



# STUDY OF SERUM ALANINE TRANSAMINASE: SERUM LACTATE DEHYDROGENASE RATIO FOR TYPHOID HEPATITIS

Panchsila B Damor<sup>1</sup>, Vaishali J Prajapati<sup>1</sup>, Snehal V Patel<sup>2</sup>, Halak J Vasavada<sup>3</sup>, Ashwin R Panchal<sup>4</sup>, Parth Shukla<sup>5</sup>

**Financial Support:** None declared  
**Conflict of interest:** None declared  
**Copy right:** The Journal retains the copyrights of this article. However, reproduction of this article in the part or total in any form is permissible with due acknowledgement of the source.

**How to cite this article:**  
Damor PB, Prajapati VJ, Patel SV, Vasavada H, Panchal AR, Shukla P. Study of Serum Alanine Transaminase: Serum Lactate Dehydrogenase Ratio for Typhoid Hepatitis. Ntl J Community Med 2016; 7(5):395-397.

**Author's Affiliation:**  
<sup>1</sup>Asst. Prof; <sup>2</sup>Prof; <sup>3</sup>Asso. Prof, Dept. of Pediatrics, Smt. SCL General Hospital, Ahmedabad; <sup>4</sup>Consultant Pediatrician, Aditi Children hospital, Ahmedabad; <sup>5</sup>Resident, Dept. of Pediatrics, Smt. SCL General Hospital, Ahmedabad

**Correspondence:**  
Dr. Panchsila B Damor  
panchu1883@gmail.com

**Date of Submission:** 25-03-16  
**Date of Acceptance:** 03-05-16  
**Date of Publication:** 31-05-16

## INTRODUCTION

Typhoid fever also known as enteric fever is a potentially fatal multisystem illness caused by *S.typhi*. It is estimated that 33.60 million cases enteric fever occurs worldwide annually<sup>1,2</sup>. *S.typhi* has been a major human pathogen for years thriving in condition of poor sanitation, crowding and social chaos. There are many complications of typhoid fever. *Salmonella hepatitis* is known to clinically mimic acute viral hepatitis<sup>3,4</sup>. Enteric hepatitis was suspected with high grade fever for more

than a week, hepatomegaly and raised serum liver enzymes.

In our country, it assumes a paramount significance in clinical practice to differentiate between typhoid fever and evaluating acute viral hepatitis in a child who presents with fever, hepatomegaly, elevated transaminases with or without jaundice as both disease are so common, but the difference lies in treatment part. Typhoid hepatitis has definitive treatment in form of antimicrobials where as acute viral hepatitis requires symptomatic treatment

## ABSTRACT

**Introduction:** Typhoid hepatitis clinically mimics acute viral hepatitis. Differentiation between these two illnesses is very important as typhoid hepatitis requires definitive treatment in form of antimicrobial drugs. This study was undertaken to study pattern of hepatic involvement in enteric fever and to evaluate serum ALT:LDH ratio for differentiating it from acute viral hepatitis.

**Material and Method :** This was a clinical observational study. Patients of enteric fever with hepatic manifestations were investigated with special reference to liver function tests, serum LDH and serum S ALT: S. LDH ratio. Results of these were compared with investigations of confirmed cases of viral hepatitis.

**Result:** Values of S.ALT, S.LDH and S.ALT:S.LDH were 121-1170 (mean 293±266), 150-2150 (mean 677±543) and 0.07-3.5 (0.52±0.5) respectively in enteric hepatitis, while in viral hepatitis were 580-2280 (1320±293), 290-1180 (445±180) and 4.5-87.2 (40±15) respectively. There is much more alteration of S.ALT level in patient of viral hepatitis as compared to typhoid hepatitis ( $p < 0.05$ ) and levels of LDH are more raised in patients of typhoid hepatitis as compared to viral hepatitis ( $p < 0.05$ ). So, the values of S.ALT:LDH ratio are higher in acute viral hepatitis as compared to enteric hepatitis ( $p < 0.05$ ).

**Conclusion:** S.ALT:S.LDH ratio's cut off value of 4 can be used to differentiate between viral and Typhoid hepatitis.

**Key words:** Typhoid hepatitis, viral hepatitis, S.ALT:S.LDH ratio.

only. So, this study was undertaken to study the pattern of hepatic involvement in children with typhoid fever and to evaluate the significance of Alanine Transaminase: Lactate Dehydrogenase (ALT:LDH) ratio for differentiating it from acute viral hepatitis.

