Global Health and Epilepsy: Update and Future Directions

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Abstract

Purpose of Review Efforts to improve epilepsy care outcomes in low- and middle-income countries (LMICs) are occurring through global health work. Despite an increase in these efforts, several barriers exist and a significant epilepsy treatment gap remains. This paper will review barriers to epilepsy care in LMICs and summarize recent published and unpublished data about global health projects which aimed to improve epilepsy care in these regions, focusing on work in the past 5 years.
Recent Findings There are multiple recent and ongoing projects including clinical, research, education, and advocacy programs.
Summary We conclude that collaborative efforts are necessary in order to develop long-term and sustainable projects. The creation of a database and a formal method of communication between stakeholders can contribute to improving the efficiency and impact of global health efforts in epilepsy.

Keywords Global health · Epilepsy · Disparity

Introduction

Epilepsy is one of the most common neurological diseases worldwide. Approximately 80% of the world's 70 million patients with epilepsy reside in resource-poor settings. The disease can affect people of any age, gender, race, or class. Approximately 500 million people are affected by epilepsy, including family members and caregivers of patients with epilepsy. Globally, epilepsy ranks 20th as a cause of years lived with disability (YLDs) [1]. The World Health Organization (WHO) has long recognized epilepsy as a public health concern, due to the physical and psychological consequences of the disorder. This includes an increased risk of premature death, loss of work productivity, and increased healthcare needs and expenditure [2–5].

The purpose of this review paper is to summarize the current state of global health research, education, clinical, and advocacy efforts in epilepsy, focusing on work within the past 5 years (2013–2018) after giving a brief background on the challenges low- and middle-income countries (LMICs) face in caring for people with epilepsy (PWE). Future directions will also be suggested, including ILAE Global Health Task Force investigations and projects.

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Methods

Search Strategy and Selection Criteria

Articles dating from January 2013 to December 2018 were identified through searches of CINAHL, EMBASE, PubMed, Scopus, Global Health (via CAB Direct), and Proquest Public Health with the following terms: "(Global Health)" AND "(Epilepsy OR Seizure*)." We identified a total of 2396 articles. The CINAHL search identified 26; EMBASE, 1203; Global Health via CABI, 25; SCOPUS, 447; and PubMed 695 articles. We removed 1450 duplicates

and 946 studies were screened. Our search aimed to identify studies published in English that reported epilepsy-related global health activities. We excluded studies which were not conducted in low- and middle-income countries, and studies in which epilepsy was not the main focus. No restrictions were made with respect to study design or patient selection. We included 182 original papers for this review.

Etiologies

In LMICs, epilepsy has a variety of etiologies which often differ from the causes seen in higher-income countries [6]. The most commonly reported known etiologies are obstetrical complications and perinatal conditions, infections such as neurocysticercosis [7–10, 11•], onchocerciasis [12–16] malaria, and HIV/AIDS [17–19] as well as traumatic brain injuries [20, 21••, 22]. Additionally, other rare and poorly understood epilepsy syndromes such as nodding syndrome and nakalanga syndrome have been reported in a few regions such as Uganda/South Sudan and Tanzania [23, 24].

Epidemiology

People with epilepsy have a two to three times increase in mortality compared to the general population. Causes of death could be directly related to epilepsy, including sudden unexpected death in epilepsy patients (SUDEP) and status epilepticus [25, 26], as well as those indirectly related to seizures, including different types of trauma and suicide. According to the Global Burden of Disease (GBD) Study 2016, the age-standardized death rates of epilepsy declined between 2006 and 2016 by 14.2% (95% UI 6.9 to 19.2), and age-standardized years lost to life (YLL) due to epilepsy reduced by 16.9% (95% UI 8.1 to 23.1) [27••]. The GBD study reports the prevalence and incidence in thousands to be 23,962 and 2761 respectively, and the age-standardized prevalence of epilepsy-related impairment has declined by 0.6% (95% UI 7.0 to 7.7) [28••].

