalah perempuan. Purata umur bagi keseluruhan pesakit strok adalah 68.21 (11.99) tahun. Satu ratus lima puluh tujuh (67.1%) pesakit strok berumur lebih daripada 65 tahun dan ke atas manakala dua pertiga berstatus kahwin (65.8%). Majoriti daripada kedua-dua kumpulan menghidap strok jenis iskemia. Faktor-faktor signifikan yang mempengaruhi peningkatan aktiviti kehidupan seharian adalah kumpulan umur <65 tahun (Adj. OR 2.241; 95% CI 1.019, 4.927; p =0.045), jenis strok iskemia (Adj. OR 4.842; 95% CI: 2.180, 10.758; p <0.001), strok yang kurang parah (markah mRS 4) (Adj. OR 3.492; 95% CI: 1.696, 7.189; p =0.001), tiada sejarah strok yang terdahulu (Adj. OR 3.702; 95% CI: 1.756, 7.803; p =0.001) dan menerima ≥8 lawatan rehabilitasi di rumah (Adj. OR 2.226; 95% CI: 1.113, 4.450; p =0.024).

***Kesimpulan*:** Kajian ini telah mengenal pasti peratusan pesakit strok yang mempunyai peningkatan aktiviti kehidupan seharian serta faktor-faktor demografi dan klinikal yang mempengaruhi pemulihan strok. Pesakit berumur <65 tahun, jenis strok iskemia, strok yang kurang parah (markah mRS 4), tiada sejarah strok terdahulu dan menerima ≥8 lawatan rehabilitasi di rumah adalah merupakan faktor-faktor signifikan yang

mempengaruhi peningkatan aktiviti kehidupan seharian selepas serangan strok. Dengan mengenalpasti faktor-faktor yang mempengaruhi pemulihan strok, ianya dapat membantu untuk menaiktaraf perkhidmatan prawatan domisiliari dan penjagaan pemulihan strok ke tahap yang lebih optimum di negara ini.

KATA KUNCI:

Penjagaan domisiliari, strok, aktiviti kehidupan seharian, Indeks Barthel

ABSTRACT

FACTORS ASSOCIATED WITH IMPROVEMENT IN ACTIVITIES OF DAILY LIVING (ADL) IN STROKE PATIENTS POST DOMICILIARY CARE IN KELANTAN

Background: Rehabilitation is crucial to assist individuals with stroke to improve activities of daily living (ADL). Despite of comprehensive rehabilitation provision, recognition of the associated factors influence stroke recovery are also important. In Malaysia, domiciliary care service is an outreach home-based rehabilitation, provided by a multidisciplinary rehabilitation team for stroke survivors. However, there has been no study conducted to assess factors associated with improvement in ADL among stroke patients after the rehabilitation service.

Objective: To describe the proportion of stroke patients with improved ADL post domiciliary care and to determine the demographic and clinical factors associated with the improvement in ADL among stroke patients post Domiciliary Care in Kelantan.

Methodology: This was a cross sectional study, conducted from February until April 2018 using secondary data obtained from Domiciliary Care Referral Letter, Domiciliary Care Patient's Record (PPD 004 (a)/2014) and Domiciliary Case Assessment Record (PPD 004 (b)/2014) which are used as formal documentations for the domiciliary care in Malaysia. The data from 11 health clinics with comprehensive domiciliary care in Kelantan were collected using a proforma and analysed using IBM SPSS Statistics version 22 software. Descriptive and multiple logistic regression analysis were performed. Improved ADL is defined as at least 30% increment at the end of the service.

Results: Between January 2015 and October 2017, there were 384 stroke patients registered in comprehensive domiciliary care service for the state of Kelantan, in which 234 individuals fulfilled the study criteria and were all included in the study. The proportion of stroke patients with improved in ADL was found to be 72.2%, which comprised of 96 (41.0%) of the male population and 138 (59.0%) of females. The mean (SD) age for stroke patients were 68.21 (11.99) years old. One hundred and fifty seven (67.1%) of stroke patients were aged 65 years and above and two third were married (65.8%). Majority of patients had ischemic stroke. Significant association was found between age group (Adj. OR 2.241; 95% CI 1.019, 4.927; p =0.045), ischemic stroke type (Adj. OR 4.842; 95% CI: 2.180, 10.758; p <0.001), less severe stroke (mRS score 4) (Adj. OR 3.492; 95% CI: 1.696, 7.189; p =0.001), no history of previous stroke (Adj. OR 3.702; 95% CI: 1.756, 7.803; p =0.001) and those received ≥8 rehabilitation visits (Adj. OR 2.226; 95% CI: 1.113, 4.450; p =0.024).

