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Original article

# Acute disseminated encephalomyelitis: A 10-year cohort study in Thai children

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ABSTRACT

Childhood acute disseminated encephalomyelitis (ADEM) is a demyelinating disease with variable clinical courses and outcomes. Its evolution to multiple sclerosis in Asian children is yet to be determined. Medical records, investigation results and magnetic resonance imaging of brain of Thai children aged less than 15 years with initial diagnosis of ADEM at a referral university hospital in Thailand from January 1997 to December 2006 were reviewed. Clinical course and the outcome were finalized by telephone interview, self-report questionnaire, and/or neurological examination by December 2008. Modified Rankin Score was applied for determination of disability. MRI findings were categorized along with the locations and number of areas of abnormalities shown by T2-weight and FLAIR. 16 patients consisting of 5 boys and 11 girls (age-range 1–14 years, mean 6.9 ± 3.6 years, median 6 years) were identified. Nine patients had cranial nerve dysfunctions including one child with optic neuropathy. One patient died with confirmed pathological diagnosis of ADEM. Among the remaining 15, who were followed from 2 to 10 years (mean 5.8 years), 13 and 3 patients were classified into monophasic ADEM and multiple sclerosis, respectively. Ten of 13 with final diagnosis of ADEM had complete recovery. There was no association between number of lesions or location in the initial MRI and the outcome and final diagnosis. ADEM in Thai children had similar clinical presentation and outcome to previous studies in Western countries. ADEM can occasionally evolve to multiple sclerosis in Thai children as being shown in previous reports from other Asian countries.



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## 1. Introduction

Acute disseminated encephalomyelitis (ADEM) is an immunologically mediated inflammatory demyelinating disorder, which is frequently preceded by a viral infection or vaccination. The principal pathology involves white matter of the central nervous system. Clinical course is of broad spectrum from mild neurological dysfunction to rapid and fulminant outcomes.[1] Presenting symptoms of ADEM often include various systemic and neurological symptoms. Neurological dysfunctions are generally multifocal and commonly included alteration of mental status and/or altered level of consciousness.[2] Peripheral nerve dysfunctions are also documented.[3] The prognosis and response to treatment are variable. Childhood ADEM possesses mostly favourable outcome and complete clinical recovery is expected. Serious complications in childhood ADEM are rare.[2,4] However, there is a considerable relapse rate ranging from 2% to 29%.[5,6] ADEM as the first manifestation of multiple sclerosis is also evident which varies from 0 to 57%.[4,5,7–17]

In Asian countries, there were studies on clinical presentation, clinical course and outcome of childhood ADEM in India, Taiwan, and Malaysia.[5,12,13,18] The total number of children and young adolescent included into these studies was 131, which is relatively small in comparison to that in Western countries. Recurrent rate and multiple sclerosis in ADEM varied from 4% in Taiwanese children to 7.6% in Northern Indian children which were lower than that in European countries.[5,12]

In Thailand, clinical isolation demyelinating syndrome evolving to multiple sclerosis were documented in Thai children diagnosed with optic neuritis and acute myelopathy in one referral center.[19–21] During the past 10 years, there was an increase in the awareness of the illness among Thai pediatricians. Conversely, there has been no study regarding long-term outcome and evolution of ADEM to multiple sclerosis in the country. In 2007, there was a consensus definition for diagnosis of pediatric demyelinating diseases including ADEM.[22] Therefore, a study to determine the clinical courses and the outcome of childhood ADEM in Thailand according to the proposed criteria was conducted in order to be comparable to other studies. The result may be utilized towards a more constructive care of children with ADEM in the future.

## 2. Methods

Medical records of children aged under 15 years, who were diagnosed with acute myelopathy, acute optic neuritis, acute cerebellar ataxia and acute disseminated encephalomyelitis at the Department of Pediatrics, Ramathibodi Hospital in Bangkok, Thailand from January 1997 to December 2006, were reviewed. To be included into the study, each patient must have clinical presentations which fulfilled the criteria for diagnosis proposed by the International Pediatric Multiple Sclerosis Study Group.[22] Clinical presentation must be polysymtomatic with encephalopathy which is defined as either behavioural change or alterartion of consciousness. Demographic data, preceding symptoms and illness, initial physical examinations, investigations, clinical course during admission, and treatment were collected for descriptive analysis. Magnetic resonance imaging (MRI) of each patient, performed upon admisson, was separately reviewed by neuroradiologist without providing history and physical signs. During the period of this study, 1.5 Teslar magnet MRI consisting of T1, T2, fluid-attenuation inversion recovery sequences (FLAIR) and gadolinium injection were routinely applied to every child in this institution. MRI abnormaltiy was classified according to the locations and number of abnormal locations. Locations of abnormality were listed according to a modification of Barkhof's classification.

**Table 1 – Modified Rankin Score.**

| Level | Description |
|---|---|
| 0 | Asymptomatic |
| 1 | Non-disabling symptoms that do not interfere with life-style |
| 2 | Minor disability symptoms that lead to some restriction of life-style, but do not interfere with the patients' capacity to look after themselves |
| 3 | Moderate disability symptoms that significantly interfere with life-style or prevent totally independent existence |
| 4 | Moderately severe disability symptoms that clearly prevent independent existence although patient does not need constant attention day and night |
| 5 | Severely disabled, totally dependent, requiring constant attention day and night |

Final determination of each patient's clinical course, outcome, and disability was carried out by the end of December 2008. Each patient was invited for an interview and a complete neurological examination. Clinical course was categorized into monophasic ADEM, relapsing ADEM, multiphasic ADEM, and ADEM with subsequent multiple sclerosis. Definition of each final diagnosis was categorized according to the consensus definitions proposed by the International Pediatric Multiple Sclerosis Study Group which were monophasic ADEM, recurrent ADEM, multiphasic ADEM and multiple sclerosis.[22] Those who were not able to participate in person, telephone interview to obtain data on general health, current academic acchievement, education performance, physical ability, disability and medication was applied. Modified Rankin Score was applied for determination of the disability outcomes (Table 1).

Preceding symptoms and illness, initial clinical presentations, investigations, treatment, and clinical course of each child were collected for descriptive analysis. Either Wilcoxon Rank Sum test or Fisher's exact test was applied for comparison or correlation between MRI finding and the final diagnosis whenever applicable.

## 3. Results

Among 39, 294 children admitted into the hospital during the study period, there were 33, 8, 5, and 19 children who were diagnosed with optic neuritis, myelitis, acute cerebellar ataxia and ADEM, respectively. Among 19 children who were previously diagnosed with ADEM, there were 16 children (5 boys and 11 girls) fulfilled the criteria for the diagnosis of ADEM