A study conducted in Egypt reported the lifetime prevalence of epilepsy to be 6.9/1000, prevalence of active epilepsy as 5.1/1000 people, with bimodal peaks in adolescents and the elderly. The treatment gap was reported to be 66.7% [29]. The estimated prevalence of epilepsy in northern India (rural and urban) was reported to be 1.1/1000 population, and 71% of cases belonged to low socio-economic background [30].

Epidemiological studies have explored the association between infectious diseases including onchocerciasis, neurocysticercosis, and epilepsy. A population-based study conducted in Peru reported that 36.9% of residents were found seropositive for neurocysticercosis and 18.8% had brain calcifications on CT scan which could provoke seizures [31•]. A study done in Tanzania reported that the overall incidence of epilepsy was 111 cases per 100,000 population, and that of onchocerciasis-associated epilepsy was 131 [32]. A cross-sectional study conducted in onchocerciasis endemic rural Congo reported prevalence of active epilepsy to be 4.6%; Colebunder (2017) reported that the prevalence and incidence of onchocerciasis is influenced by environmental factors, such as vegetation near fast flowing river, climatic factors such as rainfall, vector-related factors, human behavior (frequent contact with the river), and size of population at risk [13].

Some studies conducted in LMIC evaluated specific population features. A multi-site study done to determine convulsive status epilepticus among people with active convulsive epilepsy in South Africa, Kenya, Tanzania, Uganda, and Ghana reported a prevalence of 2.3 per 1000 population ($p < 0.0001$) [33]. The investigators also explored the prevalence and pattern of electroencephalographic features of epilepsy and the associated factors in the above-mentioned five countries. They reported that 53% of patients had an abnormal EEG with an adjusted prevalence of 2.7 per 1000 population (95% confidence interval 2.5–2.9). The frequency and pattern was site dependent (highest in Uganda) and increasing steadily with age and declining after 28 years of age [33].

Disparities

LMIC face many challenges in caring for people with epilepsy (PWE). Obstacles exist within the healthcare systems themselves, but also stem from the patient, family, and community perceptions of seizures and epilepsy. As a result, there is often a large treatment gap which in some LMIC approaches 100% [20, 21••, 22, 34, 35••].

One significant problem is the lack of knowledge and understanding about the etiology of epilepsy, features of the condition, and prognosis. Numerous studies have shown that in many LMIC, epilepsy is often perceived as a form of mental illness, anxiety, or thought to be caused by evil spirits, and that it may occur as a punishment for wrongdoings [36–38]. These beliefs occur even in educated community members such as school teachers [37, 39]. Due to these beliefs, PWE and their families often do not seek any treatment or receive care from traditional healers [40–43]. Furthermore, epilepsy is thought by many to be contagious which results in social isolation and poorer quality of life for PWE [44]. Many PWE are also unable to marry or obtain employment because of the stigma attached to their condition and as a result, they suffer discrimination and isolation which leads to further disability [20, 45].

Another barrier to care is the scarceness of resources and difficulty accessing care in these regions. Lack of diagnostic testing makes it difficult to diagnose the etiology of a patient's

epilepsy which prevents targeted treatment from being delivered. Many LMIC do not have access to newer-generation AEDs which are often better tolerated, and at times even older generation AEDs are scarce or counterfeit [46–49]. PWE in rural or remote areas may live a great distance from medical centers, making it difficult for them to access care and furthermore even patients who are able to reach medical centers are often treated by healthcare workers with a low level of knowledge of epilepsy [41, 50]. It is estimated that about 23,000 neurosurgeons (approximately 11,300 in South East Asia and 8400 in Africa) are needed in low- and middle-income countries to address the demand in neurosurgical care, and often there are few or no neurologists and neurosurgeons in these regions [51–53].

Activities/Interventions

Clinical/Research

Clinical guidelines and program development, including different models of clinical care, have been implemented in order to reduce the existent treatment gap [54•]. Documented research addressing these models reveal lack of conformity and paucity of successful programs. A very simplistic model aims to ensure that patients receive "the right care, at the right time, by the right team and in the right place" [55].

