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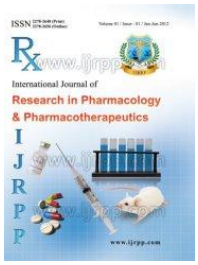

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Haematological alterations due to typhoid fever in mayiladuthurai area, Nagapattinam.

B.Anusuya[1] and S.Sumathi[2]

[1] *Department of Biochemistry, D.G.G.Arts College (Women's)Mayiladuthurai,Tamil nadu, India-609 001.*

[2]*Department of Biochemistry, D.G.G.Arts College (Women's) Mayiladuthurai,Tamil nadu, India-609 001.*

***Corresponding author: B.Anusuya**

E-mail id: ssumibio@yahoo.co.in

ABSTRACT

Typhoid fever is an acute systemic disease caused by salmonella typhi and is a serious problem in developing countries. Typhoid is known to affect all systems of our body. The effect of typhoid fever (enteric fever) were studied on basic haematological parameter of patient WBC, RBC, SGOT, SGPT, Hb, Alkaline phosphates, Total bilirubin, platelets, PCV, Eosinophil, Neutrophils, Lymphocytes. The comprehensive study of 50 sample were collected from culturally confirmed salmonella patient and apparently healthy individuals were used as control. Results obtained show that there was a significant decreases in the PCV, Hb, WBC, Total protein, Platelets, and PCV in typhoid patients compared with healthy individuals. But there was a significant increase in SGOT and SGPT as against those of apparently healthy [control] individuals.

Keywords: Typhoid fever, salmonella typhi, haematological parameter.

INTRODUCTION

Enteric fever is a systemic clinical syndrome produced by certain salmonella organism. It encompasses the terms typhoid fever, caused by salmonella typhi and paratyphoid fever caused by S.paratyphi A,S.Schottmuelleri (formerly S. paratyphi B), shirschfeldii (formerly S.paratyphi C) and occasionally other serotypes of salmonella. Though the incidence of this infection has decreased markedly in developed countries, in developing countries like ours the incidence is 0.5%. A complication of this condition involving, heart, hepatobiliary system, lungs, kidneys, pancreas, and nervous system including intracranial complication is observed. Despite its presence for a very long time, little progress has been observed in the diagnosis of the condition especially in developing countries. Diagnosis is till based on clinical features and on widal test and very occasionally on blood culture. Many other tests are out of reach till dale. Important aspect is that many of our health personal are not fully aware of some important clinical aspects of such tests. This many lead to failure of diagnosis this condition or diagnose mortality of our children. Parents of children may also face unnecessary anxiety and financial burden. Correct and rapid diagnosis of enteric fever is of paramount importance for instituting appropriate therapy. The review is written to orient our health personals particularly clinicians regarding some fundamental aspects of

laboratory investigations of such important issue is that diagnosis minimizing morbidity and mortality of our children from such infection[1].

MATERIALS AND METHODS

Sample collection

A total of fifty (50) blood samples were collected between 06-09 h in the morning in a gel and heparin (anticoagulant) tubes from normal and typhoid infected patients. Samples were centrifuged at 769 × g for 15 minutes. Serum was separated and stored in to a small aliquot at –20°C till analysis.

Place of sample collection

The blood samples of male and female patients were collected from Government Hospital, Mayiladu-thurai, Tamil nadu, India. Informed consents were obtained from all subjects. Those typhoid patients who visited the hospital for checkup and were picked up randomly from around mayiladuthurai areas.

ESTIMATION OF HAEMOGLOBIN[2].

20µl of blood was added to 2ml of drabkin solution. Mixed well and allowed to stand for 10 minutes. Read the absorbance at 540nm with values were expressed as g/dl. Drabkin solution as blank. Read the absorbance of the standard in the same way.

ESTIMATION OF PLATELETS [3]

Aspirate a little of platelet diluting fluid in to the RBC pipette and expel the fluid. Make a dilution of blood 1 in 200 with diluting fluid as described in RBC count. Keep the counting chamber in a Petridis containing klet cotton klool .Klait for 10 minutes, until the platelets have settled. Count all the platelets in the klhole finely ruled area red cell using high power objective. Platelets are lilac-coloured, 1/7 to ½ the diameter of RBC and usually oval, rod, or comma-shaped.