Conclusion: The young age <65 years old, ischemic type of stroke, less severe stroke (mRS 4), no history of previous stroke and ≥8 rehabilitation visits were found to be significant factors associated with the improvement in ADL post stroke event. Recognition of these factors of stroke recovery is beneficial to intensify an optimal stroke care and rehabilitation services in the country.

KEYWORDS:

Domiciliary care, stroke, activities of daily living, Barthel index.

CHAPTER 1

INTRODUCTION

1.1 Introduction

1.1.1 Overview of stroke

Stroke is a life-threatening disease but is preventable. It occurs when blood supply to the brain is abruptly interrupted, which results in damage to brain cells. The outcome of a stroke is related to different part of the brain tissue involved and the magnitude of the damage. There are two commonest types of stroke; ischemic stroke occurs due to blockage of blood supply and haemorrhagic stroke occurs as a result of bleeding in the brain parenchyma.

Stroke is a global public health burden as it causes significant mortality and morbidity worldwide. Stroke contributes 4.5% of DALYs from all cause and it was the second primary cause of mortality (Feigin *et al.*, 2017). Regions of Eastern Europe, central Africa, north Asia and south Pacific hold the highest rate of disease burden and mortality, substantially more than any other regions (Johnston *et al.*, 2009). The study also reported significant association of national per capita income with the stroke burden and mortality, in which countries with low-income were most affected compared to high income countries. Developed countries have demonstrated 20.1% reduction in the mortality rate among young stroke survivors as compared to a higher rate of deaths, at 36.7% in developing countries (Feigin *et al.*, 2017).

In developing countries, the incidence of stroke is higher mainly because of greater prevalence of morbidities such as hypertension, obesity and other lifestyle diseases (Lloyd-Sherlock, 2010). In low and middle income countries, the estimated incidence of ischemic and haemorrhagic stroke is 63.0% and 80.0% respectively. The fatality rate is twice higher in haemorrhagic stroke compared to ischemic stroke cases over the past two decades (1990–2010) (Hankey, 2013).

Stroke incidence varies in Asia. Malaysia represented the lowest incidence of stroke while Japan and Taiwan were the top countries with higher stroke incidences. However, the data was not comparable because the difference in the study time point and various methods applied in different studies. Stroke mortality is related to the stroke severity and the accessibility to healthcare and rehabilitation. For example, Japan and Singapore accounted for the least death from stroke meanwhile the highest mortality rate was observed in countries like Mongolia and Indonesia (Venketasubramanian *et al.*, 2017). These may be related to a better quality of care and structured rehabilitation in Japan and Singapore which contribute to low mortality rates and enhanced quality of life.

In Malaysia, a multi-ethnic study by Aziz *et al.* (2015) demonstrated the incidence and prevalence of stroke between 2010 and 2014 was increasing in trend. The annual incidence of haemorrhagic and ischemic stroke risen by 18.7% and 29.5%, respectively. The high prevalence of modifiable lifestyle risk factors such as smoking, high blood pressure and blood sugar and hypercholesterolemia have significantly contributed to the higher incidence of stroke in Malaysia (Ali *et al.*, 2013).

Stroke has been the second leading cause of death in Malaysia since year 2000. This was 12.1% of 93,056 total deaths from vital registration in the country, comprising higher mortality rate in males compared to females (Hoy *et al.*, 2013). Approximately 60.0% of stroke survivors are alive at four years and about 40.0% of them lives with some degree of disability (Gadidi *et al.*, 2011). However, 67.0% attain improvement in activities of daily living (ADL) and higher rates of functional recovery five years after the stroke if rehabilitation was provided (Thorsén *et al.*, 2005). Therefore, it is substantial to have a better understanding of stroke care and targeted rehabilitation interventions in order to enhance stroke recovery.

1.1.2 Stroke Rehabilitation

Lindsay *et al.* (2008) defined stroke rehabilitation as "a progressive, dynamic, goal orientated process aimed at enabling a person with impairment to reach their optimal physical, cognitive, emotional, communicative, and/or social functional level."

