

# Clinical Status of Lactate Dehydrogenase Activity in Cerebrospinal Fluid with Age and Sex Distribution in Different Types of Meningitis

## Abstract

**Aim:** The cerebrospinal fluid concentrations of Lactate dehydrogenase (LDH) were studied in patients with pyogenic, tubercular and viral meningitis in different age and sex group.

**Material and methods:** A total of 160 cases, aged between 1 month and 60 years, including patients with bacterial meningitis (n=50), pyogenic meningitis (n=46), viral meningitis (n=24) and a control group (n=40), were analyzed on the basis of data from the initial clinical examinations.

**Results:** Significant increase in LDH level ( $P < 0.001$ ) were observed in the test group when compared to the control group. Bacterial meningitis is more common than non bacterial meningitis. Pyogenic meningitis is more prevalent under 1 year of age group while tuberculous meningitis is seen most frequently between 3 to 5 year of age.

**Conclusion:** The maximum prevalence of different types of meningitis was in the age group of 1 to 10 years age. The LDH level did rise quite significantly in pyogenic meningitis.

**Keywords:** LDH; Lactate dehydrogenase; CSF; Cerebrospinal fluid; Meningitis; Cell injury; Isoenzymes

## Research Article

Volume 4 Issue 5 - 2016

**Manish K Sinha<sup>1</sup>, Mayuri Prasad<sup>2</sup>, SS Haque<sup>3\*</sup>, Rawi Agrawal<sup>4</sup>, Anju Singh<sup>5</sup>, Uday Kumar<sup>6</sup>, Amitesh Kumar<sup>7</sup> Rekha Kumari<sup>8</sup> and Keshari JR<sup>9</sup>**

<sup>1</sup>Department of Biochemistry, Patna Medical College and Hospital, India

<sup>2</sup>Department of periodontology, Buddha Institute of Dental Sciences and Hospital, India

<sup>3</sup>Department of Biochemistry, Indira Gandhi Institute of Medical Sciences, India

<sup>4,5</sup>Department of Pathology, Indira Gandhi Institute of Medical Sciences, India

<sup>6,7</sup>Department of Gastroenterology, Indira Gandhi Institute of Medical Sciences, India

<sup>8,9</sup>Department of Biochemistry, Indira Gandhi Institute of Medical Sciences, India

**\*Corresponding author:** SS Haque, Department of Orthopedics, Department of Biochemistry, Indira Gandhi Institute of Medical Sciences, India, Email: sshaq2002@yahoo.co.in

**Received:** November 17, 2016 | **Published:** December 30, 2016

## Introduction

Cerebrospinal fluid (CSF) examination is often of crucial importance in the diagnosis of neurological disease [1]. CSF is secreted mainly by the choroid plexuses of the lateral, III<sup>rd</sup> and IV<sup>th</sup> ventricles with a small additional contribution from the cerebral subarachnoid space and the ependymal lining of the ventricles. In healthy individual, the CSF concentration of LDH is approximately 10% of the normal serum levels and is a nonspecific marker of CNS cell injury.

Lactate dehydrogenase intracellular tetramer protein, expressed as five isoenzymes having different distribution in various tissues [2,3]. It is an important indicator of bacterial meningitis [4,5] and it help to differentiate bacterial from non bacterial meningitis [6,7]. Viral meningitis is usually associated with normal or mildly elevated LDH levels, while bacterial meningitis is usually associated with significantly higher levels [8].

In the cases of pyogenic meningitis the infection is caused either by haematogenous route or by extension of infection from nearby structures such as ears, paranasal sinuses, osteomyelitic foci in the skull etc. We investigated the role of cerebrospinal fluid concentrations of Lactate dehydrogenase (LDH) in patients with pyogenic, tubercular and viral meningitis in different age and sex group.

## Material and Methods

The present study carried out at Department of Biochemistry, Darbhanga Medical College and Hospital, Darbhanga during the period from Feb 2009 to Nov 2010.

Total 160 CSF samples were examined. Out of them 120 patients of all age groups and either sex of clinically suspected cases of meningitis were taken as test group. 40 control subjects of all age and either sex having no neurological, hepatic, muscular, and cardiac disorders were taken as control group. Cerebrospinal fluids were collected by the lumbar puncture with all aseptic and antiseptic precautions were taken in a clean, dry and sterile vial. CSF was centrifuged at 3000 rpm for 10 minutes and estimation of LDH, LDH was estimated by UV kinetic method (using Kit) by semi-auto analyzer.

## Results

In our study 40 control subjects were age ranged from 1 - 60 years with a mean of 26.4 years (Table 1).

**Table 1:** Showing age distribution of controls and their percentage.

Age Group in Years	No. of Cases	Percentage
1 – 10	11	27.5
11 – 20	9	22.5
21 – 30	4	10
31 – 40	8	20
41 – 50	4	10
51 – 60	4	10
Total	40	100

The maximum number of control cases was in the age group of 1-10 years (27.5%) and the minimum number in the age group of 21-30, 41-50 and 51-60 years age group i.e. 4(10.0%) in each age group (Table 1). The range of age was 1-60 years with mean of 26.4 years, and out of these 24 were males and 16 were female with a male: female ratio of 1.5:1 (Table 2).

**Table 2:** Showing sex distribution of controls.

Sex	No. of Cases	Percentage	Male: Female Ratio
Male	24	60	1.5 : 1
Female	16	40	

The cases studied include 46 cases of pyogenic meningitis, 50 cases of tuberculous meningitis and 24 cases of viral meningitis. The prevalence of meningitis is more common in males than females (2.75:1) (Table 3), and that it is more prevalent in younger age group (1-10 years) (Table 4). Relatively more exposure of males to the environment and less of immunity to be present in younger age group may be accountable to these findings. Still, to conclude on fewer numbers of cases in the present series is not without risk and it needs further probe and work.

