

Artikel Ulasan/Review Articles

Neuropsychology of Epilepsy in Malaysia: A Narrative Review (Neuropsikologi Penyakit Epilepsi di Malaysia: Satu Ulasan Naratif)

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ABSTRACT

The aim of this study is to describe the development of neuropsychological research among epilepsy patients in Malaysia so far, the current trend and the focus of future research endeavour. The research in epilepsy grows concurrently with the interest in the field of neuropsychology in Malaysia. Beginning with the presurgical evaluation of epilepsy patients as part of the epilepsy protocols, research areas expanded further into neuropsychological profiling. The current trend in Malaysia is determining the factors influencing neuropsychological outcomes as well as the risk factors associated with low quality of life among epilepsy patients. The future neuropsychological research should emphasize on the effectiveness of neurorehabilitation of epilepsy patients as well as psychosocial and cultural issues particularly on social stigma and employability in line with the research priorities set by the Research Task Force of the ILAE Commission on Asian and Oceanian Affairs for people with epilepsy in Asia-Oceanic region.

Keywords: Epilepsy; neuropsychology; profiling; quality of life; psychosocial outcomes; Malaysia

ABSTRAK

Tujuan kajian ini adalah untuk memperihalkan perkembangan penyelidikan neuropsikologi dalam kalangan pesakit epilepsi di Malaysia setakat ini, trend terkini dan fokus usaha penyelidikan di masa hadapan. Penyelidikan epilepsi berkembang seiring dengan minat dalam bidang neuropsikologi di Malaysia. Bermula dengan penilaian prapembedahan pesakit epilepsi sebagai sebahagian daripada protokol epilepsi, bidang penyelidikan berkembang seterusnya kepada profil neuropsikologi. Trend terkini di Malaysia adalah menentukan faktor yang mempengaruhi kesan neuropsikologi dan juga faktor risiko berhubung kualiti hidup yang rendah dalam kalangan pesakit epilepsi. Penyelidikan masa hadapan neuropsikologi seharusnya menekankan ke atas keberkesanan neurorehabilitasi untuk pesakit epilepsi dan juga isu psikososial dan budaya terutamanya mengenai stigma sosial dan peluang pekerjaan selari dengan keutamaan penyelidikan yang telah ditetapkan oleh Research Task Force of the ILAE Commission on Asian and Oceanian Affairs untuk pengidap epilepsy di kawasan Asia-Oceania.

Kata kunci: Epilepsi; neuropsikologi; memprofilkan; kualiti hidup; kesan psikososial; Malaysia

INTRODUCTION

Neuropsychology field in Malaysia has started since early 1990s in conjunction with the establishment of the Master in Clinical Psychology programme at the Universiti Kebangsaan Malaysia (Din 2011). Neuropsychology subject was taught to the master trainees in Clinical Psychology Programme, Master of Psychiatry Programme, undergraduate students in the Audiology and Speech Programme and Occupational Therapy Programme of the Universiti Kebangsaan Malaysia (UKM). Neuropsychological services were offered in both, the Department of Psychiatry, Faculty of Medicine, UKM and Health Psychology Programme of the Faculty of Health Sciences, UKM. The clinical services provided at the Health Psychology Programme include neuropsychological evaluation, diagnosis, and neurorehabilitation for all age groups. Referrals for neuropsychological assessment

were received from all the states in Malaysia. The interest to conduct neuropsychological research has grown in Malaysia involving patients with neurological disorders such as stroke, epilepsy, degenerative disorders, and learning disorders. Many studies were conducted to determine the factors associated with mild cognitive impairment in UKM (Lau et al. 2017).

The aim of this narrative review is to describe the development of neuropsychological research among epilepsy patients in Malaysia so far, the current trend and the focus of future research endeavour.

SEARCH STRATEGY AND SELECTION CRITERIA

Neuropsychology research covers cognitive as well as psychosocial issues. References for this review were identified by conducting electronic searches of the

following databases: Pubmed Central, Google Scholars and other resources available online such thesis and proceeding of conferences. This search unearthed a large volume of diverse material but little were available from Malaysia focusing on neuropsychology of epilepsy. Subjects search terms and combination included: epilepsy, seizure, quality of life, neuropsychology, cognitive or cognition, psychosocial, and Malaysia. The inclusion criteria are epilepsy research conducted in Malaysia or Asian region involving Malaysia, articles in English, and all age groups. Exclusion criteria are similar studies in other countries, epilepsy studies in Malaysia but not relevant to the topic, animal studies, articles in other languages, review articles, and unavailable abstract or full text. The data available were expanded through scrutiny of the reference lists of the retrieved articles and inclusion of gray literature. There was no time limit for the search and a total of 65 articles were included for this review (Figure 1). The selection process was conducted by the author aiming at a narrative review, not a systematic literature review.

