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Research Article

**TYPHOID FEVER AND CHANGES IN HEMATOLOGICAL
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Objectives: The diseases of bloods & biochemical alterations because of participation of various organs in typhoid fever are very common. The main objective of this research work was to conclude the occurrence and seriousness of above mentioned alterations in young patients admitted in clinics due to this typhoid fever.

Methodology: This research was carried out in medical wards of Mayo Hospital Lahore. The duration of this research was from March 2015 to February 2018. This research work involved medical data, demographical information, haematological & biochemical alterations in each patient of research work. Patients whose blood found with *Salmonella typhi* had entered into this research work. Calculation of total blood, tests to check the functions of liver, blood culture, urine, electrolytes, and parasites of malaria and profile of coagulation performed for every participant, whereas serology of virus caused by hepatitis & ultrasound of abdomen cavity had performed on those patients who had abnormal function tests of liver. Patients with ALT greater than three times of healthy ones selected for the serology of the hepatitis caused by virus, whereas patients found with the high value of haematological alterations underwent the assessment of bone marrow.

Results: Seventy-five patients were the participants of this research work. The average age of the participants was 28.4 ± 8.7 years. More than eighty-one percent were the male participants and females' participants were more than eighteen percent. The very frequent haematological alterations concluded were; anaemia was present in more than sixty-one percent, thrombocytopenia was in forty percent, leucocytosis was in more than ten percent and leucopenia was present in four percent patients. The most common biochemical alterations included; progressed alanine aminotransferase was in more than seventy-three percent, aspartate aminotransferase was in more than sixty-two percent, bilirubin was more than thirty percent, alkaline phosphatase was forty-four percent, time of prothrombin was more than fifty-seven percent & blood urea was twelve percent but the serum albumin was very low in forty percent patients. When these changes came to the ideal range, all the patients were discharge from the hospital.

Conclusion: Typhoid fever is the cause of many changes and hepatic malfunctioning. The participation of liver in this disease linked with many complications. These changes are very dangerous due to the liver involvement but these are easily treatable with the help of therapy of antimicrobials.

Key Words: Antimicrobials, haematological, biochemical, alterations, aspartate, aminotransferase, alanine, leucocytosis.

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INTRODUCTION:

Typhoid fever is an infection caused by bacteria, *Salmonella Typhi* which is a gram-negative. This problem is the outcome of intake of contaminated water or food. This contamination occurs due to the wastages of the infection carriers [1]. This disease is a main health issue in the countries which are under development but is also occurring in the modern countries [2]. This disease affects the youngsters and children. This disease is a main reason of morbidity worldwide with more than twelve million patients and six lacks deaths occurs every year due to this horrible disease in each year [3]. About eighty percent patients and deaths happen in Asia. Eleven hundred cases out of one lakh people are suffering from this disease in the countries which are under development [4]. Haematological changes are very frequent in this fever [5] and hepatic malfunctioning is reported from one percent to twenty-six percent [6].

Medically important renal disease in this fever is not a common incident which is available in zero to six percent of patients [7]. This research work was carried out to conclude the occurrence and seriousness of haematological alterations, hepatic malfunctioning and renal participation in the young patients who were getting treatment from Mayo Hospital in a consequence of this typhoid fever.

METHODOLOGY:

This research was carried out in medical wards of Mayo Hospital Lahore. The duration of this research was from March 2015 to February 2018. Medical data, demographical data, biochemical & haematological alterations evaluated in every participant. A separate Performa was used for the data entry of every patient. The patients were interrogated for having a serious disease and medication in past. The patients entered into this research work when they found positive for *Salmonella Typhi*.

The patients having background history of liver abnormalities, renal disorders, and blood abnormalities, status of immune compromised, positive virus serology of hepatitis, and inhalation of such medicines which enhance the biochemical factors existed from the bond of this case study. The samples of blood were taken for the testing of liver functioning, diabetes and other related detections. The examination of bone marrow was carried out in only those participants who were not responding the serious haematological alterations.

