ACUTE DISSEMINATED ENCEPHALOMYELITIS (ADEM) IN CHILDREN: A MULTICENTER RETROSPECTIVE STUDY

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ICNC 2022 — 17th INTERNATIONAL CHILD NEUROLOGY CONGRESS

INTRODUCTION

The clinical landscape of acute disseminated encephalomyelitis (ADEM) has been better recognized due to recent advances in the field, particularly the identification of myelin oligodendrocyte glycoprotein (MOG) antibodies.

OBJECTIVES

- To evaluate demographic, clinical, laboratory data and outcome characteristics in a large cohort
- To investigate the role of anti-MOG antibodies in clinical findings and outcome

MATERIALS AND METHODS

- ADEM patients (n=245) from 24 centers followed up between 2010 and 2022 were evaluated.
- The outcome of 172 patients followed-up ≥ 1 years.
- **Incomplete recovery** was considered as having:
  - **a modified Rankin Score (mRS)≥1**
  - with/or **epilepsy** at the end of 1-year follow-up.

Table 1: Final diagnoses of the relapsing ADEM patients according to anti-MOG status

	Serum anti-MOG antibody		
Final Diagnosis	Positive (n)	Negative (n)	Unavailable(n)
Multiphasic ADEM (n=9)	3	2	4
Multiple sclerosis* (n=8)	0	6	2
ADEM-ON (n=3)	1	0	2
Unclassified (n=3)	3	-	-

*Recieved the diagnosis of MS within 10-60 months.

RESULTS

Clinical Landscape:

Relapsing ADEM (Table 1)

- **9.4%** (23 patients) of the cohort (n=245) **relapsed.**

ADEM with MOG antibodies (Table 2)

- Serum anti-MOG IgG tested in 89 patients by cell-based assay immunofluorescence were positive in **31.5%.**
- Children with MOG antibodies:
  - were **younger**
  - had **higher white blood cell counts**
  - had **a higher rate of basal ganglia involvements** on MRI
- Anti-MOG IgG positivity was not associated with the need for a intensive care unit, relapse, or recovery.

Outcome:

Incomplete recovery (Table 3)

[Modified Rankin Score (mRS)≥1 (n=26), epilepsy (n=20), (p<0.05)]

- Among patients with at least one-year follow-up, 43/172 **(%25)** patients had **incomplete recovery** associated with:
  - **Glasgow Coma Score <10 on admission**
  - **need for intensive care unit**
  - **need for mechanical ventilation**
  - **presence of seizures on admission**

CONCLUSIONS

- The clinical landscape of ADEM was more accurately defined in the MOG antibody era.
- The relapse rate of 9,4% in this series supports the often monophasic nature of ADEM.
- The overall prognosis is good, regardless of the anti-MOG antibody status.
- The clinical severity on admission appeared to be the most important prognostic factor.

Table 2: Clinical features and short term outcome of MOG IgG+ and MOG IgG- ADEM patients

		ADEM (MOG IgG+) n=28 (31,5%)	ADEM (MOG IgG –) n=61 (68,5%)	p value (<0.05)
Age (years) mean ±SD		5.1±2.7	7.1±3.4	**0.006***
Sex n (%)	Female	14(50)	27(44.3)	0.652†
	Male	14 (50)	34(55.7)	
White blood cells (/mm³)		15100±6116	12168±5830	**0.05***
Seizure	Yes	7 (25)	9 (15.5)	0.304†
	No	21 (75)	49(84.5)	
MRI Findings	White Matter	21 (77.8)	40 (74.1)	0.716*
	Corpus callosum	1 (3.7)	5 (9.3)	0.658*
	Basal Ganglia	13 (48.1)	14 (25.9)	**0.046***
	Thalamus	8 (29.6)	26 (48.1)	0.111*
	Brain Stem	16 (59.3)	32 (59.8)	0.899*
	Cerebellum	12 (44.4)	19 (35.2)	0.419*
	Spinal Cord	12 (44.4)	14 (26.4)	0.104*
	Periventricular	8 (29.6)	12 (22.2)	0.466*
	Optic nerve	1 (3.7)	9 (16.7)	0.95*
	Contrast enhancement	9 (32.1)	24 (39.3)	0.281*
Treatment	Steroid	26 (92.9)	60 (98.4)	0.182†
	IVIG	13 (46.4)	25 (41)	0.674†
	Plasmapheresis	1(3.6)	5(8.2)	0.409†
Need for ICU	Yes	11 (39.3)	15 (25)	0.171†
	No	17 (60.7)	45(75)	
Duration of ICU (days) mean ±SD		7 (7-76)	16 (9-32)	0.596*
Need for MV	Yes	4 (14.3)	4 (6.6)	0.269†
	No	24 (85.7)	55 (93.4)	
mRS at 3rd month	0	16 (88.9)	28 (68.3)	0.116†
	≥1	2 (11.1)	13 (31.7)	
mRS at 1st year	0	21 (91.3)	39 (86.7)	0.707†
	≥1	2 (8.7)	6 (13.3)	
Relapse	Yes	7 (25)	8 (13.1)	0.164†
	No	21 (75)	53 (86.9)	
Epilepsy	Yes	3 (13.6)	8 (14.3)	0.918†
	No	19 (86.4)	48 (85.7)	
Recovery	Complete	20 (82)	39 (75)	0.627†
	Incomplete	5 (18)	13 (25)	

