

Current status of post-traumatic brain injury rehabilitation care in LMI Southeast Asian Countries: A mini systematic review

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ABSTRACT: Low-to-middle income countries (LMICs) in Southeast Asia (SEA) had the highest global traumatic brain injury (TBI). However, post-TBI rehabilitation care may be limited in these countries, thereby contributing to the poorer quality of life (QoL) of patients with TBI. The present systematic review aimed to elucidate the current status of post-TBI rehabilitation care in the LMICs in the SEA region and to discuss the limitations that may hinder the advancement of TBI rehabilitation within this region. A literature search was carried out using five databases (PubMed, Ovid MEDLINE, EMBASE, CINAHL and Scopus), and the final number of articles were selected according to the PRISMA guidelines. This review selected four relevant research articles from Malaysia and Thailand for critical appraisal. These articles showed that the status of post-TBI rehabilitation care in these regions remains unclear based on the scarcity of available literature. Only early rehabilitation care strategies have been discussed in the literature, such as individualised structured cognitive rehabilitation, utilisation of humanoid robots and the implementation of sensory stimulation programs. This review also suggested that TBI rehabilitation improvements may be hindered by a lack of government funding, unequal distribution of care services and reliance on traditional care. Thus, more research into TBI rehabilitation care is significantly needed within the SEA region to overcome these barriers, leading to the preservation of patients' QoL.

Keywords: post-injury care; TBI; rehabilitation; quality of life; LMIC

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1.0 INTRODUCTION

Traumatic brain injury (TBI) significantly and largely contributes to global mortality and morbidity, affecting nearly 74 million people annually ([Dewan et al., 2018](#);

[Iaccarino et al., 2018](#)). The impact or burden of TBI-related neurological dysfunction may be transient or lifelong post-injury, demonstrating a wide range of symptoms in terms of motor, cognitive, emotion and

other functions (Armstrong et al., 2019), all of which may drastically reduce one's quality of life (QoL).

This impact on QoL post-TBI varies significantly based on each country's economic and healthcare system level. As compared to high-income countries (HIC), low to middle-income countries (LMIC) have a greater mortality rate but a lower disability rate (De Silva et al., 2009), where the latter is a direct correlation with the number of survivors post-TBI achieved between the two types of countries. However, when studies compared the disability rate among the survivors of TBI between HIC and LMIC, then LMIC patients had a greater degree of disability (Samanamalee et al., 2018). According to a global TBI incidence study by Dewan et al., Southeast Asia (SEA) countries, mostly LMIC countries, contributed to 56% of global TBI cases and had the highest TBI burden (Dewan et al., 2018). SEA LMIC countries such as Malaysia, Philippines, Thailand and Indonesia were especially prone to these TBI burdens, given the high incidence rate of road traffic accidents (nearly 90% of the world incidence rate) (Dewan et al., 2018; Iaccarino et al., 2018; Kitamura et al., 2018), coupled with low-availability of trauma-care facilities/services and less help-seeking behaviour (rehabilitation) by patients (Tay & Wong, 2018), the latter often owing to financial,

cultural or logistic challenges (Dewan et al., 2018; Iaccarino et al., 2018).

Rehabilitation is integral to post-TBI care and is essential in preserving a TBI patient's QoL (WHO, 2011; Armstrong et al., 2019) (Figure 1). Rehabilitation has also been shown to promote neural plasticity and restore brain connectivity post-TBI, gradually improving functional outcomes (Lippert-Grüner et al., 2007; Lui et al., 2014). Rehabilitation generally assesses the degree of impairment and disabilities based on the ICF (International Classification of Functioning, Disability and Health) health model (Laxe et al., 2013). It helps the person cope with health and functioning following TBI (WHO, 2011). Rehabilitation effort covers a spectrum of functioning, from acute care to vocational and returning to work. Rehabilitation may occur through single or multiple training/therapy sessions by professionals (e.g. physiotherapists, rehabilitation physicians) targeting the physical/cognitive/affective dysfunction, ensuring their return to daily activities (WHO, 2011) (Figure 1). It has proven beneficial when rehabilitation is introduced in the initial phases post-TBI. It has also been beneficial during the post-acute to chronic phase post-TBI (Armstrong et al., 2019; Mohammad et al., 2020).