**Table 3:** Showing sex incidence in different groups of meningitis.

Group of disease	Male	Female	Male : Female
Pyogenic Meningitis	36	10	3.6:1
Tuberculous Meningitis	36	14	2.57:1
Viral Meningitis	16	8	2:01

**Table 4:** Showing distribution of patients of different types of meningitis in various age groups.

Age Group in Years	No. of Cases in Pyogenic Meningitis	No. of Cases in Tuberculous Meningitis	No. of Cases in Viral Meningitis
1 – 10	18	24	12
11 – 20	8	8	6
21 – 30	10	8	4
31 – 40	2	6	2
41 – 50	2	2	-
51 – 60	6	2	-

The CSF – LDH level is more in pyogenic, and tuberculous meningitis as compared to control, which is statistically highly significant ( $P < 0.0001$ ). It is also more in viral meningitis than control, which is also statistically significant ( $P < 0.05$ ) (Table 5).

**Table 5:** Showing the statistical analysis of CSF-LDH level of different types of meningitis in comparison to that of control.

Group studied	Mean of LDH in IU/L	't' value	'p' value	Remarks
Control	31.0	-	-	
Pyogenic Meningitis	247.65	25.05	<0.0001	Highly Significant
Tuberculous Meningitis	154.24	14.99	<0.0001	Highly Significant
Viral Meningitis	49.58	4.19	<0.05	Significant

## Discussion

Meningitis is a significant cause of morbidity and mortality in children worldwide. Quick diagnosis in acute bacterial meningitis is due to large spectrum of signs and symptoms. The activity of LDH varies from person to person and also from laboratory due to variation in the standardization of apparatus and reagents used.

The CSF-LDH level in control group of individuals is in close agreement with the observations made by other workers like Choudhary, Guruswami & Das, et al. [9-11]. This value also corresponds with the work of Donald et al. [12]. Marked rise in CSF-LDH activity could be explained on the basis of the followings:

- Increased permeability of cerebral cell membrane.
- Leucocytes being the main source of LDH, these rise to higher level of CSF-LDH as their number is increased in pyogenic meningitis.
- The inflammatory process in pyogenic meningitis causing more damage to brain leading to greater liberation of the enzymes.

In pyogenic meningitis CSF-LDH activity may be of significant, complimentary importance together with routine study in judging the diagnosis, severity of diseases, the effect of treatment and so the final outcome- the prognosis. Pyogenic meningitis is more prevalent under 1 year of age group while tuberculous meningitis is seen most frequently between 3 to 5 year of age. The LDH level did rise quite significantly in pyogenic meningitis.

The present series of work has indicated that the CSF-LDH level is near to that of normal control values in cases of viral meningitis and meningoencephalitis; is significantly raised in tuberculous meningitis and is still more raised in cases of pyogenic meningitis. It may be concluded that the CSF-LDH estimation is of value in diagnosis of different types of meningitis and is of prognostic value in tuberculous and pyogenic meningitis.

## Conclusion

Pyogenic meningitis is more prevalent under 1 year of age group while tuberculous meningitis is seen most frequently

between 3 to 5 year of age. So CSF- LDH estimation is of importance as a diagnostic and prognostic tool for different types of meningitis at different age.

## References

1. Adams RD, Victor M (1989) Special techniques for neurological diagnosis, Principles of neurology, (4<sup>th</sup> edn), McGraw Hill 10, USA.
2. Fleisher M, Wasserstrom WR, Schold SC, Schwartz MK, Posner JB (1981) Lactic dehydrogenase isoenzymes in the cerebrospinal fluid of patients with systemic cancer. *Cancer* 47(11): 2654-2659.
3. Subhash MN, Rao BS, Shankar SK (1993) Changes in lactate dehydrogenase isoenzymes pattern in patients with tumors of the central nervous system. *Neurochem Int* 22(2): 121-124.
4. McArthur JC, Nance-Sproson TE, Griffin DE, Hoover D, Selnes OA, et al. (1992) The diagnosis utility of elevation in cerebrospinal fluid beta 2-microglobulin in HIV-1 dementia. *Neurology* 42(9): 1707-1712.
5. Watson MA, Scott MG (1995) Clinical utility of biochemical analysis of cerebrospinal fluid. *Clin Chem* 41(3): 343-360.
6. Knight JA, Dudek SM, Haymond RE (1981) Early diagnosis of bacterial meningitis - cerebrospinal fluid glucose, lactate and lactate dehydrogenase compared. *Clin Chem* 27(8): 1431-1434.
7. Wellmer A, Prange J, Gerber J, Zysk G, Lange P, et al. (2001) D-and L-lactate in Rabbit and Human Bacterial meningitis. *Scand J Infect Dis* 33(12): 909-913.
8. Knight JA, Dudek SM, Haymond RE (1981) Early diagnosis of bacterial meningitis - cerebrospinal fluid glucose, lactate and lactate dehydrogenase compared. *Clin Chem* 27(8): 1431-1434.
9. Chaudhuri BR, Das HK (1976) Enzyme pattern in vascular disease of brain. *J Indian Med Assoc* 67(6): 137-142.
10. Guruswaami P, Ramakrishnan S (1987) Biochemical parameters in the differential diagnosis of meningitis. *Indian J Med Res* 86: 226-231.
11. Das AK, Biswas TK, Dutta SK (1988) Pyogenic Meningitis with special reference to Lactic dehydrogenase in CSF. *J Indian Med Assoc* 86(8): 215-217.
12. Donald PR, Malan C (1986) Cerebrospinal fluid lactate and lactate dehydrogenase activity in the rapid diagnosis of bacterial meningitis. *S Afr Med J* 69(1): 39-42.