Original Article

Functional Outcome after Rehabilitation among Different Diagnostic Groups of Childhood Meningoencephalitis

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Abstract

Objective: To study the functional outcomes in different groups of meningoencephalitis patients after rehabilitation approach in addition to standard medical therapy.

Study period: From January 2007 to January 2009.

Study Design: Prospective longitudinal analytical study.

Study Area: Departmentof Physical Medicine & Rehabilitation, Department of Paediatric Medicine in North Bengal Medical College, Sushrutanagar, Darjeeling, India.

Study population: 108 patients.

Material and methods: After taking consent and institutional ethical committee clearance the sample size were assessed. After stabilisation of the affected children with medical therapies, rehabilitation regimen was added.

Outcome measures: Percentage of total Wee FIM score.

Follow up: 0, 2weeks, 6 weeks.

Results: Data analysed by McNamara's chi Square test showed disability rate is much higher than other aetiology. Best prognosis is seen in patients with viral infections.

Discussion: In developing countries children in lower socioeconomic group from rural areas are the most victim of tuberculous meningoencephalitis who responded reasonably with rehabilitation regimen.

Conclusion: Rehabilitation regimen is best helpful in viral infection. Tuberculous infection, relatively commoner in India does not respond very well.

Key words : **Meningoencephalitis, Wee FIM score, disability.**

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Introduction:

Meningoencephalitis ie , inflammation of both the meninges and brain parenchyma, is real challenge in the field of neurorehabilitation. Disability rate is much higher in case of childhood meningoencephalitis because the insult on an immature developing cerebral cortex leads to wide range of neurodeficit. The impact is much higher in developing countries like India due to lower socioeconomic condition and paucity of rehabilitation services available for every affected child.

According to world literature causative organism of meningoencephalitis is mostly the virus followed by bacteria and less likely the parasites, fungi etc.[1,2.] In south East Asia especially in India incidence rate of tuberculous meningoencephalitis is much higher than developed world where immunocompromised children are the most victims[3]. Streptococcus Pneumoniae, Haemophilus

influenzae and *Neisseria meningitides* are common causes of acute bacterial meningitis (ABM) in children during post-neonatal period.[4-8] ABM in early childhood may lead to several potential disabilities including hemiparesis, quadriparesis, visual field defect, cortical blindness, sensoryneural hearing loss, cranial nerve palsies, cerebral palsy, ataxia, complex seizure disorders, learning disabilities, obstructive hydrocephalus, behaviour disorder, neuropsychiatric dysfunction, brain atrophy and so on.[8-11]

Viruses account for most cases of acute meningoencephalitis and enteroviruses (non-polio enteroviruses) are most common among them. Enteroviruses like echoviruses, coxackie virus A and B commonly cause meningitis. Arboviruses cause meningoencephalitis rather than pure meningitis. Japanese B virus is the biggest offender of this group worldwide. Other causes of viral meningitis are HSV-1, HSV-2, mumps, measles, varicella zoster virus etc. Long-term neurological sequel in children from viral meningoencephalitis include quadriparesis, hemiparesis, and neurogenic bladder, loss of speech, blindness, sensorineural hearing loss, seizure disorders, hydrocephalus, parkinsonian features, cranial nerve palsy, learning disabilities, and behaviour disorders and so on. Herpes simplex and arbovirus infections, including Japanese B encephalitis, can cause in severe neurological disorders.[12-14] A study[15] conducted in UK on children with meningitis during first year of life revealed that 42 per cent of children with echovirus meningitis had mild or moderate neurological disabilities till five years of age.

Survivors of TBM may have permanent neurological sequelae. In TBM, dense exudate envelops the arteries and cranial nerves and causes blockade in the flow of CSF, which in turn leads to hydrocephalus. Development of arteritis and infarctions of brain lead to hemiplegia, quadriplegia and other neurodeficits.Due to the variably of disease distribution in India and wide range of neurodeficit and functional impairment, disability spectrum is really different. This project is a humble attempt to find out the efficacy of rehabilitation regimen in meningoencephalitis in a developing country.

Materials and Methods:

The present prospective longitudinal analytical study was conducted in the Departmentof Physical Medicine & Rehabilitation and Department of Pacdiatric Medicine in North Bengal Medical College, Sushrutanagar, Darjeeling, India during the period from January 2007 to January 2009. The patients admitted in the department of Paediatric Medicine in North Bengal Medical College in their age group of 3 to 12 years with meningoencephalitis confirmed clinically, radiologically by CT scan, biochemically by CSF picture with Glasgow coma scale of 15 were included in this study with following exclusion criteria:

1. Neurological and haemodynamic instability
2. Glasgow coma scale <15
3. Past history of neurodeficit like cerebral palsy, Down's syndrome etc.
4. Hypothyroidism
5. Congenital cyanotic heart disease.