NEUROPSYCHOLOGICAL EVALUATION FOR PRE AND POST EPILEPSY SURGERY

Neuropsychological research among epilepsy patients in Malaysia started when there was a need to conduct neuropsychological evaluation for epilepsy patients as part of the presurgical evaluation in 1999 at the Hospital Universiti Kebangsaan Malaysia (HUKM). Epilepsy surgery services commenced in 1996 at HUKM (Selladurai 2007) and the success of the first cohort of epilepsy surgery at HUKM was reported in a presentation at the Malaysian Neuroscience Society 2012 Conference (Din et al. 2012a). Twelve patients who were eligible for epilepsy surgery showed significant improvement on their Performance IQ, Vocabulary and Picture Arrangement subtests of the Wechsler Adult Intelligence Scale (WAIS). They also showed better score on psychomotor speed, verbal fluency, verbal learning, and intelligence after surgery. Sayuthi et al. (2009) reported on the neuropsychological profiles of seven epilepsy patients who undergo epilepsy surgery at the Hospital Universiti Sains Malaysia (HUSM) at baseline and one year postsurgery. The findings showed a decline in general IQ, verbal IQ, verbal and non-verbal memory.

NEUROPSYCHOLOGICAL PROFILES OF EPILEPSY PATIENTS IN MALAYSIA

Several studies have been conducted on the neuropsychological or cognitive profiles of epilepsy patients in Malaysia. Awang et al. (2011; 2012; 2013; 2015; 2016) presented on intellectual profiles of epilepsy patients for job placement purposes in Malaysia using a newly developed Ability Test in Epilepsy (ATIE) based on Gardner's eight intelligences. The study subjects were classified into eight

types of intelligence based on ATIE scores which include Musical, Verbal, Naturalistic, Spatial, Kinesthetics, Agility (musical personal), Logical Thought (math/logic-personal-spatial) and Foundation Skills (combination of six skills). The focal group had better scores on Musical, Verbal and Naturalistic compared to the generalised group. Based on ATIE, Alimin (2014) showed that the intelligence profiles that are mostly possessed by people with epilepsy (PWE) are mediocre level of musical intelligence (40.5%), high level of kinesthetic intelligence (40.5%), high level of math/logic intelligence (38.6%), high level of spatial intelligence (41.4%), mediocre level of linguistic intelligence (38.1%), high interpersonal intelligence (57.2%), high level of intrapersonal intelligence (58.6%) and mediocre level of naturalistic intelligence (41.4%). Similar studies were conducted by Rezaie et al. (2013; 2014; 2015) using an integrated Analytic Hierarchy Process and Data Envelopment Analysis (AHP-DEA) method for ranking the intelligence parameters.

Neuropsychological profiles of 32 epilepsy patients referred for presurgical evaluation at the HUKM revealed that male epilepsy patients have similar neuropsychological profiles with female patients and those with left-sided lesion did not differ significantly with right-sided lesion on their neuropsychological profiles. All of them had unilateral lesion and a Full Scale IQ above 70 (Din et al. 2008).

Comparison of neuropsychological profiles among 30 epilepsy patients with 30 healthy adults was conducted by Din et al. (2012e) using the Wechsler Adult Intelligence Scale (WAIS) for intellectual level; Rey Auditory Verbal Learning Test (RAVLT) for verbal memory; Benton Visual Retention Test (BVRT) for visual memory and Trail Making Test (TMT) for executive function. Both groups were matched for age range and levels of education. Epilepsy patients had significantly lower scores on all neuropsychological tests compared to healthy adults. Both male and female epilepsy patients had similar neuropsychological scores. There were also no significant differences on neuropsychological tests performance between different types of epilepsy.

Din et al. (2012b) determined the neuropsychological profiles of 124 epilepsy patients who attended the Neurology Clinic of UKM Medical Centre (UKMMC) based on their demographic factors. It was found that female subjects had significantly higher scores on the Similarities subtest of the WAIS and RAVLT compared to male subjects. Malay subjects had better Verbal IQ compared to the Chinese and Indian subjects while the Chinese had significantly better scores on Performance IQ. Those with tertiary education and above had significantly better scores on all neuropsychological tests; and students showed significantly better performance on all neuropsychological tests compared to those with paid job or unemployed.

