

Evaluation of Lactate Dehydrogenase Activity in Cerebrospinal Fluid in Different Etiology of Meningitis

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Abstract

Background: Meningitis remains a challenge and often a thorough Cerebrospinal fluid (CSF) examination may not give a precise diagnosis and prognosis of different types of meningitis. Bacterial meningitis is still a very common problem especially in many developing countries.

Aim: To evaluate the diagnostic and prognostic significance of Lactate Dehydrogenase (LDH) enzymes in CSF of different types of meningitis.

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. The LDH activity was significantly elevated in the CSF and serum (p < 0.001) in cases of pyogenic (PM) as well as tuberculous meningitis (TBM). Bacterial meningitis is more common than non bacterial meningitis.

Conclusion: The enzymatic activity of LDH although significantly raised in PM compared to TBM but there was no cutoff level to differentiate them. The LDH level did rise quite significantly in pyogenic meningitis.

Introduction

Lactate dehydrogenase (LDH)

Is zinc containing most important intracellular enzymes, which plays vital role in intermediary glucose metabolism. It is ubiquitously distributed in animal cells. It is found in body tissues especially in heart, brain, liver, muscles and haemopoietic cells. LDH in cerebrospinal fluid (CSF) is commonly used in diagnosis of bacterial meningitis. Bacterial meningitis is still a considerable cause of mortality and morbidity especially in children [1-3]. Although many studies have acknowledged the CSF in either diagnosis or prognosis of bacterial meningitis patients [4-6], recent studies, however emphasize the fact that absence or low levels of CSF (especially after 12 hours

manifestation of clinical symptoms) strongly rule out bacterial meningitis [7].

The present work has been undertaken with aims to assess whether there is any significant difference in LDH activity in CSF in different types of meningitis, so that it can differentiate between pyogenic, tuberculous and viral meningitis.

Material and Methods

The present study carried out at Department of Biochemistry, Darbhanga Medical College and Hospital, Darbhanga, 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, protein and sugar were done with clear supernatant parts of CSF. LDH was estimated by UV kinetic method (using Kit), protein and sugar End-point method (using Kit) by semi-auto analyzer.

Results

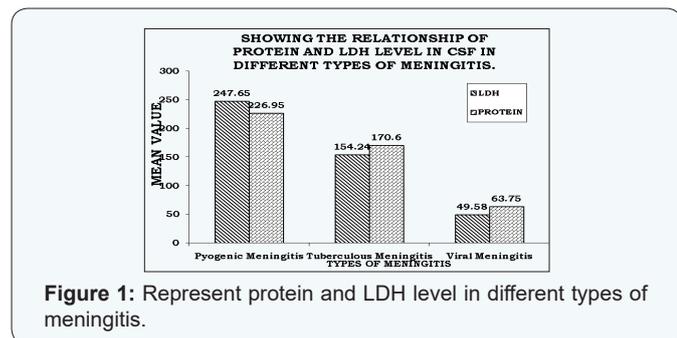


Figure 1: Represent protein and LDH level in different types of meningitis.

The mean values for CSF protein and LDH level in different types of meningitis are shown in Figure 1. The LDH level did rise quite significantly in pyogenic meningitis (Mean 247.65 IU/L Range 181-333 IU/L and $p < 0.0001$). In control group the

range of CSF-LDH was 10-44 I.U/L with a mean of 31.0 ± 9.47 I.U/L (Figure 2). It was almost concluded that the estimation of CSF-LDH is of diagnostic as well as prognostic value particularly if interpreted together with clinical examination and routine cytochemical examinations. In cases of tuberculous meningitis also the CSF-LDH level was significantly high but less than that of pyogenic meningitis (Range 95-250 IU/L, Mean 154.24 IU/L, $p < 0.0001$). In tuberculous meningitis also CSF-LDH estimation is of diagnostic and prognostic importance. In viral meningitis the CSF-LDH levels was slightly higher than that of normal and significantly lower than that of tuberculous meningitis and pyogenic meningitis (Range 22-73 IU/L, Mean 49.58 IU/L, S.D. 15.58 IU/L and S.E.M. 4.49 IU/L shown in Table 1. In viral meningitis CSF-LDH estimation may differentiate it from that of tuberculous and pyogenic meningitis and so of diagnostic importance.