## METHODOLOGY

This clinical observational study was done at Smt.S.C.L.General hospital Ahmadabad, a tertiary care hospital affiliated with medical college. All patients of enteric fever hospitalized in pediatric ward from May 2011 to November 2012 were included in the study<sup>5</sup>. Patients of enteric fever with hepatic manifestations were further studied. patients of enteric fever with hepatic involvement were classified as having mild hepatitis (2-3 times of normal levels), moderate (3-20 times of normal levels) and severe hepatitis (more than 20 times), based on serum ALT levels. They were investigated with special reference to serum lactate dehydrogenase and serum ALT:LDH ratio. We have compared the values of serum ALT, serum LDH and ALT:LDH ratio of moderate and severe enteric hepatitis patients with those of confirmed patients of viral hepatitis. All patients were followed up till discharge. Student t test was used to compare the significance of difference between arithmetic means of standard deviation of serum ALT and LDH in viral and enteric hepatitis.

## OBSERVATION

Out of the 307 children of enteric fever 64(20.5%) patients had typhoid hepatitis. Among 64 patients 34 were male and 30 were female. Commonest clinical presentation was fever (100%) followed by bodyache (93.75%), decrease in appetite (84.38%), vomiting (78.13%) and hepatomegaly (67.19%).

**Table 1: Severity of typhoid hepatitis as per S.ALT level**

Severity as per S.ALT levels	Cases (%)
Number of patients with Typhoid hepatitis	64
Mild hepatitis (2-3 times normal)	29 (45.31)
Moderate hepatitis (3-20 times normal)	25 (39.06)
Severe hepatitis (>20 times normal)	10 (15.63)

**Table 2: Comparison of serum ALT level and serum LDH level in typhoid hepatitis and viral hepatitis**

Diagnosis	Values	S. ALT	S.LDH
Typhoid hepatitis	Range	121-1170	150-2150
	Mean ±SD	293±266.0	677.38±543.7
Viral hepatitis	Range	580-2280	290-1180
	Mean ±SD	1320±293	445±180
P value for mean		<0.05	<0.05

**Table 3: Comparison of serum ALT:serum LDH ratio in typhoid hepatitis and viral hepatitis**

Disease		S.ALT:S.LDH
Typhoid hepatitis	Range	0.07-3.5
	Mean ± SD	0.52±0.50
Viral Hepatitis	Range	4.5-87.2
	Mean± SD	40±15

Out of these 64 patients 29 patient had mild hepatitis, 25 had moderate and 10 had severe hepatitis

In present study serum ALT levels in the Typhoid hepatitis ranges from 121 to 1170 and mean of which is 293 IU/L, while in viral hepatitis the serum ALT ranges from 580 to 2280 and the mean of which is 1320 IU/L.

In this study S.LDH level in the Typhoid hepatitis ranges from 150 to 2150 and the mean of which 677.38 IU/L. In viral hepatitis serum LDH ranges from 290 to 1180. The mean of which is 445 IU/L.

## DISCUSSION:

The clinical picture of typhoid fever has changed considerably. Among the varied clinical spectrum of typhoid fever when with hepatic involvement is important to distinguish between typhoid hepatitis and viral hepatitis. In our study, out of 307 patients of enteric fever, 64(20.5%) patients had typhoid hepatitis which is almost similar to study done on Malaysian children<sup>6</sup>. This incidence was low as compared to study done by S. Balasubramaniam et al, which have 59%(n=100)<sup>7</sup>. In our study, the most common clinical feature was fever (100%) followed by body ache (93.75%), decrease in appetite (84.38%), vomiting (78.13%) and hepatomegaly (67.19%). In our study there is no patients with jaundice as compared to study done by S.Balasubramanyan which have 4%<sup>7</sup>. This suggest that jaundice is very rare presentation. In present study, out of 64 patients with typhoid hepatitis, 29 (45.3%) had mild hepatitis and 35(54.69%) had moderate to severe hepatitis. The results are correlated with incidence of mild (50.85%) and moderate to severe (49.15%) hepatitis in study done by Balasubramanian et al<sup>7</sup>. There is much more alteration of S.ALT level in patient of viral hepatitis as compared to typhoid hepatitis (P value<0.005) and levels of LDH are more raised in patients of typhoid hepatitis as compared to viral hepatitis (P Value <0.05). So, the values of s.ALT:LDH ratio are higher in acute viral hepatitis as compared to enteric hepatitis(p<0.05). These differences in values of both enzyme levels were statically significant. These results co-related with study done by Balasubramanian et al<sup>7</sup>.

In present study, the value if ALT:LDH ratio in typhoid hepatitis is less than 4 which is comparable to the earlier study<sup>3</sup>. As compared to this, patients with viral hepatitis have higher S.ALT:LDH ratio (>4). Study done by Balasubramanian et al. had this ratio less than 9 in typhoid hepatitis and more than 9 in acute viral hepatitis.