PACKED CELL VOLUME [4]

Take oxalated blood and mix thoroughly by repeated inversion and bill in klintrobes tube up to mark. Centrifuge at r.p.m for 30 minutes. The original column of blood in the tube being 100 mm. The volume of packed cells can be read directly as a percentage.

ESTIMATION OF SGOT [5].

To the test tube 1 ml of buffer substrate and 0.2 ml of serum was added. To the control 1 ml of buffer substrate was added. Both the tubes were incubated at 37˚c for 1 hours. After incubation period 0.2 ml of serum was added to the control. Standard was prepared by added 0.1-0.5 ml of the standard pyruvate and made up to 1 ml with buffer. 1 ml of the phosphate buffer was taken blank. To all the tubes, two drops of aniline citrate reagent was added. Mixed and added.1 ml of 2,4-dinitrophenyl hydrazine incubated test tube at 37˚c for 20 minutes. Then 10 ml of 0.4N sodium hydroxide was added and incubated at 37˚c for 10 minutes the brown colour was developed and read at 530 nm.

ESTIMATION OF SGPT [6].

1ml of substrate was pipette out in to 2 test tubes. The tubes were kept in boiling water bath for few minutes at 37˚c to on one tube 0.2 ml of serum was added standard was produced by talking (0.1-0.5 ml) of the standard pyruvate and made upto 1 ml with phosphate buffer. 1 ml of phosphate buffer was taken as blank. To all the tubes two drops of aniline citrate reagent was added, mixed it followed by the addition of 2,4-dinitrophenyl hydrazine. Incubated the tubes at 37˚c for 20 minutes. Then 10 ml of 0.4 N sodium hydroxide was added and incubated at 37˚c for 10 minutes. The brown colour developed was read at 520nm.

ESTIMATION OF TOTAL PROTEIN [7]

Two test tubes were taken and to placed 0.2 ml of serum and 1.8 ml of distilled water. To test added 0.5 ml of diazore agent and to the blank added 0.5 ml of 15% hydrochloric acid, added 2.5 ml of methanol and allowed it 10 stand for 30 minutes. The colour developed was read at 340 nm For standard curse, pipette out 0.2 to 1.0 ml of working standard and the volume was made upto 9 of direct bilirubin can be determined in a similar way by substitution 2.5 ml of water and 2.5 ml of ethanol.

WHITE BLOOD CELL [8]

Draw the blood upto the 0.5 mark in WBC pipette marked 11 and upto, the mark 11 with WBC fluid as described in RBC counting and fill the counting chamber in the same manner. Allow 3 min for cells to

settle if the neubauer counting chamber is used, count the cells in the four corner blocks. Each of these 4 square millimetre area is sub, divided into 16 squares, by using the low power objective and a medium ocular. In counting the cells include those cells touching on the inner lines on the right and top, but do not count the cells touching on the inner lines on the left and bottom. The difference between the two square millimetre should not be more than 10 WBC´S

NEUTROPHILS, EOSINOPHILS, LYMPHOCYTES

Neutrophils, Esinophils, Lymphocytes were identified by Autoanalayzer.

RESULTS AND DISCUSSION

Typhoid fever, also called enteric fever, is a contagious, potentially life-threatening bacterial infection. Typhoid fever is caused by the bacterium salmonella enteric serotype typhi (also known as salmonella Typhi), which is carried by infected humans in the blood and digestive tract and spreads to other through food and drinking water contaminated with infected feces. Symptoms of typhoid fever, rash and abdominal pain.

Typhoid fever is caused by salmonella typhi has been associated with some physiological changes in affected persons. These changes form part of the patho physiology of the infection irrespective of geographical location [9].

Typhoid fever occurs in over 20 million cases annually, with at least 700.000 deaths. The main burden of disease is in developing countries, particularly the Indian subcontinent and South East Asia[10].