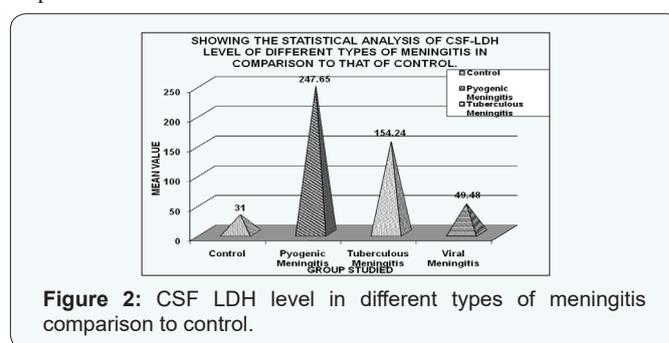


Figure 2: CSF LDH level in different types of meningitis comparison to control.

Table 1: Table showing the mean, S.D, 't' and P values of CSF LDH, protein, sugar levels in different types of meningitis.

| Types of Meningitis | LDH IU/L | | | | Protein mg/100 ml | | | | Sugar mg/100 ml | | | |
|------------------------|----------|--------|------------|----------|-------------------|--------|------------|----------|-----------------|--------|------------|----------|
| | Mean | ± S.D. | 't' values | P values | Mean | ± S.D. | 't' values | P values | Mean | ± S.D. | 't' values | P values |
| Pyogenic Meningitis | 247.65 | 37.58 | 31.38 | 0.0001 | 226.95 | 138.47 | 7.86 | 0.0001 | 23.87 | 8.976 | 12.76 | 0.0001 |
| Tuberculous Meningitis | 154.24 | 36.66 | 21.04 | 0.0001 | 170.6 | 36.64 | 23.27 | 0.0001 | 39.48 | 9.22 | 21.46 | 0.0001 |
| Viral Meningitis | 49.58 | 15.58 | 11.04 | 0.0001 | 63.75 | 10.25 | 21.54 | 0.0001 | 66.25 | 12.07 | 19.04 | 0.0001 |

Table 1 shows that CSF-LDH, mean levels in pyogenic meningitis, tuberculous meningitis and viral meningitis were 247.65 ± 37.58 , 154.24 ± 36.66 , and 49.58 ± 15.58 IU/L respectively, which is highly significant ($P < 0.0001$) as compared to controls. CSF-protein, mean levels in pyogenic meningitis, tuberculous meningitis and viral meningitis were 226.95 ± 138.47 , 170.6 ± 36.64 , and 63.75 ± 10.25 mg/100 ml, respectively, which is highly significant ($P < 0.0001$) as compared to controls. CSF-sugar, mean levels in pyogenic meningitis, tuberculous meningitis and viral meningitis were 23.87 ± 8.976 , 39.48 ± 9.22 , and 66.25 ± 12.07 mg/100 ml, respectively, which is highly significant ($P < 0.0001$) as compared to controls.

- a) Tuberculous infection producing reactions in the cerebral tissue, leading to liberation of enzyme in CSF.
- b) Leukocytes being the main source of endogenous enzymes, these cells give rise to higher level of CSF-LDH

because their number is increased in the CSF due to tuberculous infections.

- c) Increased cerebral cell membrane permeability carried out by tuberculous infection liberating the enzymes into the subarachnoid space.

Discussion

The meningitis is one of the important causes of considerable morbidity and mortality in children's. In order to differentiate aseptic meningitis to the bacterial meningitis, numbers of studies have shown the effectiveness of rapid and definite tests using CSF variables and markers of peripheral blood for various common and uncommon laboratory measurements [8-10]. This observation is quite in accordance with the observations made earlier by M Sharma et al. [11]; Moshe Nussinovitch et al. [12] who also observed raised LDH level in the CSF of patients

of pyogenic meningitis. Some researchers have suggested a disturbance in the blood-brain barrier which enables plasma LDH to reach the CSF, or production of LDH by neoplastic tissue or by white blood cells and exogenous bacterial sources [13-15]. In viral meningitis CSF-LDH estimation may differentiate it from that of tuberculous and pyogenic meningitis and so of diagnostic importance.

So CSF-LDH estimation is of importance as a diagnostic and prognostic tool as far as the dreaded disease of different types of meningitis are concerned.

Conclusion

Bacterial meningitis is more common and frequently reported than non bacterial meningitis. Evaluation of CSF-LDH activity differentiates pyogenic meningitis from non bacterial meningitis.

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