Din et al. (2010) examined verbal and nonverbal memory problems among 35 epilepsy patients referred to the Neurology Clinic of the UKMMC based on the RAVLT and BVRT. The results showed that there was no difference

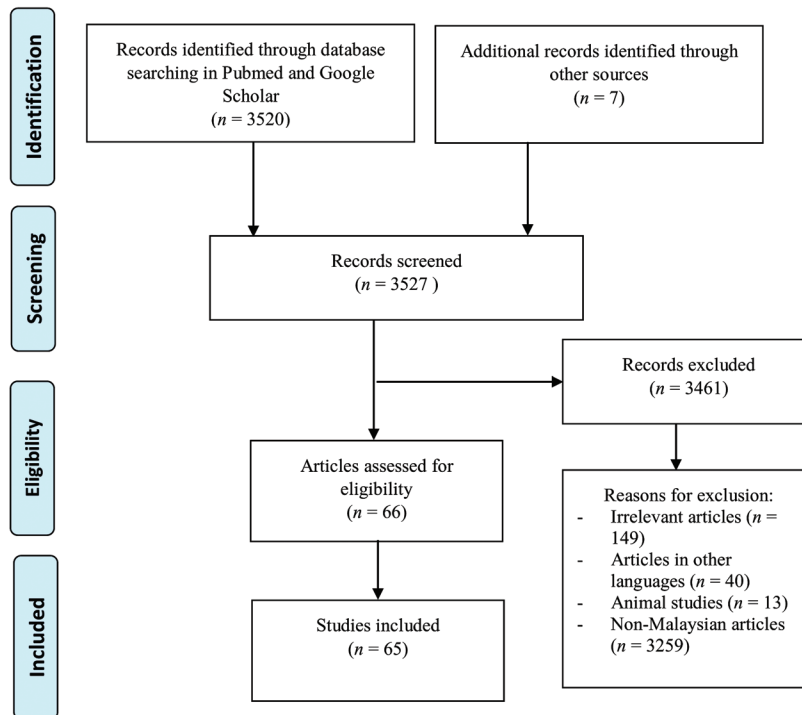


FIGURE 1. Flow chart of literature review

on memory between gender, handedness, those who had loss of consciousness and without loss of consciousness, age less than 40 and above 40 years old, age of seizure onset, and frequency of attacks per month. Verbal memory of epilepsy patients in the study differed according to the duration of sleep whereby those who sleep less than 5 hours showed better verbal memory score than those who sleep more than 5 hours. Visual memory differs according to the duration of loss of consciousness. Those who lost their consciousness more than 10 minutes had poor nonverbal memory. Those with higher education level had better verbal and nonverbal memory.

In conclusion, neuropsychological profiles of epilepsy patients were similar between genders, handedness, right or left side of lesion, or the duration of loss of consciousness. However, differences were shown between age and ethnic groups; levels of education; sleep duration and duration of loss of consciousness. Overall, PWE had lower level of IQ compared to healthy individuals.

FACTORS INFLUENCING NEUROPSYCHOLOGICAL OUTCOME AMONG EPILEPSY PATIENTS

There are numerous factors associated with neuropsychological impairment among PWE that can be grouped into demographic, clinical, psychological, and treatment factors. However, limited studies have been explored in this area in Malaysia. Din et al. (2010) examined the effects of demographic, seizure-related

and psychological factors on verbal memory of 98 adult epilepsy patients who seek treatment at the UKMMC. The demographic factors contributed 24.6% toward the verbal memory variance, while seizure-related factors explained 21.4% of the variance in verbal memory and mood predicted 5.8% of verbal memory. Significant predictors of verbal memory among epilepsy patients referred to UKMMC were level of education, age on onset, illness duration and duration of sleep.

Din et al. (2012c) conducted a study to determine factors influencing neuropsychological performance of adults PWE. Using the Full Scale IQ (FSIQ) as the measure of neuropsychological outcome, the predictors were demographic factors (age, gender, ethnic groups, marital status, levels of education, types of occupation); clinical factors (age of seizure onset, illness duration, frequency of epileptic attacks per month, had loss of consciousness or not, had sleeping problem or not, had family history of epilepsy or not, site/s of lesion, and types of epilepsy); and psychological factors which include depression, anxiety, quality of life and coping skills. Demographic factors accounted for 30.2% of the variance that predict neuropsychological performance. Among the demographic factors, it was found that levels of education and being a student as significant predictors of neuropsychological performance in PWE. Clinical factors accounted for 19.5% of the variance that predict neuropsychological outcomes in PWE. Significant clinical predictors were duration of epileptic attack, left temporal lobe lesion and other lesions. Psychological factors contributed 6.7% to the variance in neuropsychological performance of PWE. It was found that

the patients' cognitive performance was contributed by their positive coping strategies such as sharing and dealing with their problems.