TABLE 1: BIOCHEMICAL PARAMETER OF NORMAL HEALTHY INDIVIDUALS AND TYPHOID FEVER PATIENTS

S.NO	PARAMETER	NORMAL HEALTHY INDIVIDUALS	TYPHOID PATIENT
1	WBC	69±60	50±58
2	SGOT	32±3.03	38±3.29
3	SGPT	33±3.5	40±4.56
4	Platelets	2.8±1.0	1.5±3.44
5	Hb	11±2.0	9±2.5
6	Neutrophils	55±20.70	50±16.6
7	Eosinophils	4±3.16	3±2.8
8	Lymphocytes	28.±21.9	26±16.4
9	PCV	38±9.66	36±7.87

HAEMOGLOIN AND PACKED CELL VOLUME

When the mean results of normal healthy individuals and typhoid patient subjects were compared, there were significance decreased in pcv (38±9.6), Hb(11±2.0) in typhoid patients (Table1 and Figure1).

Erythropoesis and myelopoesis were depressed as indicated by packed cell volume, haemoglobin, total, and differential white blood cell counts respectively [11].

The lower values obtained in the measured erythropoetic series suggested that typhoid fever, could be a potent cause of anaemia [12].

Various haematological manifestations like haemolytic- uraemic syndrome, disseminated intravascular coagulation, and haemolytic anaemia have been observed in cases of typhoid fever. Probably anaemia was related to toxaemia, haemolysis or less often to intestinal haemorrhage. Anaemia in typhoid fever does not need to be treated energetically since it is related to endotoxaemia and improves during recovery **[**13].

Bone marrow suppression and haemophagocytosis are considered to be an important mechanism in producing haematological changes. Typhoid fever is a multi-system disease that affects the whole systems including the bone marrow which caused the decrease in PCV, Hb[14].

The significant difference ($P<0.05$) in the mean PCV values of the typhoid (26%±4.9%) and the non-typhoid individuals (43%±1.4%).Typhoid fever

infection may have suppressive effect on the bone marrow activity[15].

In many chronic disorders, the activities of the bone marrow may be suppressed leading to a non-progressive mild to moderate anaemia characterized by reduced plasma and erythroblast iron or increased reticulo endothelial iron stores. This can constitute potent problems in rural communities where good nutrition is hardly within reach of the indigenes.

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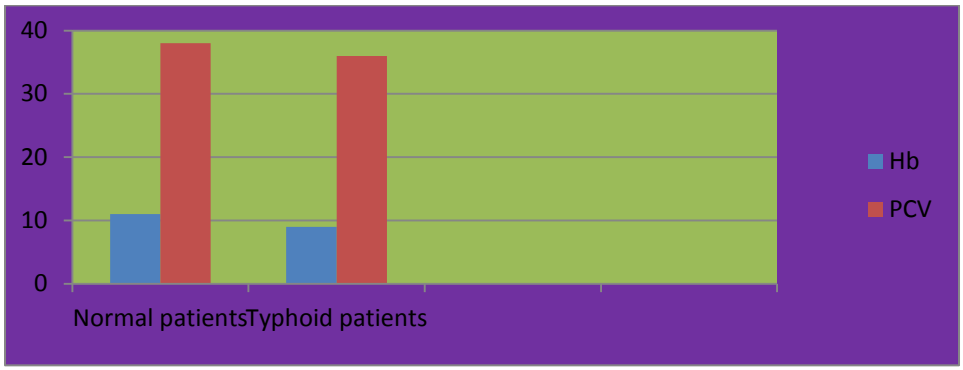

Figure 1: Estimation of haemoglobin and PCV in normal healthy individuals and typhoid patients

WHITE BLOOD CELL

The WBC count was decreased in typhoid fever patients (50±58) compared with non typhoid patients (69±60) (Figure 2).

The value of the total white blood cells through within normal range was significantly lower in typhoid fever patients compared with controls. It may be due to possible bacteria metabolism and its toxins on the bone marrow, the major site of myelopoesis [17].

A low white blood cell count is the decrease in the cells that fight diseases. The condition is called as leukopenia. The standards for the low white blood cells vary slightly with the medical practices. A low white blood cell count in adults is defined as lower than 3,500 white blood cells per micro-liter of blood. Lymphocytes increase in many viral infections and with tuberculosis. A common reason for significant lymphocytosis is lymphocytic leukemia. The majority of both acute and chronic forms of leukemia affect lymphocytes.