Rehabilitation interventions are provided either in an acute or post-acute care settings with the purpose of providing a comprehensive stroke care to assist recovery. Most of the interventions provided within the first six months from the onset of stroke, depending on the various types of the service available and the needs for recovery. However, many patients require further rehabilitation, which is more than six months duration, to achieve greater improvement in the functional and cognitive level post stroke event (Lindsay *et al.*, 2008).

There are three types of rehabilitation care available in order to help stroke survivors achieve the optimum quality of life. These are divided into inpatient care, outpatient care and home-based care. Among these, home-based care rehabilitation has been found to be the most effective intervention in lowering mortality rate and enhancing ADL improvement (Wang *et al.*, 2017).

Rehabilitation as a whole, requires a goal oriented motivation. The principle is to achieve improvement or recovery within a specific time with availability of correct methods and management. This involves a multidisciplinary team including medical and allied health team members, sharing their experts, knowledge and experience to provide an effective rehabilitation care. The process starts from the initial assessment, providing care intervention, re-assessment post rehabilitation and the evaluation of the practice and service provided (Langhorne *et al.*, 2011)

Rehabilitation intervention plays an important role to reduce the burden after the stroke. Some patients might not need rehabilitation because they obtain recovery during the acute phase. Currently, Malaysia has been focusing on the importance of rehabilitation to assist stroke patients improving their functional recovery and to enhance the quality of life. Other than usual inpatient and outpatient care at the hospital or outpatient clinics, the demand for home rehabilitation has increased.

In home based rehabilitation, patients receive stroke care at their own residences. The service is delivered by a multidisciplinary rehabilitation team. This team has to pay visits and carry out specified tasks to ensure patients had a proper rehabilitation course (Reunanen *et al.*, 2016). Home-based rehabilitation is flexible for certain patients who are severely disabled and total bedbound, and convenient for the family members that have problem with transportation.

In Malaysia, stroke patients are discharged soon after completions of inpatient management and they are given an appointment for outpatient follow up. Due to high travelling cost and difficulty in accessing medical centre or health clinics, many patients do not attend the follow-up treatment. Consequently, this problem may result in poor prognosis of the disease with complications, thus contribute to significant burden to the family members.

The potential benefit of home-based rehabilitation is the shorter length of stay in the hospital as patients are allowed to continue stroke care as soon as they return home. Family members are involved in taking care the patients and good rehabilitation result is always related to strong motivation and commitment from the family members (Langhorne *et al.*, 2011). Home based rehabilitation provides a conducive environment suitable for stroke recovery and able to further facilitate patients to regain function and experience learning process at one's own residence.

Domiciliary Care Service is a home-based outreach program introduced by the Ministry of Health Malaysia in June 2014. It involves treatment, rehabilitation and palliative care services. The goal is to ensure continuity of care at home by training the caretaker to look after the stroke patient, to reduce hospital readmission and to improve patient's quality of life. The service is delivered by an integrated primary health care team involving medical and rehabilitation team. The medical team members comprises of medical officer, assistant medical officer, nurses, nutritionist and pharmacist while the rehabilitation team involves occupational therapist and physiotherapist (Kassim and Tin, 2014). Stroke patients discharged from the hospital are referred to this service if criteria of registration is fulfilled such as severe and disabled stroke, living in the operational area and having an appointed caretaker. The

patients are provided with home-based rehabilitation for a three months period and the progress is evaluated. Further continuation of stroke care is recommended if there was not much improvement seen after the period.

1.1.3 Activities of Daily Living Among Stroke Patients

Activities of daily living (ADL), involves physical mobility and basic personal care, and is the proxy of functional recovery in stroke patients (Mlinac and Feng, 2016). Impaired ADL is usually affected by many reasons such as medical illness, neurological disease, motor vehicle accident and so on. The most widely recognised cause of ADL impairment is stroke, where the patient had various degree of disability which lead to restriction of function and movement. Therefore, rehabilitation is crucial in order to help stroke patients regain and re-learn the fundamental skills to achieve the highest level of ADL independence.

ADL is measured by the Modified Barthel Index (MBI) which includes score range from 0 to100 with a full score of 100 indicates fully independence. The domains of ADL assessed by using MBI are personal hygiene (grooming), bathing, toilet transfer, stair climbing, feeding, dressing, bowel and bladder control, chair or bed transfers and ambulating with assistance or using a wheelchair (Quinn *et al.*, 2011). MBI is the simplest, easy to be used, well-constructed and is a reliable test which has been acknowledged by many stroke studies worldwide.