Naïem (2017) conducted a similar study among 135 PWE of Hospital Universiti Sains Malaysia (HUSM) from 2015 to 2016. Patients were administered with a set of neuropsychological assessment which include IQ, verbal memory and language. IQ was assessed using the Wechsler Abbreviated Scale of Intelligence (WASI) while verbal memory was assessed using the Wechsler Memory Scale (WMS) and Verbal Fluency Test was used for language assessment. The mean Full Scale IQ score was low average ($FSIQ = 85.18 \pm 14.27$), total memory of 84.65 ± 12.91 and verbal fluency of 38.43 ± 8.57 . Factors found to have association with impaired cognitive function were patient's age, educational level, smoking status, duration of illness, number of antiepileptic drugs (AED) and history of status epilepticus of more than 30 minutes.

In conclusion, among sociodemographic factors which affect neuropsychological outcome of PWE were age, and education level, while clinical factors which significantly influence cognitive outcome of PWE were age of epilepsy onset, duration of illness, duration of epileptic attack, duration of sleep, duration of loss of consciousness, site of lesion, antiepileptic drugs, and duration of status epilepticus. Among psychosocial factors, only positive coping strategies significantly predict neuropsychological outcome in PWE.

PSYCHOSOCIAL PROFILES OF EPILEPSY PATIENTS IN MALAYSIA

Many psychosocial researches among epilepsy patients in Malaysia focused on the quality of life (QoL) of epilepsy patients (Din, Sanusi & Ahmad 2005; Din, Raymond & Kamarudin 2012d; Fong et al. 2018; Hasanah & Razali 1999; Hashim et al. 2013; Lua et al. 2008; Lua & Neni 2011; Lua, Neni & Nor Samira 2012; Maruzairi et al. 2009; Mohamed, Gill & Tan 2010; 2014; Rani et al. 2014; Viswanathan & Abdul Khalid 2004; Wo 2018). Quality of Life in Epilepsy – 31 (QOLIE-31) was the most common QoL measure utilized in epilepsy research in Malaysia. Other test of QoL includes the World Health Organization Quality of Life (WHOQOL).

A study by Hasanah and Razali (1999) using the WHOQOL-100 among 50 healthy controls and 150 ill subjects who suffered from hypertension, diabetes mellitus, patients who suffered both hypertension and ischaemic heart disease, epilepsy and schizophrenia. Each group with illness was made up of 50 subjects. The control group consisted of subjects who accompanied their relatives to the physicians' clinic. Different types of illness had different features of QoL. Patients with epilepsy reported more pain and discomfort compared to patients with hypertension, diabetic or the schizophrenia.

Among the earliest study on QoL in PWE was conducted by Viswanathan and Abdul Khalid (2004) on socioeconomy and psychosocial impact on QoL of epilepsy patients. The cross-sectional, hospital-based study selected 375 epilepsy patients from 6 centres in Malaysia over a 9 months period. They were patients who attended the outpatient clinics in the Physicians and Neurology Departments of the Hospital Kuala Lumpur. Majority of the patients were female (51%) and Malays (53%) with mean age of 29 years. The mean duration of epilepsy was 13 years. Majority of the patients had more than one seizure attack per months (43%) and 21% were seizure free. Majority had secondary level of education and higher (82%) and employed full time (43%) while 34% were unemployed and 16% were full time students. Majority felt prejudice and discriminated at work (58%) and perceived that epilepsy affect their work performance (52%). They also perceived that epilepsy affected their ability to obtain and keep a job (57%). Majority had fear of being alone (76%), having problem in leading an active social life (62%), felt that epilepsy affected their relationships with close friends (51%), had to conceal the diagnosis from others (46%) and lower their self-esteem (29%). Majority took sodium valproate (42%) and carbamazepine (42%) which induced side effects (67%) and affect their work (85%). Those with frequent seizures were more likely to have no education and unemployed, come from lower income groups, have problems obtaining and keeping a driving license or insurance and lack of active social life.

A cross-sectional study of health-related quality of life (HRQoL) among 108 children with epilepsy in five Paediatric Ward and Paediatric Outpatient Clinic of selected hospitals in Klang Valley and Kuala Lumpur using the Malay version of QOLIE-AD-48 found the overall HRQoL score as moderate (63.03 ± 18.23) (Ahmad Sharoni et al. 2013).