Thus, the cut-off value of 4 may be used to differentiate between viral and Typhoid hepatitis. The rise in serum LDH occurs in early phase of typhoid and it is due to cell necrosis of intestinal lymphatic tissue<sup>8</sup>. Thus, the rise in serum LDH can help in diagnosis of typhoid hepatitis apart from other clinical pointers. As such clinical manifestation of typhoid fever are non specific and clinically indistinguishable from other infection, including malaria, other bacterial and viral infection, can pose a significant diagnostic problem, especially in tropics where jaundice in febrile patients is due to so many reasons. The pathophysiological mechanism by which salmonella produces hepatic dysfunction although fully not known, it is postulated to be either due to direct invasion or by endotoxemia with immune mediated liver damage.<sup>10</sup> In a study done by Ahmad et al it is reported that there is significant rise in serum bilirubin without a corresponding, increase in S. ALT level which is unusual in viral hepatitis but common in typhoid hepatitis.<sup>11</sup> Also it is important to identify typhoid hepatitis early as it has high relapse rate.<sup>12</sup> Though jaundice is rare presentation, somewhat involvement of liver is always there<sup>13</sup>. Serum LDH also gets altered in other conditions such as toxic hepatitis, ischemic hepatitis, malaria, dengue, leptospirosis.<sup>14</sup> We have not evaluated LDH in other condition. Although hepatitis like picture with fever and jaundice is infrequently reported in the pediatric literature, in tropical areas the differential diagnosis of a child presenting with fever and jaundice should include typhoid hepatitis.<sup>15</sup> Early recognition of salmonella hepatitis and early institution of specific therapy can improve prognosis in these patients.<sup>16</sup>

## CONCLUSION

Values of serum ALT is more raised in patients of viral hepatitis as compared to those of enteric hepatitis ( $p < 0.05$ ). While the serum levels of LDH

are more raised in enteric hepatitis as compared to viral hepatitis. ( $p < 0.05$ ) S.ALT:S.LDH ratio's cut off value of 4 can be used to differentiate between viral and Typhoid hepatitis. Serum ALT:LDH ratio along with clinical parameters can help for early diagnosis of enteric hepatitis.

## REFERENCES

1. A Parthasarathi. IAP text book of pediatric infectious disease, 1st edition, Gwalior: JAYPEE Publisher; 2013. p 218.
2. Kliegman, Stanton, St. Geme et al. Nelson Textbook of Pediatrics, 20th edition, Milwaukee: Elsevier Publication; 2016. p 1382.
3. El-Nehiwi HM, Alamy ME, Reynolds TB. Salmonella hepatitis analysis of 27 cases and comparison with acute viral hepatitis. *Hepatology*. 1996; 24(3):516-519.
4. Gurkan F, Derman O et al. Distinguishing features of salmonella and viral hepatitis. *Pediatric Infectious Disease J* 2000;19(6):p587.
5. Ananthnarayan And Paniker. textbook of microbiology, 9th edition. Hyderabad: Universities Publication; 2013. p298-299.
6. Malik AS. Complications of bacteriologically confirmed typhoid fever in children. *J Trop Pediatric* 2002;48:102-108.
7. S. Balasubramanian et al., study of serum ALT:LDH ratio in Typhoid fever and acute viral hepatitis. *Indian pediatric journal* 2010; 47:p339-341
8. Fumagalli G. Behaviour of lactate dehydrogenase in typhoid infection. *Minerva Med* 1977;68:1199-1204.
9. Das D, Mandal SK et al. serum ALT:LDH ratio in typhoid hepatitis and acute viral hepatitis. *J. Assoc Phy India* 2003;51:p241.
10. Khosla S, Singh R et al. The spectrum of hepatic injury in enteric fever. *Postgraduate med J*. 1990;66:p923.
11. Ahmed A, Ahmed B. Jaundice in typhoid patients: Differentiation from other common causes of fever and jaundice in tropics. *Ann Afr Med* 2010;9:135-40.
12. Nasrullah SM, Nasser VH. Enteric fever. *Am J Gastroenterology*; 1978;69:63-9.
13. Moragateran R, Hayes pc. The liver in typhoid fever: always affected not just a complication. *Am J Gastroenterology*. 1991;86:1235-9.
14. Cassidy WM, Reynolds TB. Serum lactate dehydrogenase in the differential diagnosis of acute hepatocellular injury. *J Clin Gastroenterol* 1994;19:118-121.
15. Shetty AK, Mital SR, Baharinwala AH, khubchandani RP, Kumta NB. Typhoid hepatitis in children. *J Trop Pediatric*. 1999;45:287-90