1.2 Rationale of Study

The incidence of stroke is increasing in trend. The proportional contribution of stroke-related Disability Adjusted Life Years (DALYs) is on the rise worldwide. It has become a public health focus to provide a comprehensive rehabilitation to enhance stroke recovery as well as to improve quality of life after stroke occurrence. In Malaysia, the Ministry of Health had introduced domiciliary care service as a form of home-based rehabilitation program to assist stroke survivors improving their activities of daily living. It was an initiative to provide a comprehensive stroke care by doing home visits. However, no studies has been done to investigate the service outcome in terms of improvement in the ADL. It is also important to investigate factors which are associated with improvement in the ADL among these who has used the service. This will allow better targeted care as well as to improve domiciliary care service for stroke survivors in Kelantan.

1.3 Research Questions

1. What is the proportion of stroke patients with improved activities of daily living post Domiciliary Care in Kelantan?
2. What are the factors associated with improvement in activities of daily living in stroke patients post Domiciliary Care in Kelantan?

1.4 Objectives

1.4.1 General Objective

To determine the proportion and factors associated with improvement in activities of daily living among stroke patients post domiciliary care in Kelantan.

1.4.2 Specific Objectives

1. To describe the proportion of stroke patients with improved activities of daily living post domiciliary care in Kelantan.
2. To determine the demographic and clinical factors associated with improvement in activities of daily living among stroke patients post domiciliary care in Kelantan.

1.5 Research Hypotheses

Ho: There is no significant demographic and clinical factors associated with improvement in activities of daily living among stroke patients post domiciliary care in Kelantan.

CHAPTER 2

LITERATURE REVIEW

2.1 Home-based Rehabilitation in Stroke

Stroke rehabilitation has been proven to reduce long term disability in stroke patients. Many developed countries established stroke centres to provide a comprehensive stroke care in order to fasten stroke recovery and to improve quality of life after the stroke events (Langhorne *et al.*, 2011). A challenge for stroke care in Malaysia is the continuation of the care after patients were discharged from the hospital or inpatient rehabilitation unit. Many patients and family members face challenges and obstacles in accessing outpatient rehabilitation services especially due to issues of affordability, lack of information and transportation problem. Thus, in the way of the difficulties, patients default the follow-up and appointment.

Home-based rehabilitation is an individualised rehabilitation program for clients. In this case, are the stroke patients are provided with continuation of stroke care at the setting of their own home which can help them to return to a normal quality of life (Chaiyawat and Kulkantrakorn, 2012). The rehabilitation usually is a short-term, goal directed service and the average duration of the service provided is between three to 12 months period. It was reported that home rehabilitation is at the best to reduce poor prognosis of the disease and improve the ADL independency (Andersen *et al.*, 2003).

In Malaysia, home-based rehabilitation was introduced as domiciliary care service provided by the primary health care team involves medical and allied health team. The main objective of the service is to give an ease of health care accessibility for the

continuity of stroke care, collaboratively with the family members or caretaker. Besides, home-based rehabilitation entails the concept of holistic approach. The program requires integrated approach of clinical, rehabilitation and social well-being. The program acknowledges strong connection between healthcare provider and the family members. The healthcare provider is able to visualise the whole portrait of patient's living condition in which can assist them to deliver better targeted care. This also allows occupational therapist and physiotherapist to accommodate appropriate rehabilitation exercise according to environment (World Health Organization, 2004).

2.2 Demographic Factors Associated With Improvement In ADL Among Stroke Patients

2.2.1 Age

There are various studies globally have looked into significant of demographic and clinical factors in association with improvement in ADL among stroke patients (Veerbeek *et al.*, 2011). The pathophysiology effect of age on stroke recovery has long been established. A study done in Taipei, Taiwan reported younger stroke patients aged less than 65 years old had more improvement in ADL as compared to the older group (Chen *et al.*, 2013). A study on Austrian Stroke Unit Registry described almost 10.0% per 10-year increase in age were related to the likelihood of poor functional outcome after the onset of stroke (Knoflach *et al.*, 2012). Nevertheless, a study based on Hessian Stroke Data Bank in Germany revealed that older stroke survivors were likely to have ADL improvement as equal as those in the younger group but they found positive relation between increase age and inpatient mortality by 6.2% (Kugler *et al.*, 2003). Similar to a study done among stroke patients from Tung Wah Hospital, Hong

Kong, reported ageing process was not associated with poor functional outcome because those from the older group basically have an equal chance to be ADL independence just like the younger stroke patients (Luk *et al.*, 2006). Even though most of the stroke incidence occurred among elderly group but then an outstanding functional recovery can be anticipated with an adequate and efficient rehabilitation provision (Bentsen *et al.*, 2014).