Quality of life was conducted among 60 outpatients with epilepsy in the Neurologic Clinic of the Hospital Sultanah Zahirah, Kuala Terengganu, Malaysia as measured by the Malay QOLIE-31 (MQOLIE-31). All scale scores were transformed linearly into scales of 0 - 100, with higher values indicating higher functioning and well-being. The Total MQOLIE-31 score was moderate (ranged from 12.7 to 89.6 with mean of 52.6 ± 17.5), fair for Cognitive Function domain (scores ranged from 0.0 to 24.3 with mean 13.4 ± 6.0) and moderate score for Emotional Well-being (mean score 60.74 ± 21.54), Social Functioning (mean score 50.40 ± 18.35), Energy/Fatigue (mean score 57.11 ± 20.21), Seizure Worry (mean score 33.20 ± 22.20), Medication Effects (mean score 52.36 ± 26.32), and Overall Quality of Life domains (mean score 60.21 ± 26.96) (Neni & Lua 2011). Similar study among 98 epilepsy patients attending a tertiary care hospital using the World Health Organisation Quality of Life (WHOQOL-BREF) showed a mean total QOL score was 53.9 (15.8) (Anu et al. 2016). Hashim et al. (2013) compared quality of life in epilepsy patients with obstructive sleep apnea (OSA, n

= 20) and those without sleep apnea (Non OSA, n = 160) using Quality of Life in Epilepsy patients (QOLIE-31). The results showed no difference on all QOLIE-31 scales except for Seizure Worry scale which was higher in non OSA epilepsy patients.

Common psychosocial problems among epilepsy patients in Malaysia are anxiety and depression. Prevalence of depression among PWE in the clinic or hospital-based studies ranged from 12% - 36% compared to population-based rates of 12-24% in other parts of the world. Prevalence of depression was 9.2% based on the Hospital Anxiety and Depression Scale score (Mohamed et al. 2010; 2014) among epilepsy patients who attended the Universiti Malaya Medical Centre (UMMC). Prevalence of depressive symptoms among children and adolescents was 32.3% using the Reynolds Adolescent Depression Scale (Din, Sanusi & Ahmad 2005). The mean score for depression among 124 patients with epilepsy at the UKMMC was within normal range based on the Beck Depression Inventory – II (BDI-II) while the anxiety level was higher than normal based on the State Trait Anxiety Inventory score (STAI) (Din et al. 2012d). Screening for psychiatric comorbidity among 92 children with epilepsy using MINI Kid screening and clinical interview based on DSM-IV criteria revealed that 14 (15.2%) have a comorbid psychiatric disorder. The diagnoses were Major depressive disorder (7.1%), Separation anxiety disorder (7.1%), Tic disorder (14.3%), Psychotic disorder (14.3%), Attention deficit hyperactive disorder (ADHD) (57.1%) (Maruzairi et al. 2009). Shah and Othman (2017) compared the psychological problems among three chronic illness in children namely cancer, epilepsy and asthma by administering the Child Behaviour Checklist in 63 parents. The results demonstrated that children suffering from cancer had more internalizing problems as compared to the children suffering from epilepsy and asthma. Epileptic children had more thought, attention and social problems compared to cancer and asthmatic children.

Rani et al. (2014) examined the risk factors of suicidal ideation in epilepsy patients. Depression was a known risk factor for suicidal ideation in PWE, however, epilepsy itself is independently associated with suicidal ideation. A case-control study was conducted using 80 epilepsy patients and 80 controls using Beck Depression Inventory-II (BDI-II) to measure depression. Epilepsy patients scored higher on BDI-II (9.09 ± 6.48) compared to controls (5.56 ± 4.56). Epilepsy patients had significantly higher suicidal ideation rate (33.75%) compared to the control group (5.00%) and tended to be 9.68 times more likely to have suicidal ideation compared to controls [OR 9.68 (95% CI 3.19, 29.28)]. Those with suicidal ideation also used more than 2 antiepileptic drugs, had significantly higher seizure frequency and significantly higher incidence of previous head surgery.

Epilepsy has been associated with psychiatric illness. Mazumdar (1995) reported a rare case of complex partial seizure (psychomotor epilepsy) with varying shades of

psychiatric manifestations in a 27-year old Malay male who attended the Psychiatric Clinic of HUSM. These include a distinct change in his behaviour 1-2 days prior to these attacks. It started with withdrawal for hours followed by wandering around his camp, aggressiveness, social disinhibition of undressing which lasted for about 2-6 hours followed by generalised tonic clonic seizure. At other times he would have headache, epigastric “discomfort” or “fullness,” involuntary chewing and a feeling of changing into a tiger or elephant which lasted from a few minutes to an hour and either subsided spontaneously or was followed by a tonic clonic seizure.