The vast majority of programs target epilepsy as a specific disorder; however, others consider epilepsy as one of a wider group of non-communicable diseases or a mental health disease [56–63]. Few initiatives have a more global approach of identifying deficits in care or outlining practice guidelines, for implementation of surgical, medical, or dietary programs (i.e., [64, 65•, 66•]). Epidemiological research aimed at identifying epilepsy risk in specific patient populations (i.e., [67, 68]).

Epidemiological research and clinical interventions directed at novel disease-causing pathogens (with higher prevalence in LMIC) are essential. Higher-income countries do not have knowledge or experience in dealing with these entities.

Unique but easily implemented ideas could provide "real-life" research and clinical inter-country road maps. Door-to-door surveys in Bolivia [69] or the methodology of testing small pig farmers in Nigeria [9] could easily be translated to other LMIC. Concepts used in the Lifeline Express mobile clinic in India could address access to care in many regions of the world [70•]. The use of plants in Peru to treat epilepsy could be an example of how to fuse traditional and modern medicine in resource-poor regions [43]. Working out the details of how to work collaboratively with traditional healers in South Africa may foster similar collaborations in South, Central America, the Caribbean, and many regions of the world [71].

Education

Educating local healthcare providers is essential to changing the current view and introduce the concept of epilepsy as a "treatable condition without stigma" [20, 72]. Educational programs to raise awareness would improve access to care and quality of care delivered, and could lower mortality rates in this population [73].

Community-based programs have proven to be effective in improving knowledge and reducing the treatment gap in patients with epilepsy living in areas with no access to neurological care. These measures help to minimize the stigma associated with epilepsy [74]. A study conducted in rural Bolivia demonstrated that continuous educational activities targeting "non-specialists health care workers" in rural communities are extremely effective in increasing knowledge about epilepsy in the participants, minimizing stigma, and reducing treatment gap [75]. The beyond epilepsy-awareness, education, and advocacy program developed in collaboration with the Tanzania National Nurses Association and a Canadian Nurse Practitioner was implemented successfully in rural Tanzania. Frontline healthcare providers, the majority of whom were nurses, participated in the 5-day education and advocacy initiative covering diagnosis, treatment (using locally available medications), stigma reduction, and action planning which resulted in creation of local epilepsy groups, simple health messaging for radio, education of other healthcare providers, and teachers with subsequent inclusion in schools in one region that previously excluded children with epilepsy. This program demonstrated the broad impact for frontline providers and their role as change agents; this was replicated in Belize and could likely be implemented in many LMICs.

Programs designed to train healthcare workers and primary care physicians are effective in decreasing the burden of many endemic infections which may cause epilepsy. Such is the case of onchocerciasis-associated epilepsy. Onchocerciasis is transmitted by the black fly and affects 37 million people of whom 99% live in Africa [23, 76]. Education to prevent this disorder should include the affected population, in order to minimize misconceptions and stigma [14].

The inappropriate use of available AEDs is another problem in poor-resource areas with no access to subspecialized neurological care. Training of physicians, nurses, community workers, or even traditional healers is needed to reduce this management gap [77]. This training can be provided locally or in academic centers with adequate expertise [78].

Educational programs launched by national neurosurgical societies are important, but restricted local resources may limit them. Collaborations to improve neurosurgical training in LMIC are ongoing and they are producing a positive impact. These include training of neurosurgeons from countries lacking adequate training centers in neighboring regions [79]. There are collaborative efforts between neurosurgical

academic centers in the USA and sub-Saharan Africa, South East Asia Latin America. Advocacy programs from the World Federation of Neurosurgical Societies are raising awareness about the unmet neurosurgical care, as an important global health problem. These programs help to facilitate collaborative efforts [52].