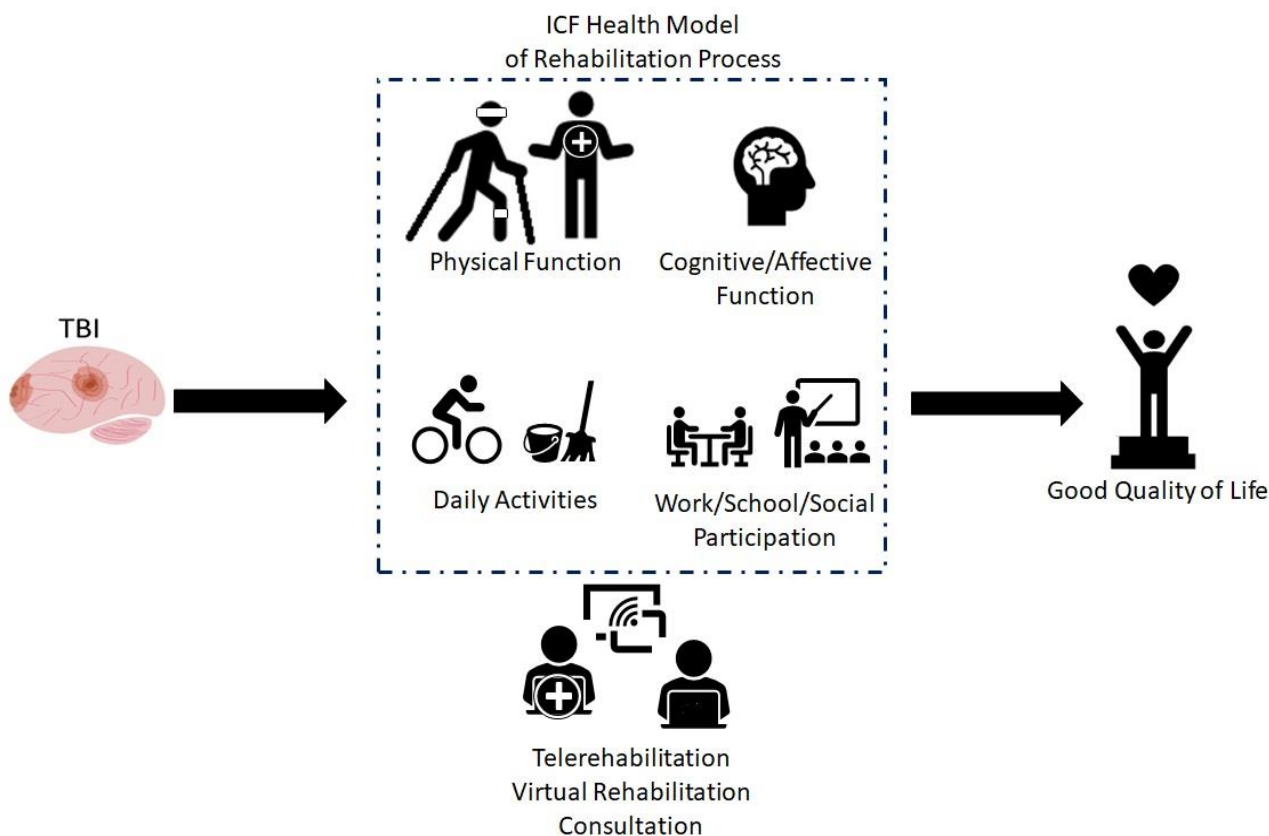


Figure 1. The role of rehabilitation in improving the QoL of patients with TBI.

Because of the broad impairment aspects and clinical presentation, a single clinician may rarely perform rehabilitation treatment; its management may involve a multi-disciplinary approach. Rehabilitation may also address the relief of other symptoms such as headaches, sleep disturbance, bowel and bladder control, and mental disturbances post-TBI ([Chua et al., 2007](#); [Iaccarino et al., 2015](#)).