2.2.2 Gender

The influence of gender is still being discussed as one of the factors affecting improvement in ADL among stroke patients. However, the predisposition differs according to age (Yu *et al.*, 2015). Women have a relatively long life expectancy thus bigger proportion of stroke at older age. They could have been exposed to various comorbidities or chronic illnesses in which negatively affect the progress of ADL improvement post stroke event. A review article review by Appelros *et al.* (2010) revealed five of 10 studies reported women were less likely to be ADL independent after three months from the stroke onset. Findings by Gargano *et al.* (2007), showed male have higher odds of having improved ADL (Adj. OR 0.37, 95% CI: 0.19, 0.87) among stroke patients registered in Michigan Acute Stroke Care, Outcomes and Treatment Surveillance System (MASCOTS) of United States. A population-based stroke surveillance study in Michigan among 644 ischemic strokes patients, found gender plays a substantial role in the progress of stroke recovery as female had substantial poorer ADL independence than male (Lisabeth *et al.*, 2015). Conversely, a prospective cohort study in the First Affiliated Hospital of Liaoning Medical University, China among 386 acute stroke patients revealed females have 0.37 odds

(95% CI: 0.19, 0.87) in achieving improvement in ADL after adjustment of the other variables (Wu *et al.*, 2014).

2.2.3 Marital Status

For stroke recovery, discussion on the influence of marital status on the improvement in ADL have been reported in various studies. The prospective Copenhagen Stroke Study among 84 severe stroke patients stated those who were married showed better stroke recovery (Adj. OR 3.1, 95% CI: 1.1, 8.8) compared to patients with no spouse. By living at home with a spouse have higher chance of recovery because of better social and family support (Jørgensen *et al.*, 1999). However, the result was different in a study carried out in Switzerland, reported that patients who were living alone have 1.61 odds of getting functional recovery (95% CI: 1.31, 1.98) (Seematter-Bagnoud *et al.*, 2013). This probably due to the fact they are more self-determined to take care own self. Another study in Michigan among 644 ischemic strokes patients, discovered female stroke patients were more likely to be widowed in old age and was significantly contributed to worse functional recovery due to isolation and poor social support (Lisabeth *et al.*, 2015).

2.2.4 Socioeconomic Status

Socioeconomic status is a proxy of individual financial status. Stroke care may require out of pocket resources and this can trigger financial hardship especially for those who are in poor socioeconomic status. As a result, the issue of affordability arise and this become a factor for lack of resources and inaccessible to healthcare provider. Therefore, stroke patients with poor financial status commonly associated with poor ADL improvement (Pei *et al.*, 2016). Another study by Bhalla *et al.* (2013) reported

stroke patients who lived in poorer socioeconomic status were related to worse functional recovery at one year post stroke.

2.3 Clinical Factors Associated With Improvement In ADL Among Stroke Patients

2.3.1 Type of Stroke

It has been long established that type of stroke is an independent clinical factor associated with improvement in ADL (Veerbeek *et al.*, 2011). Studies conducted in Amsterdam and China reported ischemic stroke type was associated with better improvement in ADL and showed greater stroke recovery (Pei *et al.*, 2016; Schepers *et al.*, 2008). A study on the population-based South London Stroke Register have found those patients with haemorrhagic stroke had lesser progress in recovery, but during the first three months from the stroke onset, it was shown that the functional outcome was better than ischemic stroke (Bhalla *et al.*, 2013). It was explained by the reduction of hematoma in the early phase after haemorrhagic stroke. As a result, patients will achieve rapid functional improvement sooner compared to the ischemic stroke patient.