Informed consent was obtained from parents of all children and the study was carried out in accordance with the Institutional Ethical Committee. After stabilisation of the patients with appropriate medical treatment like anticonvulsant, antiviral, antibiotic, antituberculous medications etc, a detailed history was taken and clinical examination was done. The relevant clinical findings and history were recorded in the proforma.

Non-pharmacological management protocol

The following rehabilitation protocol was adopted in each case of meningoencephalitis depending on the involvement.

A. *Posture and positioning:* Patients were advised care of the back with frequent change of posture. Proper positioning of all affected limbs was maintained to avoid contractures. Upper limb were kept with shoulder in 90 degree abduction, elbow in 90 degree flexion, wrist in full 30 degrees dorsiflexion and fingers in hand in the form of a grip of a cylindrical object.The lower limb was kept with hip in 30 degree abduction,knee in full extension and ankle in neutral position.

B. *Exercises:* Passive exercise of all affected joints was demonstrated to the parents of each case. They were advised to perform full range of movement at each affected joint, 10 times each and 5 to 6 times a day. Stretching exercise and PNF were also advised in appropriate situation. Sitting balance with or without support followed by standing balance and gait training recommended gradually.

C. *Orthotic management:* Like AFO (ankle foot orthosis), WHO (wrist hand orthosis) was advised in selected cases.

D. *Training of ADL activities:* Each child was given training of activities of daily life so that they can develop self confidence and independence in their day to day life. They were also advised speech therapy and counselling by psychotherapist for their abnormal behaviour as needed.

E. *Nutritional Supplement:* Nutritional supplemention the diet like plenty of milk and its products, sunlight exposure every day for half an hour in the morning, fruits, calcium, iron, vitamin B complex and vitamin D etc.

After initial visit all the patients were followed up at 2 weeks, 6 weeks and detail follow - up results were recorded at 3 months.

Functional assessment:

For assessment of activities of daily living (ADL), we used the Wee FIM (functional independence measures) instrument. (Annexure 1).

Because total normal Wee FIM score varies with age up to the age of seven years, we calculated the percentage of total Wee FIM score of a patient with respect to normal total Wee FIM score of the particular age group of that patient for easy comparison.Functional disability had been described in the study in five grades including:

Disability grade	% of Wee FIM score
Normal or no disability	100%
Mild	90-99%
Moderate	60-89%
Severe	30-59%
Very severe/profound	<30%

Results :

At the end of the study period a thorough statistical analysis by McNamara's Chi-square test was done. In this study population boys were dominating with a male: female ratio of 62:46. Most of the studied patients belonged to rural areas (rural: urban = 8:1). In this whole study group the children from lower socio economic strata of society clearly outnumbered the patient from higher socioeconomic group with a ratio of 8:1. Interestingly it was noted that 27 out of 108 patients were affected by tuberculous infection (61 viral and 20 bacterial infections documented).

Clinical status at the end of 6 weeks:

Clinical status		No of cases
Loss of speech	–	5
Hemiparesis	–	9
Quadriparesis	–	5
Inability to stand	–	6
History of seizures	–	8
Spasticity	–	18
Rigidity	–	3
Bladder involvement	–	9
Abnormal behaviour	–	14

Table 1: ***Assessment of Tuberculous Meningitis Patients (n=27)***

Parameters: Functional ability **(Wee FIM scale)**	Initial assessment (No. of Patients)	Second assessment (No. of Patients)	Final assessment (No. of Patients)
Normal	0	1	5
Mild	2	5	7
Moderate	7	8	6
Severe	8	6	5
Very severe /profound	10	7	4

Table 2: ***Assessment of Viral Meningitis Patients (n=61)***

Parameters: Functional ability **(Wee FIM scale)**	Initial assessment (No. of Patients)	Second assessment (No. of Patients)	Final assessment (No. of Patients)
Normal	0	19	52
Mild	6	21	5
Moderate	11	10	2
Severe	19	7	1
Very severe /profound	25	4	1

Table 3: ***Assessment of Bacterial Meningitis Patients (n=20)***

Parameters: Functional ability **(Wee FIM scale)**	Initial assessment (No. of Patients)	Second assessment (No. of Patients)	Final assessment (No. of Patients)
Normal	0	2	10
Mild	2	5	5
Moderate	5	7	2
Severe	7	4	2
Very severe /profound	6	2	1