Owing to the complexity and heterogeneity of TBI clinical presentation and its related functional outcomes, multifaceted post-traumatic rehabilitation care may be warranted to address each individual's requirement ([Armstrong et al., 2019](#)). However, despite the high incidence rate of TBI, the existing data and research evidence related to post-TBI rehabilitation care may be limited/inaccessible in the LMIC SEA region ([Chua et al., 2007](#)), possibly hindering the advancement in the development and implementation of rehabilitation care post-TBI. Thus, this review aims to elucidate the current status of post-TBI rehabilitation care in the SEA LMICs, showcase this scarcity in the literature, and address any possible factors that may hinder patients from this region in seeking or obtaining adequate post-TBI rehabilitation care, which may negatively impact their QoL. To our knowledge, this may be the first systematic review exploring post-TBI rehabilitation status in the SEA LMICs.

2.0 METHODOLOGY

2.1 Literature Search

A literature search was carried out using five databases: PubMed, Ovid MEDLINE, EMBASE, CINAHL and Scopus, to identify currently available literature regarding post-TBI rehabilitation in the SEA LMIC region. The initial search was performed, and results were retrieved until September 2021. The search terms applied included ["traumatic brain injury" OR "TBI"] AND ["rehabilitation" OR "post-injury care"]. The terms were first searched in the title, abstract and keywords in all databases. Then the search was performed in combination with the terms ["Southeast Asia" OR "SEA" OR "Cambodia" OR "Indonesia" OR "Laos" OR "Malaysia" OR "Myanmar" OR "Philippines" OR "Thailand" OR "Timor-Leste" OR "Vietnam"] in all fields. The Boolean operator "AND" was utilised to extract the post-injury rehabilitation articles of low to middle-income SEA countries. In MEDLINE and EMBASE, '/exp' was used to explore the related data for the search terms mentioned above. Titles and abstracts of the

literature were screened for relevancy before screening the full text.

2.2 Literature Selection

The inclusion criteria for this review were 1) peer-reviewed original research articles, 2) articles available with full text, 3) articles in the English language and 4) articles that match the scope of the study. Exclusion criteria for this review included: 1) duplicated articles, 2) review articles, systematic reviews, conference abstracts, symposiums, editorials, book chapters and case reports, and 3) articles which did not investigate post-TBI rehabilitation in the context of SEA LMIC. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines were practised throughout the study selection ([Moher et al., 2015](#)).

2.3 Literature Quality Assessment

Assessment of the quality of the articles selected for this systematic review was implemented using The Quality Assessment Tool for Quantitative Studies by The Effective Public Health Practice Project (EPHPP) (Supplementary **Table S1**), which was used to assess the quality of the prospective cohort studies ([EPHPP, 1998](#)). One study was of a randomised control trial (RCT) study protocol; thus, no quality analysis was performed due to the study being a proposal.

3.0 RESULTS AND DISCUSSION

The initial literature search retrieved 534 results from all five databases. Ninety-eight duplicated results were then excluded. The remaining 436 articles were screened according to this review's inclusion and exclusion criteria. A total of 168 articles were excluded as they were non-original research articles such as review papers, conference abstracts, book chapters and editorials. The remaining 268 articles were assessed for their eligibility and relevancy to the scope/aim of this review, and 264 articles were removed as their investigations were not focused on post-TBI rehabilitation and/or were not performed in the context of the SEA LMIC population. Thus, a total of 4 relevant studies were selected according to the PRISMA guideline (**Figure 2**) for critical appraisal in this review. The final number of studies included one RCT study protocol, two prospective cohort studies and one observational study. Study characteristics and significant findings from these four studies are summarised in **Table 1**.

Table 1. Study characteristics and significant findings on post-TBI rehabilitation in SEA LMIC.