Other psychosocial issues include research on awareness, knowledge and attitudes (AKA) toward PWE (Ab Rahman 2005; Hasan et al. 2010a, 2010b; Lim et al. 1999; Lim & Pan 2005; Lim et al. 2013a, 2013b, 2013c; Lua & Neni 2011; Neni & Lua 2011; Neni et al. 2010), social stigma (Lim 2013; Lim et al. 2013; Lim & Tan 2014; Yousof et al. 2018) and employability (Awang & Alimin 2016; Awang et al. 2016; Wo et al. 2015; 2016). Awareness, knowledge and attitudes of 615 rural residents of the East Coast region of Peninsular Malaysia was generally low (2.66 ± 0.7) with no gender difference (Neni et al. 2010). Those with higher education significantly possessed better attitudes and higher Total AKA level compared to those with lower education level and employed respondents reported significantly more favourable attitudes than unemployed respondents. Higher income rural cohorts possessed both significantly better attitudes and better AKA. Epilepsy patients who attended the Neurologic Clinic of Hospital Sultanah Zahirah, Kuala Terengganu showed moderate level of AKA (Lua & Neni 2011). University students had favourable level of awareness and knowledge of epilepsy (Ab Rahman 2005). A survey among 379 Chinese in Malaysia from Petaling Jaya, Karak and Bentung in 1998 showed more favourable attitudes toward PWE compared to people in Henan, China and Taiwan (Lim et al. 1999). A study among 697 Chinese respondents on understanding of and attitudes toward epilepsy among randomly approached respondents from the Chinese population living in the urban areas of Penang, Klang Valley, Kuala Lumpur and Sibul in Malaysia showed relatively high level of understanding and positive attitudes toward certain aspects of epilepsy (Lim et al. 2013). University students generally showed favourable level of awareness and knowledge of epilepsy (Ab Rahman 2005). Teachers scored better than secondary and college students on the Public Attitudes toward Epilepsy (PATE) Scale (Lim et al. 2013a). In conclusion, the differences in awareness, knowledge and attitude for PWE were due to different measurement used, urban or rural area, level of education, different races, or same racial group but staying in different region.

Social stigma toward PWE was measured by the public attitudes. Indirectly, social stigma had a significant impact on employment. Social stigma is related to ethnic group and urban-rural pattern of attitudes toward epilepsy which explain the cultural difference from the sociological

perspectives (Lim 2013; Lim & Tan 2014). A variety of factors had been identified to associated with stigma of epilepsy which include rural areas, lower educational level and socioeconomic status (Lim & Tan 2014), old age, female gender, being single, and not having heard or witnessed anyone having seizure.

Alimin (2014) and Alimin and Awang (2016) developed an employability model to determined significant factors which increase the chances for PWE to be employed. They found eleven significant factors namely gender, marital status, education background, age of the respondents, onset age, musical intelligence, kinesthetic intelligence, logic/math intelligence, spatial intelligence, intrapersonal intelligence and naturalistic intelligence. Wo et al. (2016) also examined factors associated with employability in PWE. Significant clinical factor associated with employability was only type of epilepsy. Other factors were associated with work ability (indicated by education level, work performance affected by seizures, ability to travel independently and ability to cope with stress at work) and family overprotection.

FACTORS INFLUENCING QUALITY OF LIFE OF EPILEPSY PATIENTS IN MALAYSIA

Many factors influenced quality of life among patients with epilepsy. Among factors that have been studied in Malaysia were demographic (Ahmad et al. 2013; Ahmad Sharoni et al. 2013; Anu et al. 2016; Din et al. 2012d; Fong et al. 2018; Lua et al. 2008; Norsa'adah et al. 2006; 2014), clinical (Lua et al. 2007; Mohamed et al. 2010; 2014; Din et al. 2012d; Norsa'adah et al. 2006; Viswanathan & Abdul Khalid 2004), and psychosocial factors (Mohamed et al. 2010; 2014; Din et al. 2012d; Lua & Neni 2011; Lua, Neni & Nor Samira 2012).

