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Immunoglobulin Profile in Tuberculous and Pyogenic Meningitis

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Cerebrospinal fluid (CSF) and serum immunoglobulins (Ig) have been studied in healthy children by Chandra *et al.*(1) and in disease by others(2,3). Little attention has been paid to the quantitative assessment of various Ig in CSF and serum in meningitis. This study was undertaken to assess the diagnostic and clinical significance of serum and CSF Ig to distinguish between tuberculous and pyogenic meningitis (TBM and PM, respectively).

Materials & Methods

Fifty established cases of meningitis admitted to Kalawati Saran Children's Hospital were studied. Twenty age and sex matched children undergoing elective surgery under spinal anesthesia for unrelated cause served as controls. The cases and controls were divided into 6 groups (I-VI) according to age (*Table I*).

CSF analysis was done in all cases. Total proteins were estimated using tur-

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TABLE I– *Ig Levels in CSF and Serum in Controls in Different Age Groups*

	Age groups	Serum IgG	Serum IgA	Serum IgM	CSF IgG	CSF IgA	CSF IgM
I	1 day-6 weeks	908.8 ± 79.7	48.7 ± 7.4	56.3 ± 10.3	3.5 ± 0.7	ND	ND
II	6 weeks-6 mo	608.9 ± 187.8	43.4 ± 73.7	87.4 ± 14.0	3.3 ± 0.4	ND	ND
III	6 mo-1 yr	809.3 ± 178.9	48.5 ± 17.2	90.2 ± 16.2	2.3 ± 1.2	ND	ND
IV	1-2 yr	1226.0 ± 181.3	75.2 ± 16.8	138.3 ± 17.8	3.6 ± 0.9	ND	ND
V	2-6 yr	1387.0 ± 190.7	101.7 ± 17.7	174.8 ± 18.8	5.9 ± 2.3	ND	ND
VI	6-12 yr	1508.0 ± 208.2	185.8 ± 16.8	168.7 ± 18.8	3.5 ± 2.0	0.3 ± 0.5	
		1074.67 ± 171.1	83.88 ± 24.9	119.28 ± 15.9	3.68 ± 1.25	–	–

ND = Note done.
The values are mean ± SD in mg/dl.

bidimetric method(4). CSF Igs (IgG, IgA and IgM) were estimated by serial radial immunodiffusion technique(5) using low concentration plates. Serum Igs (IgG, IgA and IgM) were estimated using tripartigen plates (Hoechst).

Statistical analysis was done by Student's 't' test.

Results

The distribution of Ig in controls in CSF and serum is shown in *Table I*. In controls, CSF IgM was completely absent. Ig A was detected only in Group VI (6-12 years) while IgG was found in similar concentration in all age groups. Serum IgM showed a significant rise with age in healthy controls, while IgG and IgA showed a gradual increase after the age of 6 months.

Table II shows the distribution of Igs in meningitis. There was a significant ($p < 0.01$) rise in all the three components of Ig in serum and CSF in TBM and PM. Although the mean serum and CSF Igs (IgG, IgA and IgM) were higher in TBM than PM, there was no statistical significance.

Table III shows CSF Igs expressed as a percentage of CSF total proteins in TBM and PM. IgG expressed as a percentage of total CSF proteins (IgG/CSF total proteins × 100) showed a significantly ($p < 0.01$) higher value in TBM as compared to PM subjects. When compared with healthy controls, TBM and PM cases showed a higher value for all the three Igs (P_1 and P_2 in *Table III*).

TABLE II – *Serum and CSF (Mean ± SD) Test and Control Cases*

	Serum (mg/dl)			CSF (mg/dl)		
	IgG	IgA	IgM	IgG	IgA	IgM
PM (n=29)	1896.2 ± 250.0	130.4 ± 19.5	164.2 ± 21.6	22.8 ± 4.8	2.56 ± 1.2	3.56 ± 2.03
TBM (n=21)	1826.65 ± 430.8	178.57 ± 112.6	190.28 ± 41.5	31.42 ± 5.5	6.27 ± 2.5	4.27 ± 2.5
Control (n=20)	1074.67 ± 171.1	83.88 ± 24.9	119.28 ± 15.9	3.68 1.25	—	—

TABLE III – *CSF Igs Expressed as a Percentage of CSF Total Proteins (Mean ± SD%)*

Cases	IgG/CSF total proteins × 100	IgA/CSF total proteins × 100	IgM/CSF total proteins × 100
Control (n=20) TP = 32.33 mg/dl	11 ±08	0.15 ± 40	Zero
TBM (n=21) TP = 82.16 mg/dl	46 ± 18	3.4 ± 1.0	4 ± 4
P_1 value	<0.001	<0.001	<0.001
PM (n=29) TP=92.33 mg/dl	25 ± 11	2.8 ± 2.0	3.9 ± 3.2
p_2 value	<0.001	<0.001	<0.001
p_3 value	<0.001	<0.2	<0.9

p_1 = Controls vs TBM, p_2 = Controls vs PM, p_3 = TBM vs PM

Discussion

Meningitis is a common and a serious disease of childhood. It is often very difficult to differentiate between TBM and PM, thus hindering the initial specific management of the disease. In the recent past, Ig estimation in CSF has been proposed to be of diagnostic value(6,7).

In the present study, serum and CSF IgG, A and M were significantly raised in patients of TBM and PM when compared with age and sex matched controls ($p < 0.001$). These findings are in accordance with the earlier observations(7,8).

The mean value of CSF IgG expressed as percentage of total CSF proteins is reported to be of high diagnostic significance

($p < 0.001$) to differentiate between PM and TBM. The mean CSF IgG percentage in healthy non-meningitic children is 11 ± 8% while it is raised in PM and TBM (25 ± 11 and 46 ± 18%, respectively). A similar observation has been made by Varani *et al.*(7). Hence, a mean CSF IgG percentage of more than 25% forms a highly useful diagnostic tool to establish and distinguish TBM from PM. This helps to institute an early and proper specific therapy, which would lead to a better prognosis of the case and reduce the overall morbidity and mortality.

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Hemoptysis in Tetralogy of Fallot

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Hemoptysis is a potentially lethal pulmonary complication of congenital cyanotic heart disease seen infrequently in Pediatric practice. It may be caused by rupture of enlarged bronchopulmonary collaterals, underlying hematological disorder or infections like tuberculosis. During last one year, we saw four cases of Tetralogy of Fallot (TOF) presenting with hemoptysis, out of a total of 21 admissions to the Pediatric emergency with various complications of TOF.

Case Reports

Four cases of TOF were admitted to the Pediatric Emergency of PGIMER, Chandigarh in 1989, with the complaint of hemoptysis. All patients were male, between 8-13 years of age (mean 11.2 years). The diagnosis of TOF was made clinically, electrocardiographically and confirmed by echocardiography. The details of all the four patients are given in *Table I.*

Discussion

In the natural history of TOF,

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