Country	Study Type	Sample (Age, gender)	TBI Severity	Significant findings	Quality Analysis	Reference
Malaysia	RCT protocol	Predicted: 18 to 60 years, Minimum 50 participants, gender unspecified	Mild	→ First RCT proposed for cognitive rehabilitation in SEA LMIC → Compares individualised structured cognitive rehabilitation with standard rehabilitation	NA	Hamzah et al., 2019
	Prospective cohort study	18 years and above; 87M, 13F	Moderate to Severe	→ Early inpatient TBI rehabilitation (within 12 weeks since injury) significantly improved functional outcomes post-TBI	Strong quality	Mazlan et al., 2021
	Observational study	Children; unspecified	NA	→ Utilisation of humanoids increased awareness, attention and participation of brain-impaired children	Moderate quality	Mahamood & Hanapiah, 2017
Thailand	Prospective cohort study	18 years and above; 28M, 12F	Severe	→ Improvements in modified SMART scores and GCS after commencing the SSP rehabilitation in the experimental group compared to those in the control group of unconscious patients with TBI	Strong quality	Urbanjaphol et al., 2009

3.1 Characteristics of the study

This review showed that the English literature/research on post-TBI rehabilitation was limited in the SEA LMIC region, with only two countries with published materials available on research databases; Malaysia and Thailand. The studies in Malaysia consisted of a proposed ongoing RCT protocol, one prospective cohort study and one observational study, while the study in Thailand was a prospective cohort study. This review understands that the SEA region consists of multi-lingual countries. Therefore there might be relevant non-English articles published in non-indexed journals which were not included in this review. The terms equivalent to 'traumatic brain injury and 'rehabilitation' in non-English articles may not be standardised in other Asian languages. To avoid inaccuracies and discrepancies in selecting non-English research articles and to ensure global comparability, this review decided only to include English-published research articles.

The mean age of the majority of the study population ranged from 33.4 to 46.13 years old, which may represent the higher prevalence of TBI cases reported in

adults between 20-40 years in Malaysia ([Arulsamy & Shaikh, 2020](#)) and Thailand ([Prathep et al., 2017](#)) (Table 1). Thus, this justifies the proposed RCT protocol that will also utilise participants of similar age groups. However, the studies on TBI rehabilitation in the pediatric population should also not be overlooked as children may have a more challenging time coping with the functional outcomes post-TBI as well as possible developmental issues related to TBI ([Figaji, 2017](#); [Li & Liu, 2013](#)), and therefore evidence from the adult population may not be appropriate to be extrapolated to the paediatric population. This review showed that only one study had a children population, but unfortunately, the age range was not provided ([Mahamood & Hanapiah, 2017](#)). Most of the study samples were males, which well-represented the global gender prevalence of TBI; males had twice the odds of sustaining TBI compared to females ([Frost et al., 2013](#)). However, understanding the influence of the female neuroprotective hormones ([Brotfain et al., 2016](#)) in the rehabilitation progression may be worth investigating in future studies to help the female TBI patient population better, despite being a minority.

