Epilepsy Research (2012) **102**, 160—166

journal homepage: www.elsevier.com/locate/epilepsyres

Hot water epilepsy clinical profile and treatment—A prospective study

A. Meghana[a], **S. Sinha**[b,*], **T.N. Sathyaprabha**[a], **D.K. Subbakrishna**[c], **P. Satishchandra**[b]

[a] *Department of Neurophysiology, National Institute of Mental Health and Neuroscience (NIMHANS), Bangalore, India*
[b] *Department of Neurology, National Institute of Mental Health and Neuroscience (NIMHANS), Bangalore, India*
[c] *Department of Biostatistics, National Institute of Mental Health and Neuroscience (NIMHANS), Bangalore, India*

Received 4 February 2012; received in revised form 21 May 2012; accepted 28 May 2012
Available online 22 June 2012

KEYWORDS
Clobazam;
Hot water epilepsy;
Treatment of HWE

Summary
Purpose: This study characterized the demographic, clinical, EEG and imaging profile, and therapeutic outcome among patients with hot water epilepsy (HWE).

Methodology This prospective study included 70 patients with HWE (M:F = 55:15; age: 25.3 ± 8.4 years). Details of demography, seizure characteristics and outcome, and imaging/EEG observations were recorded.

Result: There was male dominance. Majority of the patients belonged to Mandya: 30.5%, Ramanagara: 30.0% and Mysore: 15.2% districts of Karnataka, India. Forty-five patients (M:F = 37:8; age: 24.6 ± 10.1 years) had features of 'HWE alone'. Twenty-five (M:F = 18:7; age: 26.7 ± 7.9 years) had HWE with spontaneous seizures. The age at onset of seizures was comparable in both the groups — HWE: 18.7 ± 10.2 years vs. HWE with spontaneous seizure: 16.8 ± 10.3 years ($p = 0.34$). The duration of seizures were more in HWE with spontaneous seizure group: 119.5 ± 66.9 months compared to HWE alone: 69.9 ± 13.8 months ($p = 0.028$). Inter-ictal EEG ($n = 70$) showed epileptiform activities in 15 patients (21.4%). The therapeutic outcome after 3—8 months of follow up were — (a) HWE group: 6 stopped hot water head bath; 39 were on intermittent clobazam therapy — seizure free: 33; and 6 received AEDs; (b) HWE with spontaneous seizure group: all were on AEDs and seizure free.

Conclusions: Three-fourth of patients belonged to 'Mandya—Mysore belt of Karnataka'. There was increased duration of seizures among those with additional spontaneous seizure. About 3/4th subjects with HWE alone were seizure free with intermittent clobazam and remaining patients on AEDs were seizure free, confirming the earlier observations from this center.

Introduction

Seizures precipitated by a specific sensory stimulus are described as reflex epilepsy. Reflex epilepsies are interesting not only because of their being intriguing neurobehavioral

* Corresponding author at: NIMHANS, Bangalore 560 029, Karnataka, India. Tel.: +91 80 26995150; fax: +91 80 26564830.
E-mail address: sanjib_sinha2004@yahoo.co.in (S. Sinha).

0920-1211/$ — see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.eplepsyres.2012.05.011

phenomenon, but also for the insights they may provide into the pathophysiology of epilepsy. One such reflex epilepsy, hot water epilepsy (HWE), is precipitated by the stimulus of bathing in hot water poured over the head (Mani et al., 1968, 1974; Subrahmanyam, 2012; Satishchandra et al., 1988; Satishchandra, 2003; Szymonowicz and Meloff, 1978). It is also variably known as water-immersion epilepsy or bathing epilepsy (Mofenson et al., 1965; Shaw et al., 1988; Lenoir et al., 1989). The diagnostic scheme proposed by the International League against Epilepsy (ILAE) in 2001 included HWE as a type of reflex epilepsy (Engel, 2001).