2.3.2 Severity of Stroke

The association of severity of stroke with improvement in ADL have been explained as the degree of severity will further determine the process of recovery which directly affects the prognosis of the disease. There are few ways to measure the severity of stroke and one of them is through the classification of Modified Rankin Scale (mRS). It assesses the degree of immediate post stroke disability with score 0 indicates no

disability and score 5 indicates severe disability (Banks and Marotta, 2007). In a prospective cohort study conducted among stroke patients discharged from Sheba Medical Center in Israel, of the patients who survived, 42.3% showed limitation in activity, with Barthel Index of ≥95 four years post stroke. Those were patients from younger group with less severity of stroke and the study revealed they have 61.0% chance of having improved functional recovery compared to the persons with severe disability proximately after the onset of stroke (Gadidi *et al.*, 2011). Study of stroke patients from Hospital San Pedro de Alcantara, Cáceres, Spain reported initial stroke severity was an indicator of functional recovery after six months post stroke, in which the Barthel Index score post rehabilitation was negatively linked to immediate stroke disability (Lopez-Espuela *et al.*, 2016).

2.3.3 History of Previous Stroke

The relations between history of previous stroke and improvement in ADL have been discussed in many studies. A cross sectional study among disabled elders post-stroke in Tianjin City, China described the recurrent episodes of stroke was one of the clinical factors influencing ADL independency. Patients with first-ever stroke were more likely to be ADL independent compared to the elders with recurrent stroke (Pei *et al.*, 2016). In Bergen, Norway, a study conducted by Hofstad *et al.* (2017) in Haukeland University Hospital among 229 stroke patients showed history of previous stroke was associated with poorer improvement in stroke recovery. A prospective study performed in Perth, Western Australia showed patients who possessed recurrent stroke had 9.4 odds of becoming disabled or even died at 5 years post stroke (95% CI: 3.0, 30.0) (Hankey *et al.*, 2002).

2.3.4 Diabetes and Hypertension

The diagnosis of diabetes and hypertension have been studied to perceive the influence on the improvement in ADL among stroke patients. A study in European countries found 21.0% of the stroke patients were diagnosed with diabetes and at three months after the stroke, they were likely to have lower score in Barthel Index as compared to non-diabetic stroke patients (OR 1.39, 95% CI: 1.05, 1.83) (Megherbi *et al.*, 2003). In contrast to a study by Nannetti *et al.* (2009) in Florence, Italy, reported diagnosis of diabetes had no effect on ADL independency among stroke patients neither in acute or post-acute phase of stroke. However, there were also studies that looked into the association of initial glucose level on the stroke outcomes. Non-diabetic patients were less likely to regain functional recovery at three months post stroke, if there was presence of initial hyperglycaemia (Hu *et al.*, 2012). A systematic review of 32 studies identified admission hyperglycaemia, > 6.7 to 8 mmol/L (121 to 144 mg/dL) in non-diabetic stroke patients would influence poorer functional outcome (relative risk=1.41, 95% CI: 1.16 to 1.73) (Capes *et al.*, 2001).

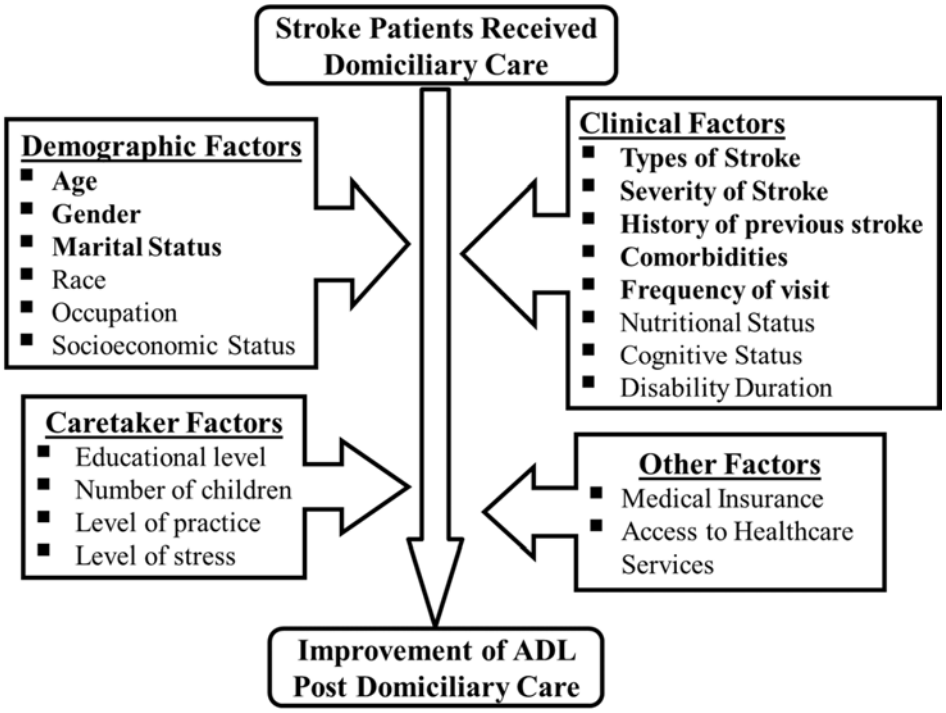
A study in south western Nigeria described diagnosis of hypertension and diabetes in stroke patients did not show any influence on functional outcome post stroke (Ojagbemi and Owolabi, 2013). Similar to a study on the population-based South London Stroke Register, they have found comorbidity diagnosis of hypertension did not showed any association with poor progress of Barthel Index score three months after stroke (Bhalla *et al.*, 2013).

2.3.5 Frequency of Rehabilitation Visits

There are studies globally have explored significant effect of frequency of rehabilitation visits on the improvement in ADL among stroke patients. A study in Chiayi, Taiwan reported positive effect of quantity of physiotherapy and occupational therapy units on improvement of functional outcome at three and six month after stroke (Huang *et al.*, 2009). Nevertheless, there was a study explained that frequency of rehabilitation visit was not the main concern after patients were discharged home. The environment at own house itself was stimulated and pleasant, reducing the anxiousness of the feeling and it was not a matter of quantity of home visits anymore but how frequent the patients performed own exercises at home between the rehabilitation visits (Koch *et al.*, 2000).

2.4 Conceptual Framework

This conceptual framework shows the factors associated with improvement in activities of daily living in stroke patients post domiciliary care. The factors contribute to the improvement in ADL can be divided into demographic, clinical, caretaker and other factors such as access to healthcare provision or medical insurance coverage. Since the study based on secondary data, therefore only eight risk factors will be analysed which are the age, gender, marital status, types of stroke, severity of stroke, history of previous stroke, diagnosis of diabetes and hypertension and frequency of rehabilitation visits. Figure 2.1 illustrates further the conceptual framework of the study.



Notes: **Bold** variables used in this study

Figure 2.1: Conceptual framework of the study

CHAPTER 3

METHODOLOGY

3.1. Study Design

This was a cross sectional study based on retrospective record review.

3.2 Study Duration

This study was conducted between December 2017 and April 2018.

3.3 Study Location

Kelantan is a state situated at the north-east of Peninsular Malaysia, divided into a total of 10 organizational districts namely Kota Bharu, Tumpat, Pasir Mas, Pasir Puteh, Machang, Kuala Krai, Gua Musang, Bachok, Tanah Merah and Jeli. The capital is Kota Bharu. There are many health facilities provided by the government for the people in this state including 10 hospitals (four hospitals with specialist and six hospitals without specialist) and 42 health clinics. Domiciliary care service was introduced in June 2014 by the Ministry of Health Malaysia. Although there are 41 clinics, this study was conducted in only 11 health clinics which provide comprehensive domiciliary care in Kelantan. A comprehensive domiciliary care is where the service is delivered by an integrated primary health care team involving medical and rehabilitation team. The medical team members comprises of medical officer, assistant medical officer, nurses, nutritionist and pharmacist while the

rehabilitation team involves occupational therapist and physiotherapist. Table 3.1 summarises the health clinics with comprehensive domiciliary care in seven districts in Kelantan.

Table 3.1: Distribution of health clinics with comprehensive domiciliary care service in Kelantan.

Districts	Health Clinics
Kota Bharu	Klinik Kesihatan Bandar Kota Bharu
	Klinik Kesihatan Ketereh
	Klinik Kesihatan Pengkalan Chepa
Tumpat	Klinik Kesihatan Bandar Tumpat
	Klinik Kesihatan Wakaf Bharu
Pasir Mas	Klinik Kesihatan Bandar Pasir Mas
	Klinik Kesihatan Meranti
Pasir Puteh	Klinik Kesihatan Selising
Jeli	Klinik Kesihatan Jeli
Kuala Krai	Klinik Kesihatan Bandar Kuala Krai
Bachok	Klinik Kesihatan Bachok

3.4 Reference Population

The reference population were the stroke patients of domiciliary care service in Kelantan.

3.5 Source Population

The source population were the stroke patients of domiciliary care service in Kota Bharu, Tumpat, Pasir Mas, Pasir Puteh, Jeli, Kuala Krai, and Bachok districts.