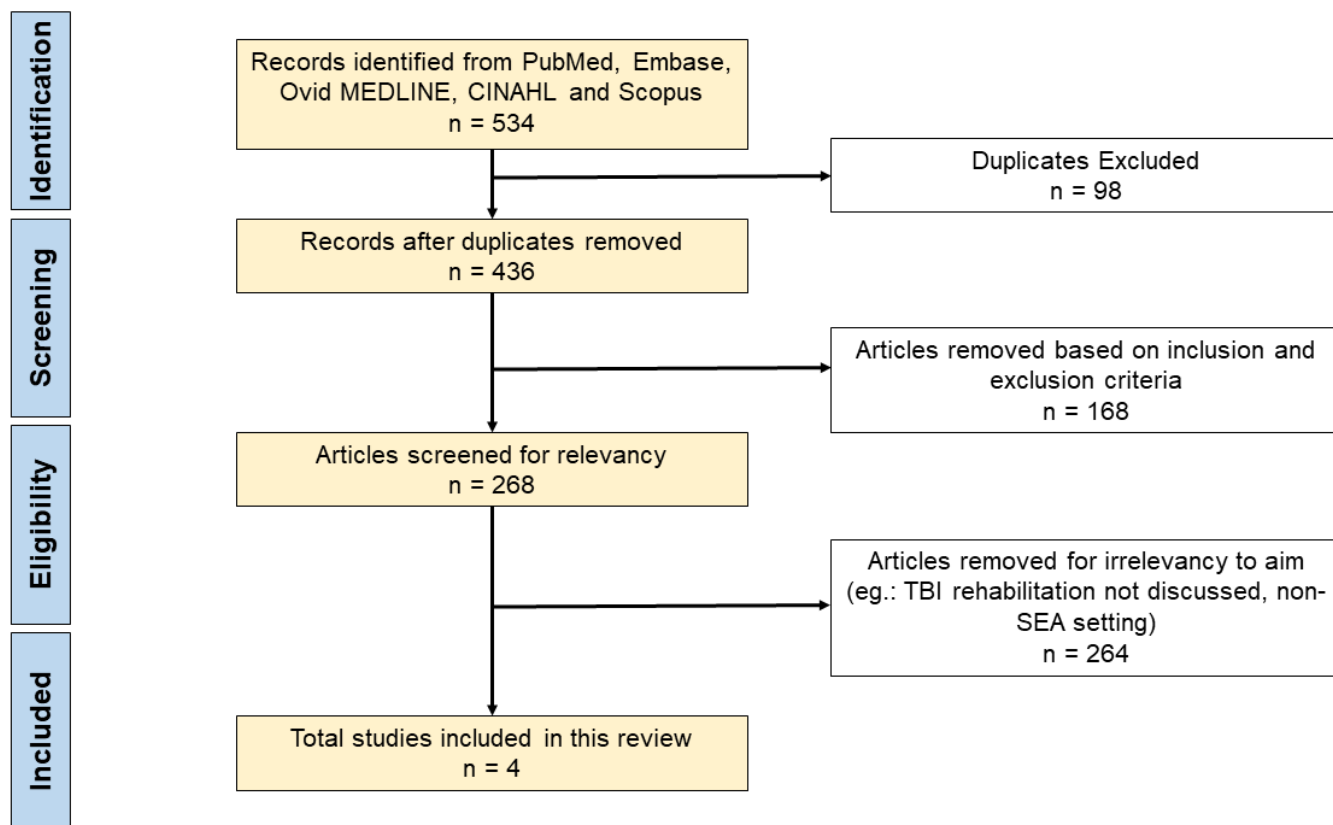


Figure 2. Study selection based on the PRISMA guidelines.

Based on the Glasgow Coma Scale (GCS) for TBI severity, each study investigated TBI rehabilitation in different TBI severities, leaning towards more severe TBI (**Table 1**). This could be because patients with mild TBI often do not seek medical help, particularly rehabilitation care ([Dewan et al., 2018](#)). Therefore it may be tasked to recruit patients of mild severity. Nevertheless, since patients with greater TBI severity (higher impact force and lower GCS score) tend to develop a greater degree of functional outcomes in terms of motor, cognition and/or neuropsychiatric deficits ([Rassovsky et al., 2006](#)), recruiting patients of moderate to severe TBI may be more meaningful in advancing TBI rehabilitation strategies.

3.2 Current status of post-TBI care in low to middle-income SEA countries

Two types of rehabilitation are recommended for patients with TBI to ensure good prognosis and recovery post-TBI; early rehabilitation and later (often outpatient) rehabilitation. Early rehabilitation occurs as soon as the patient is physiologically stable ([Parker et al., 2013](#)). Later rehabilitation, on the other hand, is recommended to patients, often after discharge. Both

rehabilitation types may be needed to promote recovery of functional outcomes so that patients can return to their daily routine and workplace effectively. One study showed that early rehabilitation might be more beneficial for recovery post-TBI than later/delayed rehabilitation. Still, a continuous rehabilitation method (early to chronic) may be the most effective at improving functional outcomes post-TBI ([Andelic et al., 2012](#)). Unfortunately, this review's selected articles have only focused on early rehabilitation. Therefore there may be an unmet need to understand the impact of later/delayed rehabilitation in the SEA LMIC population.

Sensory Stimulation Program (SSP) has been promoted as an early rehabilitation therapy for unconscious patients in hopes of improving neuronal connectivity and synaptic reconnection and facilitating recovery from the comatose state ([Moattari et al., 2016](#); [Oh & Seo, 2003](#)). Examples of effective sensory stimulation programs for TBI rehabilitation include music kinetic therapy ([Noda et al., 2004](#)) and multimodal onset stimulation therapy ([Grüner & Terhaag, 2000](#)). In this review, only the study in Thailand showed a similar

beneficial effect of SSP, where the stimulation program of five senses (tactile, visual, auditory, gustatory and olfactory senses) for 14 days improved the mean modified Sensory Modality Assessment and Rehabilitation Technique (SMART) scores and GCS scores, suggesting that SSP can enhance the responsiveness and recovery of patients with TBI ([Urbenjaphol et al., 2009](#)).