Norsa'adah et al. (2006) recruited 65 adult epilepsy patients who attended the Neurology Clinic of HUSM. They were administered with the Malay Version of the QOLIE-31 (MQOLIE-31). The total QOLIE-31 score was within the average range (Mean score = 69.7 ± 15.5). QoL in epilepsy among patients in HUSM was significantly associated with education level, age of onset and frequency of seizure. The results indicated that worrying about seizure had major effect, while antiepileptic drugs (AED) had the least influence on QoL. Similar study among 106 adults with epilepsy attending the weekly neurology clinic of Universiti Sains Malaysia Hospital showed that PWE who had one or more seizures in the past four weeks had significantly lower mean score of QOL compared to those who had no seizure after adjusting for age, sex, treatment, duration and age at onset of epilepsy (Norsa'adah et al. 2014).

Lua et al. (2008) conducted a cross-sectional study on 113 epilepsy patients recruited from 10 hospitals in Sabah, Malaysia with the purpose of determining the impact of various demographic characteristics (gender, age, marital status, ethnic origin, religion, and employment

status) on QoL. Using the Overall Score of the Malay QOLIE-31 as the dependent variable, the research found that all six demographic factors explained 17.0% of the variance in the Overall QOLIE score. Increasing age and female epilepsy patients were associated with lower QoL while Chinese ethnicity was associated with better QoL. Poor QoL was associated with being Kadazan Dusun, widowed/divorced and Chinese ethnicity. Good QoL was associated with possession of miscellaneous faiths, being female and Chinese ethnicity. Anu et al. (2016) found that a lower education level and poor seizure control affected the QoL score.

Lua, Neni and Nor Samira (2012) examined the relationship between coping strategies of 60 epilepsy patients who attended Neurology Clinic at the Sultanah Zahirah Hospital, Kuala Terengganu Malaysia with the MQOLIE-31 domains. The Brief COPE was used to measure the subjects' coping strategies. Epilepsy patients preferred to use problem-focused coping compared to emotion-focused coping strategies. Patients with good QoL preferred to use Positive Reframing, Planning and Religion while those with poor QoL coped by using Substance Use, Denial, Behavioural Disengagement, Venting and Self-Blame strategies.

Lua and Neni (2011) further investigated the influence of awareness, knowledge, and attitudes (AKA) on health-related quality of life (HRQoL) of 60 patients with epilepsy recruited from the Neurology Clinic, Hospital Sultanah Nur Zahirah, Kuala Terengganu, Malaysia. AKA was measured using the Malay AKA Epilepsy and QoL with the Malay QOLIE-30 instruments. AKA levels and overall QoL were found to be moderate for all patients. Those patients with good AKA were associated with significantly better Overall Quality of Life and Cognitive Functioning domains.

A study among 155 children age from 8 -18 years using the parent proxy and child self-report Quality of Life Measurement of Children with Epilepsy (CHEQOL-25) questionnaire found that low QoL were related to Malay ethnicity, focal seizure and high seizure frequency (more than 1 seizure per month)(Fong et al. 2018). Another study among 108 children with epilepsy with age ranged from 7 to 18 years indicated that QoL was associated with age and memory/concentration (Ahmad Sharoni et al. 2013).

Din et al. (2012d) explored the influence of demographic (age, gender, ethnic groups, levels of education, marital status, types of occupation); clinical (age of seizure onset, illness duration, duration of epileptic attack, frequency of attack, loss of consciousness, sleep problem, handedness, site of lesion, types of epilepsy), cognitive (intelligence, verbal memory, visual memory, frontal executive function) and psychosocial factors (anxiety, depression, coping skills) on QoL among 124 adult patients with epilepsy who attended the Neurology Clinic of the UKMMC. Demographic factors with significant relationship with QOLIE-31 Overall Score were age and ethnic groups. Among clinical factors, sleeping problem and types of epilepsy showed significant relationship with QOLIE-31 Overall Score. Among

psychosocial factors, it was found that depression, anxiety and non-productive coping showed significant negative relationships with QoL however, positive coping strategies showed significant positive correlations with QoL. None of the cognitive factors showed significant relationship with QoL. Significant demographic predictors include age and Indian ethnicity which explained 10% of the variances in QoL. After controlling for the demographic factors, clinical factor contributed 8.5% towards QoL; cognitive factors 12.1% and psychosocial factors 32% of the variances in QoL.

Earlier research by Mohamed et al. (2010; 2014) found that depressed epilepsy patients had poorer QoL as compared to those without depression. Another research explored on the association between obstructive sleep apnea (OSA) in 180 epilepsy patients QoL and found that seizure worry was significantly more in epilepsy patients with OSA compared to those without OSA. Following treatment of epilepsy patients with OSA using Continuous Positive Airway Pressure (CPAP), there were significant improvements in the Medication Effects, Cognitive Functioning, Overall Quality of Life and Seizure Worry domains of QOLIE-31 (Hashim et al. 2013).