Though HWE was first described in 1945 from New Zealand (Allen, 1945), there have been case reports from all round the world: Australia (Keipert, 1969), the United States (Stensman and Ursing, 1971), Canada (Szymonowicz and Meloff, 1978), the United Kingdom (Parsonage et al., 1976), Japan (Kurata, 1979; Morimoto et al., 1985) and Turkey (Bebek et al., 2001). However, it is from southern India, that a large number of cases of HWE have been reported (Mani et al., 1968, 1974; Satishchandra et al., 1988; Satishchandra, 2003). A cohort of 279 HWE cases from a university hospital and tertiary care center, NIMHANS, was evaluated over a 4-year period (1980—1983) (Satishchandra et al., 1988). A prevalence study conducted in the rural community reported prevalence rate of HWE was 60 per 100,000 (Gururaj and Satishchandra, 1992). Mani and colleagues carried out a study at Yelandur, a rural area near Mysore from the state of Karnataka and reported a prevalence rate of HWE was 255 per 100,000 for HWE (Mani et al., 1998). A house-to-house Bangalore urban—rural neuroepidemiologic survey (BURN) of 102,557 population reported that prevalence of epilepsy was 883/100,000 people and HWE accounted for 6.9% of all epilepsies (Gourie-Devi et al., 2004).

The exact etio-pathogenesis of this type of epilepsy is not clear but several factors including genetic factors, environmental factors, consanguineous marriages and habit of taking bath with high temperature water has been postulated as probable reasons (Satishchandra, 2003). In an ongoing effort to understand molecular basis of HWE, seven HWE families with several of their members affected with the disorder were examined and two loci for HWE at chromosome 10q21.3-q22.3 (Ratnapriya et al., 2009b) and 4q24-q28 (Ratnapriya et al., 2009a) were identified.

It is reported that seizures can be controlled with optimum intervention, both lifestyle and pharmacological but if left untreated might progress to spontaneous seizure types with variable outcome (Satishchandra et al., 1998). This study objective was to characterize the demographic, clinical, EEG and imaging profile, and therapeutic outcome among patients with hot water epilepsy (HWE) alone and those with HWE with spontaneous seizures.

Patient and methods

This prospective hospital based study was conducted at a university teaching hospital, a major tertiary care referral center for neuro-psychiatric disorders in south India. The study was approved by the institute ethics committee (IEC). Seventy patients (M:F = 55:15; age at evaluation: 25.4 ± 9.46 years; age at onset of HWE in both groups: 18.17 ± 10.07 years; (range: 10—50 years) duration of HWE with spontaneous seizure 116.5 ± 66.9; duration of spontaneous seizure 91.2 ± 8.9 months; average interval between HWE and spontaneous seizure 3.96 ± 0.56 months) with a diagnosis of HWE were recruited between May 2009 and September 2011 from the neurological services after obtaining written informed consent. The diagnosis of HWE was based on proposed criteria by Commission of the International League Against Epilepsy (Commission on Classification and Terminology of the International League Against Epilepsy, 1989). The recruitment and evaluation was carried out under the supervision of neurologists with special interest in epilepsy research (PSC/SS).

The demographic details of study subjects were determined using the address mentioned in the ration card, which is issued to each individual by the state for the purchase of subsidized essential commodities in India. Recruited patients were evaluated and data related to detailed history of epilepsy including bathing habits, precipitating factor — hot water bath, triggering areas, seizure semiology from eye witness, age at onset of seizures, frequency of seizures, history of epilepsy/HWE in the family, previous history of febrile convulsions/birth related injuries, gross development; personal/family medical histories were recorded. Clinical videography using mobile phone/video camera was performed for the documenting the seizures in patients having 1:1 relation with hot water head bath. Eighteen subjects with frequent and 1:1 relation with hot water head bath consented for it. Using a thermometer, the temperature of the hot water in 2—3 buckets was recorded prior to the head bath and was at 50—55 °C. Eighteen patients underwent clinical video recording during hot water bath: 7 patients had taken hot water bath themselves while in other 11 relatives had poured the hot water and in 8 of them induced seizures could be recorded. Among the 8 patients who got the seizures during video recording, 3 had taken bath themselves and in the remaining 5, relatives had poured the hot water. The details of scalp EEG and neuroimaging observations carried out as per standard procedures were noted.

Data analysis

Data was analyzed using SPSS 15 and then independent samples '*t*' test was used to find the significance of study parameters between 2 groups of patients (a) pure HWE and (b) HWE with spontaneous seizure. Significance was assessed at 5% level of significance. For multivariate frequency distribution of statistical variables, cross tabulation was used. And Chi square test for categorized variables. (Level of significance will be kept at 0.05).

Results

Demographic and clinical features

There were 55 men and 15 women. Majority (74.2%) belonged to the ''hindu'' community in this study. The proportion of the Hindu and Muslim community in state of Karnataka was 83.8% and 12.2%, respectively (India Census, 2001) and the difference was statistically significant (*p*: 0.0205). Majority of the patients belonged to Mandya: