

EVALUATION OF BIOCHEMICAL CHANGES IN TYPHOID PATIENTS OF JAMMU RURAL

Dr. Chandan Sharma¹, Dr. Ashima Badyal^{2*}

¹Physician, Sub-District Hospital, Akhnoor, District Jammu, J&K, India

²Lecturer, Department of Biochemistry, Government Medical College, Jammu, J&K, India

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Corresponding author: Dr Ashima Badyal

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Abstract

Background: Typhoid fever is a bacterial infection caused by bacterium salmonella enteric serotype typhi, which affects only humans. It is frequently endemic in developing countries and may cause very different clinical findings due to poor sanitation and overcrowding. Due to the high mortality rate associated with it, this study was designed to determine the various biochemical parameters in typhoid patients' serum.

Methods: A case-control study was conducted in the OPD of Community Health Center Katra, Jammu, J&K, from October 2018 to March 2019 on 100 patients and 100 controls with in the age group 25-40 years.

Results: The mean serum glucose concentration in patients was 151.3 ± 12.6 mg/dL and among cases, it was 86.2 ± 10.9 mg/dL. Mean serum LDL, however, was significantly higher in case of patients (126.0 ± 13.1 mg/dL) than controls, which can be attributed to a kind of peroxidation, affecting regular metabolism of lipids and therefore unbalanced delivery of lipids to various organs of the body. Albumin was found significantly higher in typhoid patients, while Globulin levels falling below normal ranges may be indicative of poor protein digestion in the body. Diastolic BP was positively and significantly involved with the patients with Typhoid.

Conclusion: Early detection and diagnosis of typhoid fever and early diagnostic tests measuring the various biochemical and enzyme changes in patients can be a useful tool for typhoid diagnosis, management of patients and control of mortality rate.

Keywords: Typhoid Fever, Salmonella, Serum Glucose, Serum HDL, Serum LDL

Introduction

Typhoid, a popular name for typhoid fever, is a common worldwide bacterial disease/infection, quite often life threatening, caused by bacterium salmonella enterica serotype typhi, occurring frequently in underdeveloped regions due to overcrowding and poor sanitation.¹ Typhoid fever is transmitted by polluted food and water through feces and urine of patients and carriers. Typhoid fever is endemic in developing countries and may cause varied type of clinical findings like: hepatic involvement and abnormal liver function tests, which may be seen in 50% of the patients.²

Developing nations, especially those of Asia and Africa, have the highest rates of typhoid fever. Poor access to clean and potable water, improper systems of sanitation and improper health care facilities may just add to the burden.³ Clinical features of typhoid are generally defined by: gradual onset of high fever over several days; complains of weakness and abdominal pain; constipation, vomiting and headaches. People develop skin rashes with rose coloured spots, which is also a common symptom.⁴ But, typhoid in severe cases may be confusing as, in some cases, without treatment symptoms may last weeks or month's altogether if untreated and in other instances, people may carry the bacterium without being affected, however, they may

spread the disease to others. An often used term: Enteric fever, is however a collective term, which refers to typhoid as well as paratyphoid. With an annual estimate of 16-33 million cases of typhoid fever, resulting in 216,000 deaths, especially in endemic areas, the world health organization identifies typhoid as a serious public health problem.⁵

Though, several researchers like Chin J in 2000⁶ had also performed similar studies with cases and controls, but very few of such studies existed for the rural population belt of North India or Jammu in particular. A variety of biochemical changes occur in patients with the onset of typhoid fever and this study aims to determine the correlation of various biochemical investigations to the disease in some defined demographic segments.

Methods:

The present case-control study was conducted in the OPD of Community Health Center Katra, which belongs to a rural belt of Jammu, J&K, during the period of 6 months, i.e. from October 2018 to March 2019 on 100 patients diagnosed with typhi positive, with in the age group 25-40 years. An equal number of healthy individuals within same age group were also involved in the study as controls. General information such as name, age, gender etc was recorded in case history performa. Physical examination

was done and complete profile with respect to weight, height, blood pressure, fever or vomiting was recorded.

For the control group, which comprises staff and attendants of patient coming to OPD of CHC Katra, the study announcement was made open for healthy subjects, and those who replied to the announcement were included. Prior to the biochemical analysis, typhoid test (widal test) was carried out on the control group to ensure that at least two weeks before the experiment day, they were not on any anti-malarial therapy or typhoid treatment. Diabetic, obese and pregnant females were also excluded from the study. Fasting venous blood sample was collected from the cases as well as controls; it was centrifuged and the serum was separated for the analysis on the same day for routine procedure; this was followed in the biochemistry laboratory of the center. The sample analysis for serum glucose, cholesterol levels, triglycerides, serum proteins, albumin, globulin, ALT, AST test was carried out in fully automatic analyzer by using different reagent kits as per the procedure defined by the manufacturer as per their defined principles.

All the subjects, including the controls, were fully informed about the study and a voluntary week-long session was planned for the subjects giving them thorough details of the purpose of the research work. Afterwards the participants were given informed consent forms and those who returned correctly filled and signed forms, were screened for enrolment. The study was duly approved by institutional ethical committee. The results were analyzed statistically using suitable software (MS Excel 2010 in this case). p value of <0.05 were considered as statistically significant.

Results:

The study was conducted on 100 patients and 100 controls, over a period of 6 months. All the patients were typhi positive. The Age range considered was: 25-40 years. Distribution as per age and gender showed that, maximum number of patients belonged to the age group: >35 & ≤ 40 (36 or 36%) and same was the case with controls (38%). (Table 1)

Table 1: Demographic profile of study groups:

Sr No		No of Patients	No of Controls
1	Age Group		
	>25 & ≤ 30	30	31
	>30 & ≤ 35	34	31
	>35 & ≤ 40	36	38
	Total:	100	100
2	Gender		
	Male	55	58
	Female	45	42
	Total:	100	100

On physical examination of weight, blood pressure, fever (and vomiting), it was found that diastolic blood pressure and body temperature were positively and significantly ($p < 0.05$) associated with typhoid, however weight showed no significant relation with the disease development in the present set of people. (Table 2)

Table 2: Physical profile of study groups:

Sr No	Parameter	Mean Value among patients	Mean Value among controls	p-value
1	Weight	78.6	72.5	$p > 0.05$
2	Blood Pressure			
	Systolic	116.4	136.9	$p < 0.05$
	Diastolic	87.1	79.7	$p < 0.05$
3	Body Temperature	99.3	97.8	$p < 0.05$

$P < 0.05$ (significant)

The mean serum glucose concentration in patients was 151.3 ± 12.6 mg/dL and among cases, it was 86.2 ± 10.9 mg/dL. Mean serum triglycerides was comparable in both typhoid infected patients (116.5 ± 10.3 mg/dL), as compared to controls (161.2 ± 11.4 mg/dL). Mean serum LDL, however, was significantly higher in case of patients (126.0 ± 13.1 mg/dL) than controls.

As regarding Albumin and Globulin levels were also found higher among patients than that of controls. Values of ALP (μ), AST (μ) and ALT (μ) in case of patients was significantly higher as compared to that of controls. ($p < 0.05$) (Table: 3)

Table 3: Serum profile of biochemical investigations in patients and controls

Sr no	Investigation Parameter	Normal Value (& units)	Patients	Controls	p-value
			Mean \pm SD	Mean \pm SD	
1	Serum Glucose	70-92 mg/dL	151.3 \pm 12.6	86.2 \pm 10.9	$p < 0.001$
2	Serum Triglycerides (TG)	150-200 mg/dL	166.5 \pm 10.3	161.2 \pm 11.4	$p > 0.05$
3	Serum High Density Lipo-protein (HDL)	40-85 mg/dL	70.6 \pm 5.7	59.8 \pm 5.4	$p < 0.001$
4	Serum Low Density Lipo-protein (LDL)	90-130 mg/dL	126.0 \pm 13.1	97.8 \pm 9.7	$p < 0.001$
5	Serum Total Protein	5.5-8.0 g/dL	8.65 \pm 2.02	6.73 \pm 1.51	$p < 0.05$
6	Albumin	3.5-5.0 g/dL	5.8 \pm 0.6	4.04 \pm 0.88	$p < 0.05$
7	Globulin	2.3-3.4 g/dL	2.03 \pm 0.33	2.56 \pm 0.28	$p > 0.05$
8	Alkaline Phosphatase (ALP)	53-128 U/L	118.6 \pm 11.7	87.2 \pm 10.6	$p < 0.05$
9	Aspartate Amino Transferase (AST)	8.0-40 U/L	26.5 \pm 5.2	14.9 \pm 3.6	$p < 0.05$
10	Alanine Amino Transferase (ALT)	8.0-56 U/L	39.6 \pm 8.3	25.4 \pm 5.0	$p < 0.05$

$P < 0.05$ (significant); $p < 0.001$ (highly significant)

Discussion:

Typhoid fever has several clinical manifestations, such that, during the first week, there may be a slow rise in body temperature with fever fluctuations. Relative bradycardia, headache, cough, abdominal pain may persist longer. Sometimes it may be presented with diarrhea and bloody nose. However, there may be decrease in the circulating white blood cells, but Widal test is usually negative in the first week.⁷

A significant difference in the value of alkaline phosphates (AST and ALT) was observed in typhoid patient when compared with normal individual, which was found quite higher among the patients. This may be related to the hepato cellular injury/damage.

Albumin was found significantly higher in typhoid patients, agreeing to the earlier findings of Shamin *et al.*⁸ Globulin levels falling below normal ranges (2.03 ± 0.33 g/dL in this case), may be indicative of hepatic dysfunctions, celiac disease, etc. Further, it may be indicative of poor protein digestion in the body.

Similar to the findings of Ezeigbo *et al.*,⁹ diastolic BP was positively and significantly involved with the patients with Typhoid. LDL and albumin levels were quite high among group 1 i.e. patients as compared to the healthy individuals, which was in accordance with the findings of Forbes *et al.*¹⁰ Such changes in lipoproteins can be attributed to a kind of peroxidation, affecting regular metabolism of lipids and therefore unbalanced delivery of lipids to various organs of the body.¹¹ Typhoid fever is also associated with inflammation and ulceration of the gut and liver, which leads to an increase in LDL cholesterol, which increases risk of heart diseases and other risk factors.¹² This study gives a clear indication of relation between typhoid fever and metabolism of lipids.

There are vaccines available for the prevention of typhoid fever: oral Ty21a and injectable 'typhoid polysaccharide' vaccine, and are generally recommended for people exposed to endemic areas or travelers; with boosters recommended for every two to five years respectively.¹³

The limitation of the study lies with the smaller age-group (25-40 years) considered, where no significant association of the disease was found with this demographic variant. A larger age-group and a much stratified cross-sectional study with respect to age-segments of typhoid patients and their respective biochemical profile may also be a useful find.

Conclusion:

This study has given a clear indication and ample evidence of relation between typhoid fever and metabolism of lipids. This further indicates that early detection and diagnosis of typhoid fever will be very useful in the management of

patients and can control the mortality rate, therefore early diagnostic tests measuring the various biochemical and enzyme changes in patients can be a useful tool for typhoid diagnosis.

References:

- 1 Parry C, Dougan G. Typhoid fever. *England journal of medicine* .2002;347: 1770-82.
- 2 Ozen HG, Secmeer G, Kanra Z, Ecevit M, Ceyhan A, Dursun Y. Typhoid fever with very high transaminase levels *Turk. J Pediatr.* 2001;37: 169-71.
- 3 Chandra RK. Nutritional deficiencies and mucosal immunity, *Textbook of Gastroenterology and nutrition in infancy*, New York Raven Press. 2000;2:565-8.
- 4 Chowdhary F, Chisti MJ, Khan AH, Chowdhary MA. *Salmonella Typhi* and *plasmodium falciparum* coinfection in a 12-year old girl with hemoglobin E trait from a non-malarious area in Bangladesh. *J Health Popul Nutr* 2010;28: 529-31.
- 5 Hamze M, Nabouls M, Vincent P. Evaluation of the widal test for diagnosing typhoid fever in labanon. *pathol-bio paris.* 1998;46: 613-16.
- 6 Chin J. Typhoid fever in control of communicable disease, an official report of the American Public Health Association 2000;32-541.
- 7 Havel PJ. Peripherals signals conveying metabolic information to the brain short-term and long-term regulation of food intake and energy homeostasis. *Exp Biol Med.* 2010: 963-977.
- 8 Amen S, Ayesha S, Bilal H. Study of biochemical changes and elevated level of enzymes in *Salmonella typhi* infected patients in Pakistan population. *International Journal of Bio-automation.* 2012;16: 33-42.
- 9 Ezeigbo II, Nwaehujor CO. The Serum levels of malondialdehyde, cholesterol and total lipids in patients diagnosed as having typhoid salmonellosis in Nsukka urban area, southeast Nigeria. *International Journal of Current Research.* 2010;6: 8-10.
- 10 Forbes GB, Reina JC, *et al.* Adult lean body mass declines with age, some longitudinal observations. *Metab.* 1970: 653-63.
- 11 Lepage G, Paradis K, Lacaille F. Ursodeoxycholic acid improves the hepatic metabolism of essential fatty acids and retinol in children with cystic fibrosis. *J. Pediatr.* 1977;130: 52-8.
- 12 Goldbourt U, Medalie JH. Isolated low HDL cholesterol as a risk factor for coronary heart disease mortality: a 21 year follow up of 8000 men. *Arterioscler Thromb Vasc Biol.* 2001;17: 107-13.
- 13 Khosla SN, Goyle N, Seth RK, Lipid Profile in enteric fever. *The Journal of the Association of Physicians India.* 1991;3: 260-62.