While the study by Mazlan ([2021](#)) in Malaysia also suggested that early rehabilitation plays a crucial factor in influencing the prognosis of post-TBI functional outcomes ([Mazlan et al., 2021](#)), they did not elaborate on the type of early rehabilitation that was performed on their patient cohort. Given the larger TBI cohort in SEA LMIC, research on different kinds of sensory stimulation programs for patients may be easily performed within this region, advancing the global early rehabilitation strategies for improving the outcomes post-TBI. In addition to SSP, the usage of humanoids in the rehabilitation of children with TBI has proven to be also effective as an early rehabilitation strategy, given its simplicity and ability to detect and modify (increasing or reducing in difficulty) according to the needs of the patients ([Mahamood & Hanapiah, 2017](#)). The authors even concluded that the utilisation of humanoids in rehabilitation might even become automated (with the advancement in artificial intelligence) in the near future, thereby increasing patients' reach and willingness to seek rehabilitation and reducing the resources (manpower) needed for effective early TBI rehabilitation in SEA.

Besides early rehabilitation, one of the selected studies in Malaysia suggested a later rehabilitation (outpatient) protocol for improving cognitive dysfunction post-TBI ([Hamzah et al., 2019](#)). Heterogeneity in the presentation of post-TBI cognitive deficits may require a varied but personalised treatment strategy to be more effective in dealing with cognitive challenges ([Mazlan et al., 2016](#); [Rapp & Curley, 2012](#)). Thus, to address this issue, the RCT protocol that was proposed by Hamzah *et al.* ([2019](#)) planned to assess the outcome of a 12-week individualised structured cognitive outpatient rehabilitation in adult patients with mild TBI compared to standard rehabilitation, while accounting for ethnicity differences ([Hamzah et al., 2019](#)). The rehabilitation protocol will consist of 2 parts to help them recognise and solve the weaknesses in their cognitive functioning.

Overall, due to the scarcity of studies on TBI rehabilitation in the SEA LMIC region, conclusive

information relating to factors influencing TBI rehabilitation and identifying gaps for improvement may be premature. Nevertheless, this review has decided to elaborate on some potential barriers in SEA LMIC that may influence post-TBI rehabilitation and how these countries may overcome them based on current rehabilitation strategies applied to other diseases.

3.3 Barriers to the post-TBI rehabilitation

3.3.1 Limited and unequal rehabilitation service

Unequal and un-standardised distribution of rehabilitation services and workforce in the country worsens the condition of the patients, especially those staying in remote/rural areas where transportation accessibility may be lacking ([Eldar et al., 2008](#); [Jesus et al., 2017](#); [Tay & Wong, 2018](#)). In Malaysia, it was reported that there were 1502 government, 686 private and 626 NGO rehabilitation centres, including 511 community-based rehabilitation model (CBR) centres for various diseases ([Naicker et al., 2019b](#)). Although these numbers seem adequate for a middle-income country like Malaysia, most of these rehabilitation centres were found to be located in urban areas compared to rural areas, where they were generally situated within 20km of the city rather than equally located throughout the country ([Tay & Wong, 2018](#)). This hurdle in accessibility to rehabilitation facilities may discourage some patients with TBI from continuing or even starting their rehabilitation program. Thus, it may support the lack of rehabilitation-focused clinical studies available in Malaysia. This hurdle may also extend to other countries within the SEA LMIC region, where there's a huge innovation and advancement gap between rural and urban areas. Although the number of TBI cases reported in urban areas may outweigh rural areas, thereby supporting the current distribution of rehabilitation centers, this does not mean rehabilitation services in rural areas should be forgone.