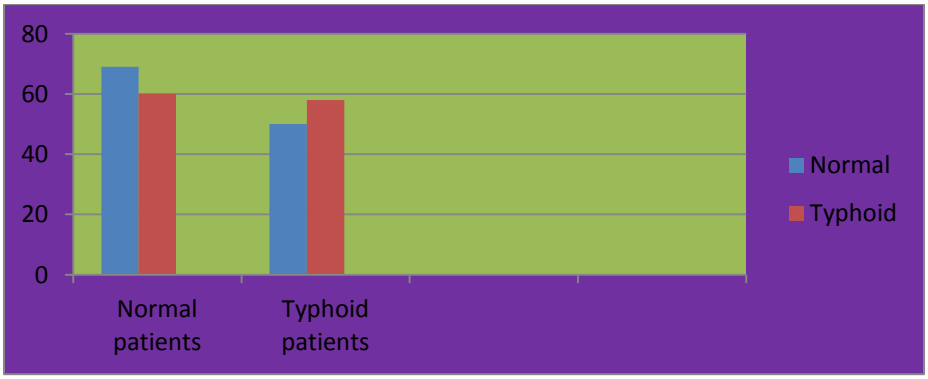

Figure 2: Estimation of WBC in normal healthy individuals and typhoid patients

PLATELETS

The mean platelet levels were (1.5±3.4) in typhoid patients and (2.8±1.0) in normal individuals. A significance decreased in mean platelet levels was observed in typhoid individuals as compared to normal individuals (Figure 4).

Platelet count was less than 100,000 in 2 cases and 120,000 in 1 case while in 2 cases bleeding and clotting times were prolonged. Biochemical abnormalities in the form of raised serum bilirubin, SGOT/SGPT, serum alkaline phosphatase, 5'-adenosine nucleotidase and decreased plasma fibrinogen levels, prothrombin time index was observed[18].

The thrombocytopenia observed in the comparison may suggest that platelets' activation could be a major factor when antibody level rises. Platelets have been reported to be activated by some particulate factors like bacteria and soluble chemicals like toxins. Once activated, it undergoes viscous metamorphosis that leads to intravascular thrombus formation which is a prelude to disseminated intravascular coagulation [19].

The thrombocytopenia observed in eight patients could be either due to decreased production of platelets by the bone marrow during acute infection or in part by their increased destruction by an enlarged spleen[20].

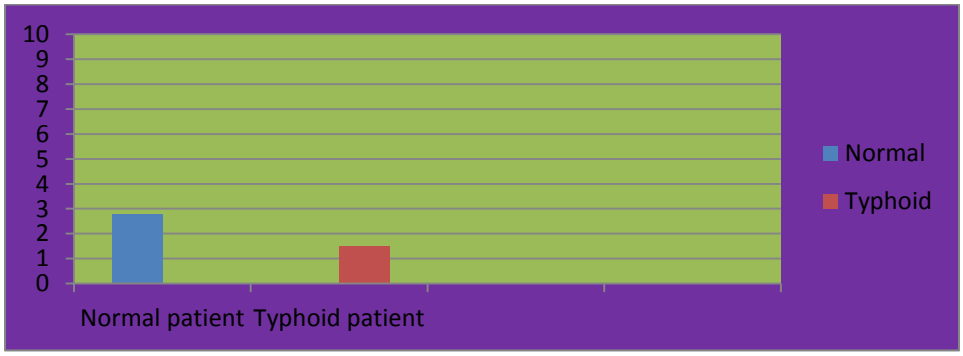

Figure 4: Estimation of platelets in normal healthy individuals and typhoid patients

NEUTROPHILS, EOSINOPHILS, LYMPHOCYTES

Serum neutrophils (50±16), Eosinophils (4±2), Lymphocytes (28±16) concentration was significantly lower in typhoid infected individuals as compared to normal individuals (Figure 5).

Leucopaenia and neutropaenia which were observed previous reports of pathophysiology of typhoid fever. This could be as a result of increased demand of cellular immune responses to the infection. Neutrophils are particularly crucial in oxygen-dependent toxicity against invading bacteria [21].

Reported that there were reversed immature neutrophils to total neutrophil count ratio (1/T ratio) in neonatal sepsis in Rawalpindi. Salmonella species being intravascular organisms invade the white cells and are consequently transported to organs and tissue where it vegetates to cause metabolic derangements [22].

The characteristic finding in our typhoid patients was leucopenia and eosinopenia in contrast with malaria which often exhibits leucocytosis with an increase in the percentage of large mononuclear cells. Cases of dengue fever may resemble the early stage of typhoid and paratyphoid characterized by reduction in total white cell count but with late eosinophilia in contrast to cases of typhoid where there is eosinopenia [23].