3.6 Sampling Frame

The sampling frame was the stroke patients post domiciliary care from 11 health clinics which offers comprehensive domiciliary care in Kota Bharu, Tumpat, Pasir Mas, Pasir Puteh, Jeli, Kuala Krai, and Bachok between January 2015 and October 2017.

3.7 Study Sample

The study sample was the data on stroke patients post domiciliary care from 11 health clinics which offers comprehensive domiciliary care in Kota Bharu, Tumpat, Pasir Mas, Pasir Puteh, Jeli, Kuala Krai, and Bachok between January 2015 and October 2017 which fulfilled the inclusion and exclusion criteria.

3.8 Study Criteria

In this study, the criteria of sample selection can be categorised as follows:

3.8.1 Inclusion criteria: Patients who were diagnosed with stroke, either ischemic or haemorrhagic stroke, received three months service of domiciliary care.

3.8.2 Exclusion criteria: Incomplete data in Domiciliary Care Referral Letter, Domiciliary Care Patient's Record (PPD 004 (a)/2014) and Domiciliary Case Assessment Record (PPD 004 (b)/2014) more than 20.0% which cannot be verified further, missing data or patient who were lost to follow up or died before completing the program.

3.9 Sample Size Determination

The sample size was calculated based on the study objectives as follows:

3.9.1 Objective 1:

To describe the proportion of stroke patients with improved activities of daily living post Domiciliary Care in Kelantan, the single proportion formula for estimation of sample size was used,

$$n = (z/\Delta)^2 \, p \, (1-p)$$

Absolute precision (Δ) = 6% (0.06)

Z value based on 95% CI = 1.96

P = based on proportion of stroke patients with improved ADL post home rehabilitation, 78.0% (Von Koch *et al.*, 2000)

$$n = (1.96/0.06)^2 * (0.78) \, (1-0.78)$$

$$= 183$$

A sample size of 231 was estimated to be sufficient to address specific objective one, including an allowance of an additional 26.0% possibility of missing or incomplete data (Yagi *et al.*, 2017).

3.9.2 Objective 2:

The estimated sample size for objective two was calculated for each variable of demographic and clinical factors associated with improvement in activities of daily living (ADL) among stroke patients post domiciliary care using Power and Sample Size calculation software to compare two independent proportions.

Table 3.2: Summary of sample size calculation for each associated demographic and clinical factors of improvement in ADL among stroke patients post domiciliary care in Kelantan.

Factors/ Variables	**P0***	**P1**	**M**	**n**	**N (nx2) + 26%**	**Literature Review**
Age (≥65 years)	0.46	0.70	1	65	164	Chen *et al.* (2013)
Gender (Male)	0.77	0.50	1	49	124	Wu *et al.* (2014)
Marital status (Single)	0.64	0.40	1	67	169	Seematter-Bagnoud *et al.* (2013)
Types of stroke (Haemorrhagic)	0.71	0.50	1	84	212	Nordin *et al.* (2016)
Severity of stroke (mRS 5)	0.37	0.55	1	73	184	Gadidi *et al.* (2011)
History of previous stroke	0.53	0.30	1	71	179	Nordin *et al.* (2016)
Diabetes	0.46	0.70	1	65	164	Salvà *et al.* (2015)
Hypertension	0.38	0.60	1	80	202	Ojagbemi and Owolabi (2013)

The sample size was calculated for each variables including an allowance of an additional 26.0% possibility of missing data.

P0 = Proportion of control/non-exposed factors associated with improved ADL from literature review

P_1 = Estimated proportion exposed factors associated with improved ADL

α = Value of the standard normal distribution cutting off probability α (1.96 for α = 0.05 (two-tailed))

β = Value of the standard normal distribution cutting off probability β (0.8 for 80.0% power)

m = Ratio of stroke patients with improved ADL : declined ADL = 1:1 (Eventhough the estimated ratio between this two groups is 1:3, but taking ratio 1:1 is adequate to achieve enough power to answer the hypothesis)

In conclusion, based on the above calculations, the largest sample size which was used in this study was from objective 1 (n=231)

3.10 Sampling Method

The study used secondary data from Domiciliary Care Referral Letter, Domiciliary Care Patient's Record (PPD 004 (a)/2014) and Domiciliary Case Assessment Record (PPD 004 (b)/2014) at the selected 11 health clinics with comprehensive domiciliary care, which consists of 234 data on stroke patients who completed three months service.