In contrast, Vietnam and Laos showed a better distribution of rehabilitation care within their countries. In Vietnam, all hospitals, especially in urban areas, and around 90% of the general hospitals in the provinces (rural areas) provide rehabilitation services, while Laos has extensive availability of rehabilitation services offered at the central hospitals, district hospitals, and the national rehabilitation centres ([Hamasaki et al., 2020](#)). These countries even provide vocational training schools and outpatient clinics for follow-up care to ensure effective recovery of functional outcomes of patients with various disorders ([Hamasaki et al., 2020](#)). Thus, other SEA LMICs may use Vietnam and Laos as an

example to improve their rehabilitation service accessibility to patients. However, due to the lack of TBI research facilities in Vietnam and Laos, the improvements in TBI functional outcomes or the impact on the QoL of patients within the population may still be unclear/unknown.

Insufficient rehabilitation specialists may also hinder effective TBI rehabilitation care in the SEA LMICs. The National Health Human Resources Report revealed that there were only 4.5 physiotherapists (PTs) and 3.4 occupational therapists (OTs) per 100,000 population in Malaysia in 2014 ([Tay & Wong, 2018](#)). Similarly, there were about 3.4 PTs and 0.5 OTs per 100,000 population in Indonesia in 2017 ([Nugraha et al., 2018](#)). These numbers were much lower than that of high-income countries such as Singapore and Australia, which were 30 and 121 per 100,000 population, respectively ([Ministry of Health Singapore, 2017](#); [Physiotherapy Board of Australia, 2017](#)), suggesting that the workforce in the rehabilitation sector requires significant upgrading in SEA LMICs. In fact, in Cambodia, many of the patients prefer going overseas for rehabilitation due to a limited number of specialists coupled with a lack of confidence in the rehabilitation care available in their country, especially for diseases/disorders that may not be well-represented in the country ([Hamasaki et al., 2020](#)). Therefore, more national efforts may be needed in each LMIC to train healthcare providers in rehabilitation services and care to instil confidence in the population regarding the country's post-injury care capabilities.

3.3.2 Lack of government funding

The latest data from the World Bank in 2018 showed that the percentage of health expenditure among the SEA LMIC ranged from 2.25 to 6.03% of Gross Domestic Product (GDP), with Laos and Cambodia being the lowest and highest spending countries, respectively ([Bank, 2018](#)). Compared to HIC, these countries had a lower percentage of health expenditure, suggesting that there might be a lack of funding in the health sector which may result in insufficient rehabilitation resources for acquired disorders such as TBI. Moreover, out-of-pocket spending (OOPS) or external aid in lower-income countries may account for a greater share of the health expenditure (WHO, 2020). For instance, the funding for rehabilitation in Cambodia was poor due to a lack of government subsidies and the absence of public insurance system ([Hamasaki et al., 2020](#)). While in Vietnam, despite the coverage of medical care costs by public insurance through the referral system, around one-third of the population is still uninsured ([Hamasaki](#)

[et al., 2020](#)) and therefore may not seek rehabilitation care due to financial constraints. This demonstrates that people living in LMIC may have to largely rely on their financial status to access healthcare services including rehabilitation.

3.3.3 Poor introduction to rehabilitation care

Limited knowledge, firm reliance on traditional therapy and cultural stigma may contribute to patients' and caregivers' poor confidence or preference for available rehabilitative care ([Naicker et al., 2019a](#)). The influence of cultural backgrounds or views on seeking or effectively undergoing rehabilitation post-TBI has not been investigated in a multi-cultural region such as SEA LMIC. A review of TBI rehabilitation practices and research in a Hong-Kong setting, a HIC Asian country, found that cultural stigma may impede the rehabilitative process post-TBI, which could negatively impact the patients' functional improvements ([Yu et al., 2015](#)). Thus, these cultural-related hurdles in implementing effective TBI rehabilitation may extend or even be more extensive in the SEA LMIC region and should be investigated in future studies. Spreading TBI awareness may divert the reliance on traditional or unconventional therapy post-injury.