The haematological changes are common in typhoid fever and these include anaemia, leucopenia, eosinophilia, thrombocytopenia and sub-clinical disseminated intravascular coagulation[24].

Neutropenia in typhoid fever has been attributed to increased margination and defective granulopoiesis. Relative lymphocytosis is followed by neutropenia during recovery phase, however, neutrophilic leucocytosis is considered to be a feature of complicated typhoid fever [25].

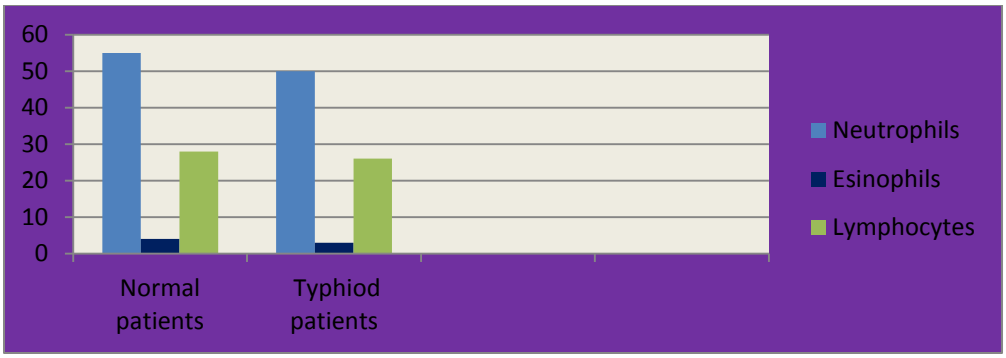

Figure 5: Estimation of neutrophils, eosinophils, lymphocytes in normal healthy individuals and typhoid patients

ESTIMATION OF SGOT AND SGPT IN NORMAL HEALTHY INDIVIDUALS AND TYPHOID PATIENTS

The mean serum glutamate oxaloacetate transferase levels were (32±3.29) in typhoid patients and (32±3.03) in normal individuals. A significance decreased in mean serum glutamate oxaloacetate transferase levels was observed in typhoid individuals as compared to normal individuals.(Figure 6).

The mean serum glutamate pyruvate transferase levels were (33±4.56) in typhoid patients and (33±3.5) in normal individuals. SGOT/SGPT ratio of when conditionally associated with SGOT levels 40 U/L was found to characterize the pattern of transaminase alterations in enteric fever as compare other normal individuals. This combination was satisfied by almost 72% of enteric fever patients versus only 6% of controls [26].

The concentration of serum glutamate oxaloacetate transferase (SGOT) and serum glutamate pyruvate transferase (SGPT) is for detecting hepatocellular injury and may help in monitoring the status of liver. Both enzymes increased in many hepatic diseases and have limited value in differential diagnosis. However, aminotransferases are considered useful in differentiating hepatocellular from cholestatic forms of liver injury. SGOT activity is related to damage of cell in kidney, pancreas, and erythrocytes. SGOT and SGPT were significantly higher ($P < 0.0001$) in some typhoid patients. In general, mechanism relating to association between liver marker and in typhoid fever may reflect elevations in SGOT and SGPT.

SGOT was increased in 62.5% in patients with hepatomegaly and it is interesting to note that almost the same percentage of cases without hepatomegaly also had increased levels of SGOT. Similar observations were made with SGPT and no correlation was found between the occurrence and degree of hepatic enlargement or hyper bilirubinemia with abnormalities in liver function tests.

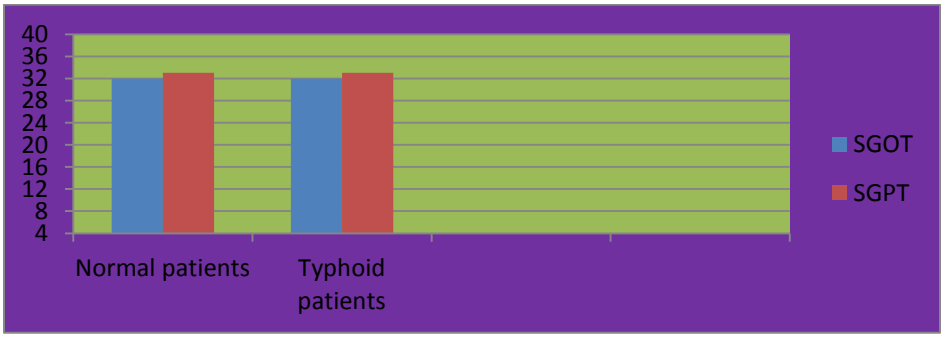

Figure 6: Estimation of SGOT and SGPT in normal healthy individuals and typhoid patients