Individual epilepsy and neurological societies have limited budgets for international outreach programs. Multi-society collaboration is then crucial to create high-impact and sustainable educational programs. One such example is the collaboration between the Child Neurology Society and International Child Neurology Association. With the support of local leaders, the societies organized multiple educational symposiums and training workshops in different regions in Africa, the Caribbean, Asia, and Latin America [66•]. These workshops included EEG training, development of ketogenic diet programs, and improvement of infrastructure. The World Health Assembly's resolution on Epilepsy is another example of multi-society collaboration. The resolution consisted of a large-scale global program targeting epilepsy education with implementation in multiple countries [80••].

Advocacy

Advocacy at many levels is essential to increase awareness and drive change to improve the lives of PWE in LMICs. Obtaining epidemiological data about incidence and prevalence of epilepsy in each country is important to create strategies to reduce the treatment gap and evaluate the cost of medical therapy [81].

The global campaign against epilepsy's mission is to improve acceptability, services, treatment, and prevention of epilepsy worldwide. The campaign has been a collaborative effort between the International League against Epilepsy, the International Bureau of Epilepsy, and World Health Organization with local governments and societies in multiple countries. This has been achieved by raising political and public awareness and promoting education, training services, and treatment [82••]. The campaign identified multiple gaps that needed to be addressed. These included knowledge gap, advocacy gap, and public education gap. This global effort has been effective and efforts still continue, with demonstration projects in multiple regions. The resolution has proven to be a powerful tool to engage governments into the creation of concrete action plans directed to improve the care of patients with epilepsy, and it is probably one of the major examples of the impact of advocacy programs at a global level [80••].

Advocacy programs are important in raising awareness at a community level as well. Patients with epilepsy have difficulties accessing education, finding jobs, or getting married. These programs must include local governments, school-teachers, social workers, and non-governmental agencies in order to be successful. One example of a successful advocacy intervention is the "global campaign against epilepsy demonstration project" in China. This was a very successful program with 167,400 patients screened for epilepsy and diagnosis confirmed. After starting treatment (mainly with phenobarbital), 2/3 of patients were seizure free or had seizures reduced by 50% [83].

Children with epilepsy constitute a vulnerable population and face unique challenges because of stigma. The resolution on the global burden of epilepsy was approved in May 2015 by the World Health Assembly. This is an important instrument to improve epilepsy care for children around the world.

Epilepsy has been considered in many countries as part of mental health disorders and included in large-scale advocacy programs. For example, the WHO one health tool, based in campaigns of "global mental health," was used in sub-Saharan Africa and South Asia. This appears to be a useful instrument to create patient-centered programs to promote general wellbeing [84], but epilepsy-specific interventions are needed to dispel myths and improve care. Implementing a global health delivery (GHD) framework can help to improve epilepsy care in low-income counties by focusing on prevention, screening diagnosis, patient–community education, and therapy. This model can reduce the treatment gap in rural areas, improving outcomes and efficiency, reducing disease burden, and increasing economic productivity [85].

The funding for international advocacy and educational programs is limited. Societies can collaborate with short-term training, symposia, and collaborative research, but a global fund for epilepsy is necessary to create a meaningful response to treatment gaps in poor-resource countries [86].

Conclusions and Future Directions

Although many successful programs to close the treatment gap for patients with epilepsy have been implemented in LMIC, there is still more work to be done. Program design and planning should focus on the local needs of the specific regions. These models should be sustainable. Collaboration between local and international societies is essential to create efficient, long-term projects that can benefit patients living in poor-resource areas. By improving communication between the different stakeholders, ideas and resources can be shared to design high-impact programs.

The creation of databases of ongoing global epilepsy projects can facilitate project planning and distribution of resources. Databases should be widely accessible, web-based, and frequently updated. The ILAE Global Health Task Force is piloting a central database for 2019 in order to accelerate its mission of improving epilepsy care worldwide.

Compliance with Ethical Standards

Conflict of Interest   Mary C. Spiciarich, Jane R. von Gaudecker, Laura Jurasek, Dave F. Clarke, Jorge Burneo, and Jorge Vidaurre each declare no potential conflicts of interest.

Human and Animal Rights and Informed Consent   This article does not contain any studies with human or animal subjects performed by any of the authors.

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