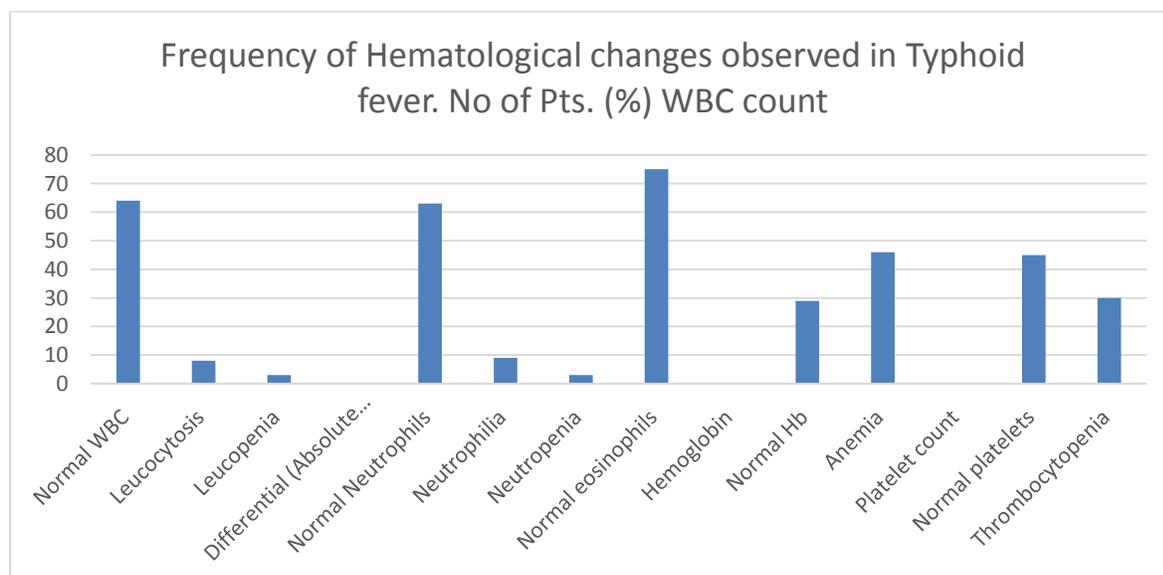
Anti-microbial treatment was in use for its treatment. A large number of patients obtained this treatment for duration of more than fourteen days. The patients of serious typhoid fever obtained this treatment for more than twenty days. All the patients got rid from hospital when the value of these changes reached at a moderate healthy range and patients showed no signs of these complications. SAS Enterprise Guide version 4.1 was in use for the analysis of the collected information. The P value of less than 0.05 considered as significant.

RESULTS:

Seventy-five patients were the participants of this research work. The average age of the patients was 28.4 ± 8.7 years. Males participants were greater in number than the female participants. There were sixty-one male participants and fourteen female participants in this study. The previous history shows the travelling of the patients to the area of disease. The total period of the disease was three to twenty-eight days. There are many symptoms of this disease. Tired look, temperature, anaemia, abdomen pain and jaundice were some of the main medical signs. The most important haematological changes are available in Table-1. The amount of Serum alanine amino-transferase was high from the reference spectrum in fifty-five patients.

Table-I: Frequency of Hematological changes observed in Typhoid fever.	
Parameter	No of Pts. (%)
WBC count (Mean \pm SD:7.12 \pm 3.69x10 ³ /ul) (Range:1.5-28.8x10 ³ /ul).	
Normal WBC	64(85.3)
Leucocytosis	8(10.6)
Leucopenia	3(4)
Differential (Absolute count)	
Normal Neutrophils	63(84)
Neutrophilia	9(12)
Neutropenia	3(4)
Normal eosinophils	75(100)
Hemoglobin (Mean \pm SD: 12.33 \pm 1.78 gm/dl) (Range: 5-15.4 gm/dl).	
Normal Hb	29(38.6)
Anemia	46(61.3)
Platelet count (Mean \pm SD:288.93 \pm 146.76x10 ³ /ul) (Range: 11-734x10 ³ /ul).	
Normal platelets	45(60)
Thrombocytopenia	30(40)