QoL in epilepsy patients also can be improved using a variety of treatment and behavioural intervention programmes. Lua and Neni (2013) compared the impact of SMS-based epilepsy education programme and printed epilepsy educational module among 140 epilepsy patients from three public hospitals in East Coast Peninsular Malaysia. The intervention group showed improvement of their QoL in the domains of Seizure Worry, Overall Quality of Life, Emotional Well-Being, Social Functioning and Overall MQLIE-30.

A study was conducted on medical adherence and QoL in epilepsy patients by Ahmad, Othaman and Islahudin (2013). The study recruited 52 epilepsy patients at a local tertiary hospital who were treated with at least one antiepileptic drug. Adherence intention was evaluated using the Modified Morisky Adherence Scale while QoL was evaluated using Quality of Life in Epilepsy Patient Weighted-10 questionnaire (QOLIE-10). The results showed negative correlation between complexity of medication with seizure control ($r = -0.33$, $p = 0.017$). Only 21.2% ($n = 11$) achieved high adherence intention in the study population. Furthermore, good seizure control was found to improve patient quality of life ($F = 4.067$, $p = 0.012$). Similarly, a higher adherence intention also improved quality of life ($F = 4.161$, $p = 0.021$). In conclusion, adherence intention has a significant impact on patient quality of life and adherence intention should be monitored to provide appropriate support in improving quality of life in epilepsy patients. Lua et al. (2007) found that PWE on single drugs had better QoL score compared to those on multiple medications.

In conclusion, sociodemographic factors commonly associated with low QoL in PWE are increasing age, low education level and ethnic group, while clinical factors

include age of epilepsy onset, seizure control, multiple medication, and types of epilepsy. Psychosocial factors associated with low QoL in PWE are depression, anxiety, and non-productive coping strategies. Treatment factors include high medical adherence and SMS-based intervention programme were associated with good QoL.

THE FUTURE OF RESEARCH IN NEUROPSYCHOLOGY OF EPILEPSY IN MALAYSIA

There are still vast areas of study in neuropsychology of epilepsy that have yet to be explored in Malaysia. Literature search on psychosocial and cognitive/neuropsychological issues also yields a handful of research on social stigma, employability, the effects of neurorehabilitation on cognitive as well as the psychosocial outcomes (Lai et al. 2018), how far the neuropsychological deficits affect work performance or academic achievement (Wo et al. 2018); and the relationship between neuropsychological profiles and psychosocial adaptation. Similar areas of study should be expanded on different age groups, ethnic groups and different cultures in Malaysia.

Since the 2002 Asian-Oceanic Epilepsy Congress (AOEC) with a symposium entitled "Priority of Epilepsy Research in Asia" was held, Chi-Wan (2007) suggested that we should seriously look into the research priorities in studying the psychosocial and cultural issues of epilepsy in Asia-Pacific areas. Research on PWE in Malaysia did not emphasize much on cultural issues. Research on cultural issues in the Asian region cover belief in the aetiology of epilepsy, understanding of epilepsy, and public attitudes toward epilepsy (Chi-Wan 2007). However, studies on these issues were not done using the same questionnaire or period of time. Similarities and differences were seen in one ethnic group who resided in different regions such as a survey on Knowledge, Attitude and Practice among Chinese in living in China, Taiwan, Malaysia, Singapore and Hong Kong (Lim & Pan 2005). Thus, the formation of a research committee under the Commission on Asian and Oceanic Affairs (CAOA) was suggested in 2005 to focus on psychosocial and cultural issues. In order to do this, Chi-Wan (2007) and Lim and Pan (2005) suggested that a uniform study protocol can be designed to collect data on "public awareness, understanding and attitudes toward epilepsy" and "patients" perception of having epilepsy" and followed by conducting survey among the general population, patients with epilepsy, family members, health providers, or school teachers. A Research Task Force (RTF) was formed by the Commission on Asian and Oceanic Affairs (CAOA) of the International League Against Epilepsy (ILAE) to promote research in epilepsy in Asia-Oceanic region with the ultimate aim to improve the lives of PWE (Kwan et al. 2015).

CONCLUSION

Efforts should be made in speeding up the research development in Malaysia in general by establishing a multicenter research groups and collaboration with the well-established research centers in the world. Research map of neuropsychology of epilepsy in Malaysia should move forward from profiling phase to development of intervention programmes or modules for PWE in Malaysia and determining the effectiveness of the programmes. Research in this area should also be in line with the proposed research priorities of the Research Task Force of the ILAE Commission on Asian and Oceanian Affairs.

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