Furthermore, caregivers of patients with TBI, particularly family members, should also be equally educated on the positive impact of rehabilitation care post-injury. In a study in Thailand, it was highlighted that a proper discharge plan was not available for the reference of the family/caregivers in the continuity of post-TBI care, which may negatively affect the patient's health condition and rehabilitation outcome ([Siripituphum et al., 2020](#)). In addition, negative events, including non-sensitive or disrespectful interactions in the healthcare settings experienced by the patients and caregivers, may affect their introduction and trust in healthcare providers during rehabilitation care ([Bright et al., 2018](#)). Thus, to promote reasonable confidence in the benefits of TBI rehabilitation, patients and caregivers should be well introduced to some basic information and research in TBI and post-injury care.

3.3.4 Interventions to overcome the barriers

Globally, WHO introduced Rehabilitation 2030: a call for action in 2017 to promote accessibility, provide a high-quality workforce and services, as well as enhancing data collection of rehabilitation ([Gimigliano & Negrini, 2017](#)). The implementation of modern/mobile medical delivery has been growing, encouraging the use of communication devices and online services for consultation and monitoring in rehabilitation care. This

includes the introduction of Telerehabilitation ([Jafni et al., 2019](#); [Tay & Wong, 2018](#)) (**Figure 1**). This enables patients who lack access to rehabilitation centres to receive expert or specialist consultation without travelling to the facility, increasing their willingness to accept the rehabilitation consultation and improving their well-being. During the recent pandemic, telerehabilitation in the SEA region has grown exponentially, although there may still be room for improvement ([Intan Sabrina & Defi, 2021](#)). This growth encourages the future use of telerehabilitation for TBI care as well. Studies outside the SEA region have proven the effectiveness of the home-based rehabilitation program for patients with TBI, which may provide more cost-effective care compared to inpatient rehabilitation ([Warden et al., 2000](#)), thereby encouraging patients who may be financially burdened to seek rehabilitation. For example, in Singapore, the cost of inpatient rehabilitation significantly impacted patients with TBI by increasing medical complications ([Teo et al., 2021](#)). Thus, if this cost may be waived, this may directly provide a positive impact on patients. In relation, the Medical Interactive Recovery Assistant (MIRA) platform, which has been proposed for other diseases, may also offer virtual rehabilitation through exergames (virtual reality therapy (VRT)) for upper limb rehabilitation ([Zainal et al., 2021](#)). However, factors such as resistance to change, limited knowledge of the technology, and lack of online connectivity in LMICs may impede tele-/virtual rehabilitation ([Jafni et al., 2019](#)).

Interestingly, Thailand, Myanmar and Vietnam have organised mid-level training programs in response to the lack of professional personnel in related areas such as occupational therapy, physiotherapy and speech therapy ([WHO, 2011](#)). As a result, trained personnel from the local community were recruited in Thailand to retain the healthcare providers in the areas ([WHO, 2011](#)). This may be a promising first step towards improved rehabilitation post-injury care in the LMIC SEA region. In addition, an electronic medical records system for rehabilitation, similar to that proposed by a study in Myanmar ([Rock et al., 2020](#)), may help shed light on the drawbacks of current rehabilitation systems

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in place. Besides that, collaborative efforts with HICs, such as the Cambridge–Yangon Trauma Intervention Project, may also advance LMIC rehabilitation care more effectively ([Bashford et al., 2018](#)).

4.0 CONCLUSIONS

This systematic review showed a scarcity of TBI-related rehabilitation research in the LMIC of the SEA region, despite the higher global TBI burden within these countries. Based on the limited studies retrieved, which were only from Malaysia and Thailand thus far, early rehabilitation strategies such as sensory stimulation programs and non-automated humanoids have effectively improved outcomes post-injury and encouraged a patient willingness to seek rehabilitation. While later rehabilitation (chronic stages post-TBI) has been suggested, research into its implementation within this region has yet to be concluded. Besides elucidating the available literature on rehabilitation within this region, this study also highlighted the various limitations that may hinder effective rehabilitation care in SEA LMICs, such as unequal distribution of services, and the potential solutions to overcome them, particularly by utilising telerehabilitation and increasing collaborative efforts with HICs. Thus, more rigorous research on TBI rehabilitation in the future may better understand the importance of rehabilitation post-injury and advance current rehabilitation strategies, thereby ensuring a better QoL for patients post-injury.

Supplementary Materials: Table S1: EPHPP Quality Analysis.

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