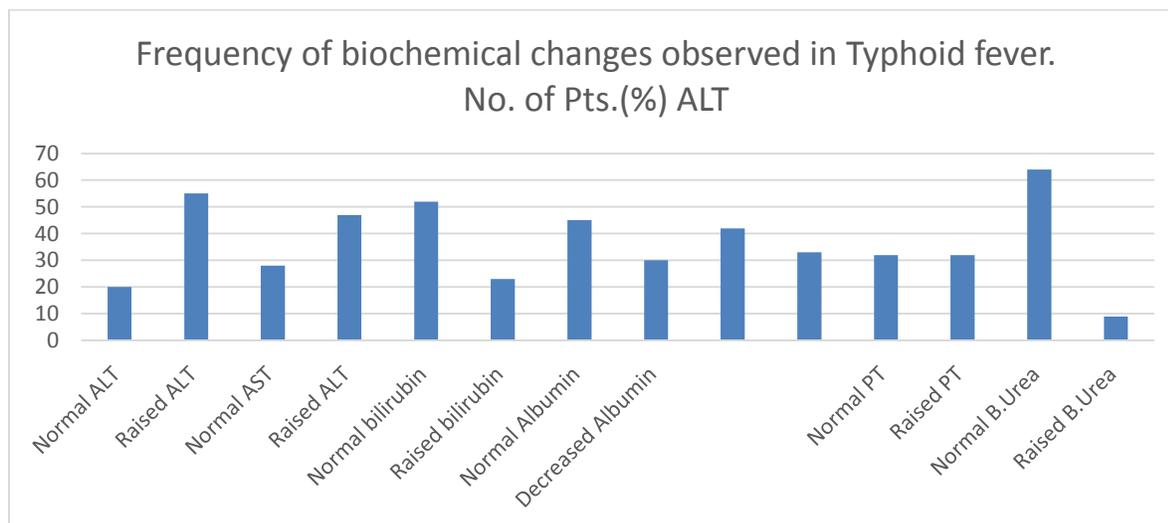
Ref.range: WBC: 3.6-11x10³ cell/ul, Hb: 13-18gm/dl,
Platelets: 150-400x10³ cell/ul.



The most vital biochemical changes are available in Table-2. The level of serum bilirubin level was greater than 3 mg/dl in eight patients whereas the time of prothrombin was less than three seconds in six patients.

Table-II: Frequency of biochemical changes observed in Typhoid fever.	
Parameter	No. of Pts.(%)
ALT (Mean \pm SD: 160.8+244.04 U/L) (Range: 12-1807 U/L).	
Normal ALT	20(26.6)
Raised ALT	55(73.3)
AST (Mean \pm SD: 126.64+161.72 U/L) (Range: 10-889 U/L).	
Normal AST	28(37.3)
Raised ALT	47(62.7)
Bilirubin (Mean \pm SD: 1.8+4.04 mg/dl)	
Normal bilirubin	52(69.3)
Raised bilirubin	23(30.6)
Albumin (Mean \pm SD: 3.46+0.55 gm/dl) (Range: 1.7-4.8gm/dl).	
Normal Albumin	45(60)
Decreased Albumin	30(40)
Alk. Phosphatase (Mean \pm SD: 125.28+123.17 U/L) (Range: 48-934 U/L).	
Normal Alk.Phosphatase	42(56)
Raised Alk.Phosphatase	33(44)
Prothrombin Time (Mean \pm SD: 14.73+1.95 sec) (Range: 11.7-25.9sec).	
Normal PT	32(42.6)
Raised PT	32(42.6)
Blood Urea (Mean \pm SD: 25.21+13.53 mg/dl) (Range: 7-67 mg/dl).	
Normal B.Urea	64(84.3)
Raised B.Urea	9(12)