Table 4: ***Comparison of Functional Outcome of Three Groups of Meningoencephalitis Patients at the end of Study***

Parameters: Functional ability **(Wee FIM scale)**	Tuberculous meningitis, n -27 (% of patients)	Viral meningities, n=61 (% of patients)	Bacterial meningitis, n=20 (% of patients)	P value
A. Normal	**5 (18%)**	**52 (85%)**	**10 (50%)**	**<.05**
B. Disabled	**22 (82%)**	**9 (15%)**	**10 (50%)**	<.05
Mild	7 (26%)	5 (8.2%)	5 (25%)	—
Moderate	6 (22%)	2 (3.3%)	2 (20%)	—
Severe	5 (19%)	1 (1.6%)	2 (20%)	—
Very severe/profound	4 (15%)	1 (1.6%)	1 (5%)	

Annexure 1:

Wee FIM levels:

	Score	
No helper:	7.	Complete independence (timely safely)
	6.	Modified independence (device)
Helper- modified dependence:	5.	Supervision (subject =100%)
	4.	Minimal assistance (subject = 75% or more)
	3.	Moderate assistance (subject = 50% or more)
Helper complete dependence:	2.	Maximal assistance (subject = 25 % or more)
	1.	Total assistance or not testable (subject < 25 %)

Disability status was variable according to the aetiology of disease.Prognosis was much better in patients with viral infection. It was not so good in patients with bacterial and tuberculour aetiology.

DISCUSSION

Although 130 patients were recruited initially 108 (61 viral, 27 tuberculous, 20 bacterial etiology) completed this prospective study. Unfortunately we lost 8 patients (6 tuberculous and 2 bacterial cases died during the study period) and 14 cases (5 bacterial, 8 viral, 1 tuberculous) dropped out from the study.

The children with male preponderance (male to female ratio was 31:23) mainly from lower socioeconomic group of rural population (ratio of lower: higher income group and rural: urban population were 8:1) were the main victims of this dreadful condition. This observation is corroborative with the other Indian studies of Chinchankar *et al* from Pune, India was reported that out of 31 children of ABM, 55 per cent had long term sequel with significant neurodevelopment handicaps ranging from isolated hearing loss to severe mental retardation with multiple disabilities.[8]

Grimwood *et al* reported that children after ABM suffer from persistent disturbances in learning and memory, behavioural problems and poor academic performance. They also discovered that neuropsychological deficits were frequently aggravated by hearing impairment.[12] in a study by Madagame *et al*,[17] functional outcome of 22 paediatric patients with severe ABM requiring mechanical ventilation was assessed in areas of locomotion, self-care, and communication. Sixty-eight per cent of children showed functional disabilities at the time of discharge and 41 per cent continued to suffer from functional disabilities in different areas of function during follow-up.[17] In our study also significant number of patients suffered from loss of speech, hemiparesis, quadriparesis etc.

Paganini *et al*[18] in a study of 40 cases of TBM reported that 45 per cent of children had completely recovered but mild, moderate and severe neurological sequel were noticed in 18 per cent, 8 per cent and 22 per cent of patients respectively, along with three fatal cases (7 per cent).[18] Schoeman *et al* determined the long-term outcome of TBM in 76 children, who were diagnosed with the disease and treated with ant tuberculosis drugs.[19]

Only 20 per cent of children were found to be completely functionally normal during follow-up. Main areas of functional deficits were cognitive impairment (80 per cent), poor scholastic progress (43 per cent), emotional disturbance (40 per cent) and motor impairment (25 per cent). One child was blind but no child reported sensori-neural deafness. In the present study group lots of children suffered from behavioural abnormality and loco motor disability.

Numerical comparison of their functional abilities by percentage of total Wee FIM score clearly demonstrate that disabilities were maximum with TBM cases, followed by ABM and minimum in viral meningitisduring and at the end of the study. An interesting observation is that all three groups recovered at the most during the first two weeks of rehabilitation process, after which the rate of recovery slowed down. The best results were noticed in patients with viral meningitis because 85 per cent of these cases displayed normal functional abilities at six weeks in contrast with 82 per cent of tubercular cases showed residual disabilities at six weeks. Almost half of the patients with bacterial infections landed up with residual disabilities at the end of study.

CONCLUSION:

Disability in tuberculous meningoencephalitis which is predominant in developing country is much higher even after proper rehabilitation programmes. Although viral meningoencephalitis is most common, children became mostly independent with appropriate pharmacological and non-pharmacological measures.

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