CONCLUSION

Enteric fever is a systemic clinical syndrome produced by certain salmonella organism. On the basis of our findings, we may conclude that the observed variations of biochemical parameters such as WBC, Total protein, Hb, Eosinophils, Neutrophils, Lymphocytes, platelets and PCV was significantly lower in typhoid patients compared with normal healthy individuals. It indicates the Leucopenia, thrombocytopenia, mild neutrophilia, lymphocytosis and anemia, these points to possible for enteric fever. Among all studied parameters in the present study we observed a significant increase in SGOT and SGPT values in typhoid patients compared to controls. However, SGOT and SGPT are considered for detecting hepatocellular injury and may help in monitoring the status of liver. Typhoid fever causes high incidence of biochemical and enzymatic changes but these changes are cover up by antibacterial therapy. This study appears to be ample evidence based on the biochemical parameters in typhoid patients to explain influence of typhoid morbidity. Typhoid fever is treatable, especially in its early stages, and a vaccine is available to help prevent the disease if you plan on living or travelling to high risk areas of the world.

REFERENCE

[1] Cleary TG.Salmonella. In. Behrman RE, Klieg man RM, Jenson HB editors. Nelson Textbook of Pediatrics 17th ed. Philadelphia. Saunders, 2004; 916

[2] Day.C, Diabetic Med; 2000 161-14.

[3] Obeagu[10,12,13,16,27] Emmanuel Ifeanyi Changes in some haematological parameters in typhoid patients attending University Health Services Department of Michael Okpara University of Agriculture, Nigeria Int.J.Curr.Microbiol.App.Sci ;2014 3(1): 670-674

[4] King E.J and Armstron.A.R (1965)[3,4,5,6,8,9]

[5] Malloy H.T, Evelyn K.A, And mateer J.G,J.BIOL.CHEM ;1937 119:481.

[6] Cooke F, Wain J. The emergence of antibiotic resistance in typhoid fever. Travel Med Infec Dis.;2004 2 (2): 67-74.

[7] Baker KM[14,16,17], Mills AE, Rachman I. Haemolytic-uraemic syndrome in typhoid fever. BM;1974,2:84-7

[8] Khosla SN[15,17,18,20], Singh R, Singh GP. The spectrum of hepatic injury in enteric fever. Am J Gastroenterol 1988, 83:4: 413-416.

[9] Ejezie F.E,Emenuga V.N, Ureme S.O, Ohanu M.E, Nnabuchi C.I Some Haematological and Biochemical Profiles of Typhoid Fever in IGBOS of Nigeria. Indian journal of applied research Volume : 4 | Issue : 3 | Mar 2014

[10] Olubuyide, I.O.(1992) TyphoidFever in the Tropics, Postgraduate Doctor Africa: 14.2:37-41.

[11] Breen EA, Tullis 1. Ethanol gelation: a rapid screening test for intravascular coagulation. Ann Med 1968; 69:1197

[12] Lalitha,J. Vasanthi,T. Malathi,S. Ganesh,R; Apane,V and Lakshi,M. 2008.Clinical Profile and Outcome of Typhoid Fever in Children from a Teriary Care Hospital. Disease in Childhood 93(2).

[13] Unaiza, Q., and Javeria,A. 2013.Haematological Changes Associated with Typhoid Fever. Rawal Medical J.38(1).

[14] Abro AH, Abdou AMS, Gangwani JL, Ustadi AM, Younis NJ, Hussaini HS. Hematological and biochemical changes in typhoid fever. Pak J Med Sci ;2009 (2):166–171.

[15] Calva JJ, Palacios GR. Salmonella hepatitis: Detection of Salmonella antigens in the liver of patients with typhoid fever. J Infect Dis ;1986, 154: 373-374.