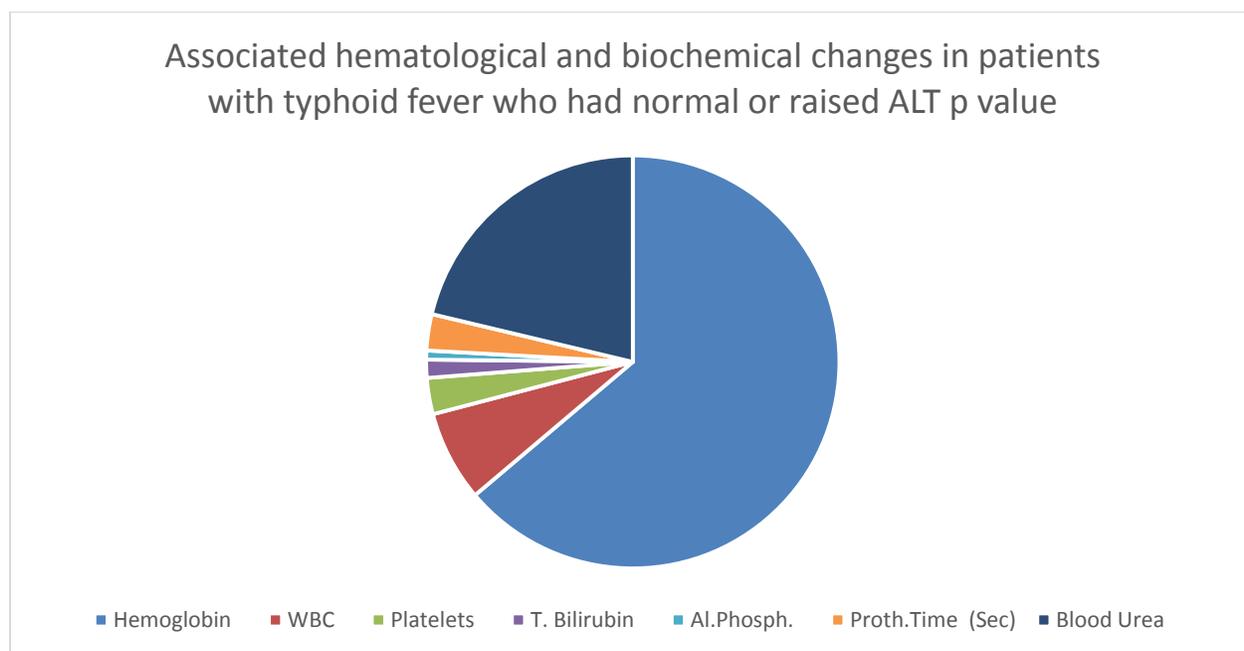
Ref.range: ALT: 0-41U/L, Alk.Phos: 40-129 U/L, T.Bil:0-1mg/dl,
Alb.: 3.4-4.8gm/dl, AST: 0-38 U/L, B.Urea:12-40 mg/dl.



The patients found with high level of ALT had a high occurrence of anaemia, thrombocytopenia, and progression in serum bilirubin, alkaline phosphatase and duration of prothrombin as described in Table-3 & Fig [1].

Table-III: Associated hematological and biochemical changes in patients with typhoid fever who had normal or raised ALT			
Parameter	Pts. With normal ALT	Pts. With raised ALT	p value
Hemoglobin	12.3±2.1gm/dl	12.3±1.6gm/dl	0.9
WBC	8.5±5.6x103/UL	6.6±2.5x103/UL	0.1
Platelets	290.0±167.4x103/UL	206.7±131.0x103/UL	0.04
T. Bilirubin	0.7±0.6mg/dl	2.1±4.6mg/dl	0.02
Al.Phosph.	112.5±59.3U/L	166.7±136.1U/L	0.01
Proth.Time (Sec)	14.12±1.2	14.9±2.1	0.04
Blood Urea	27.7±13.2mg/dl	24.2±13.4mg/dl	0.3

Associated hematological and biochemical changes in patients with typhoid fever who had normal or raised ALT p value



Serology of hepatitis caused by virus carried out in 28 patients. Hepatomegaly & splenomegaly were most frequent outcomes of the examination carried out with the help of ultrasound. All the patients got intravenous antibiotics at early stage in hospital. The average stay in the hospital was 10.9 ± 3.9 days. The stay was longer in the case of serious typhoid fever. All the cases showed recovery from biochemical & haematological alterations. No great incident carried out in the treatment of this disease and all the participants recovered to good health.