*Student's t-test, †McNemar's Chi Square/Fisher's exact test, p<0.05 significance level
ND: not defined, CSF: Cerebrospinal fluid, ICU: Intensive care unit, IVIG: Intravenous immunoglobulin, MV: Mechanical ventilation, mRS: Modified Rankin Scale

Table 3: The relation between clinical and laboratory findings and 1-year outcome

		Complete recovery n (%), 129 (75)	Incomplete recovery n (%), 43 (25)	p-value (<0.05)
Age (mean ±SD)		6.5±3.8	6.4±3.7	0.891*
Sex n (%)	Female	46 (35.7)	17 (39.5)	0.648†
	Male	83 (64.3)	26 (50.5)	
Precedent events n (%)	Immunization	3 (2.3)	1 (2.3)	0.313†
	Infection	98 (76)	38 (88.4)	
	ND	28 (21.7)	4 (9.3)	
White blood cells (/mm³) mean ±SD		12205±5052	12480±5638	0.529*
CSF protein	Normal	81 (76.4)	25 (67.6)	0.290†
	High	25 (23.6)	12 (32.4.)	
CSF/blood IgG Index	Normal	31 (62)	9 (75)	0.512†
	High	19 (38)	3(25)	
Seizure at onset	Yes	27 (21.4)	21 (48.8)	**0.001†**
	No	99 (78.6)	22 (51.2)	
Glasgow Coma Scale on admission	<6	6 (4.7)	6 (14)	**0.001†**
	6-10	14 (10.9)	14 (32.6)	
	>10	108 (83.7)	22 (51.2)	
Treatment lag	1 day	34 (27.2)	11 (25.6)	0.068†
	2-7 day	68 (54.4)	30 (69.8)	
	>7 day	23 (18.4)	2 (4.7)	
Treatment	Steroid	121 (93.8)	41 (95.3)	0.999†
	IVIG	49 (38)	20 (46.5)	0.323†
	Plasmapheresis	9 (7)	9 (20.9)	0.010†
Need for ICU	Yes	37 (29.4)	24 (55.8)	**0.003†**
	No	89 (70.6)	19 (44.2)	
Duration of ICU (mean ±SD)		10 (7-16)	17.5 (5-60)	0.084*
Need for MV	Yes	7 (5.5)	8 (19)	**0.012†**
	No	121 (94.5)	34 (81)	
Duration of MV median (min-max)		5.5 (1-10)	9.5 (4-20)	0.052*
mRS on admission	0	5 (4.1)	-	0.207†
	≥1	118 (95.9)	38 (100)	
Relapse	Yes	12 (9.3)	6 (14)	0.388†
	No	117 (90.7)	37 (86)	
Anti-MOG Ab status	Negative	28 (65.1)	11 (78.6)	0.511†
	Positive	15 (34.9)	3 (21.4)	
	ND	86	29	

*Student's t-test, †McNemar's Chi Square/Fisher's exact test, p<0.05 significance level
ND: not defined, CSF: Cerebrospinal fluid, ICU: Intensive care unit, IVIG: Intravenous immunoglobulin, MV: Mechanical ventilation, mRS: Modified Rankin Scale

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