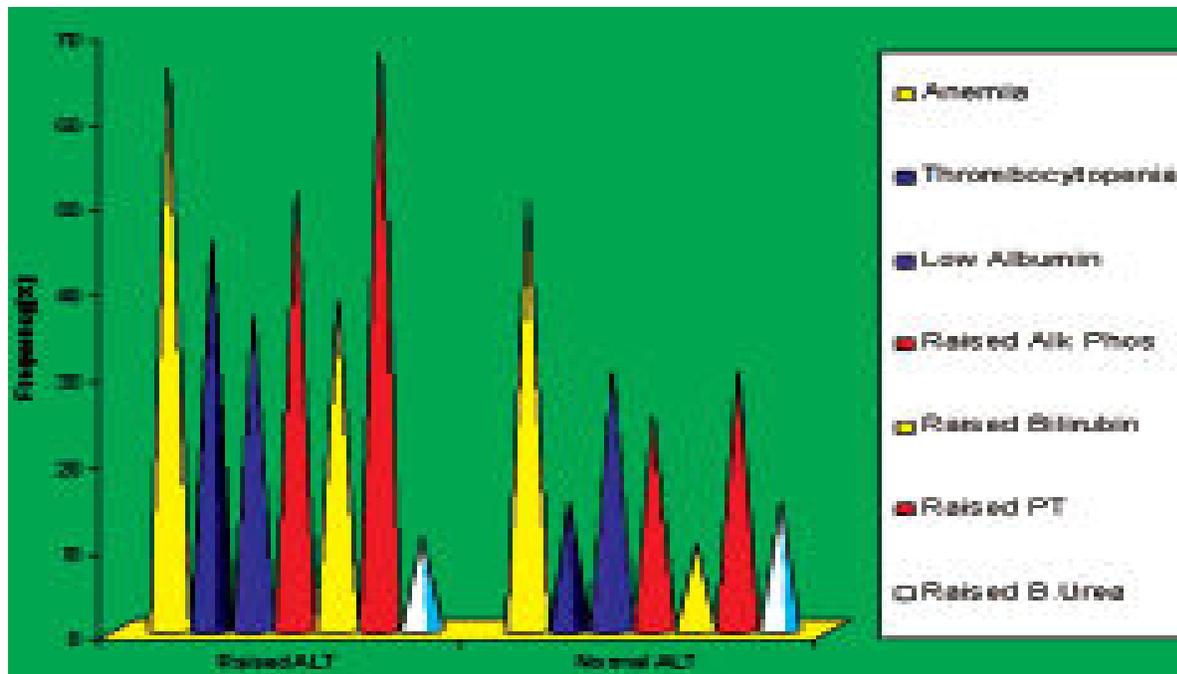


Fig-1: The graph shows the frequency of hematological and biochemical changes associated in patients with raised and normal ALT levels in Typhoid fever.

DISCUSSION:

The typhoid fever physiology is very complicated method which goes through various grades [8]. This disease starts with no symptoms incubation duration seven to fourteen days, during this period bacteria attacks macrophages and extend in the whole system. A very increase in the temperature occurs in the very first week. The progress of rose spots, pain in the abdomen & splenomegaly starts in the second week of disease. The 3rd week is the main age of complications and very severe intestine infection linked with necrosis which gives outcome of perforation & haemorrhage [9]. There are various reported complications of typhoid fever. Parry MC has stated that bleeding through intestine, perforation & encephalopathy are the most dangerous abnormalities [10]. Hepatitis, suppression of the bone marrow, paralytic ileus and myocarditis were the most common abnormalities in this research work of Choo [11]. The changes of haematology are very frequent in typhoid fever. These include coagulation, anaemia, eosinophilia, leucopenia & thrombocytopenia. The suppression of the bone marrow plays a vital role in the creation of changes in haematology [5].

In this research, more than sixty-one percent patients had anaemia, which is much higher than concluded by Ahmed (thirty-eight percent) [12] & Alam (thirty-one percent) [13] but lower than researched by Joseph (seventy-seven percent) [14] & Rasoolinejad

(eighty percent) [15]. Leucopenia was available in only four percent patients [16]. Serious hepatic malfunctioning due to acute virus is uncommon [17]. S typhi infects the Kuffer cells which lead to several dangerous complications [18]. The occurrence in the increase of liver enzymes during this fever concluded as twenty-two percent, twenty-six percent and fifty-two percent in different research works [16, 19, 20]. Morgestern concluded the occurrence of jaundice in nine percent [20], whereas Giltin reported the jaundice in thirty-three percent patients [21]. The participation of liver in this fever has a connection with the extra hepatic abnormalities [22]. The range of the renal problems includes mild to serious glomerulonephritis [23].

CONCLUSION:

Haematological alterations & hepatic malfunctioning are the main outcomes of typhoid fever. The participation of liver is present in the occurrence of these serious abnormalities. But these alterations are easily treatable with the help of anti-microbial therapy. Kidneys also play minor part in these changes but they do not require particular therapy.

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