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# ABDOMINAL COMPUTED TOMOGRAPHY FINDINGS AND HEPATIC DYSFUNCTION ASSOCIATED WITH SCRUB TYPHUS

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**Abstract:**
***Objective:*** *This retrograde research work interrogated the hepatic dysfunctions and abnormal findings of CT (Computed Tomography) in the patients diagnosed with scrub typhus.*
***Methodology:*** *349 patients were present with confirm scrub typhus. 94 patients underwent computed tomography of abdomen cavity. The review of the computed tomography images was carried out by the radiologist. We collected the data of the patients about the history of disease, signs, clinical symptoms and findings of laboratory testing from the electronic clinical records of these patients.*
***Results:*** *In 349 patients present with scrub typhus, aspartateamino-transferase's elevation (78.50%) & alanineamino-transferase (63%) were much dominant in comparison with the alkaline phosphatase (27.20%) &total bilirubin (16.10%). Abdominal computed tomography findings of ninety four patients were, in decreasing order of rate of occurrence, enlarged lymph-node (53.20%), inhomogeneous liver's enhancement (47.90%), splenomegaly (46.80%), ascites (28.70%), less attenuation in the periportal regions (27.70%), thickening of the wall of gall bladder (17%) and infarct of spleen (6.40%).Also, there was tendency of elevation in the level of the aspartate amino-transferase in accordance with the findings of computed tomography (P= 0.0280).*
***Conclusions:*** *The findings of this research work concluded that abdominal manifestation of CT of scrub typhus with raised amino-transferases was present with variation and they were not specific. However, awareness of these outcomes may evoke the scrub typhus's recognition by the health professionals in endemic regions.*
***KEYWORDS:*** *Tomography, Gall Bladder, Alanine, Splenomegaly, Aspartate, Abdomen, Phosphatase, Dysfunction, Scrub Typhus.*

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## INTRODUCTION:

The cause of the scrub typhus is orientia tsutsugamushi. It is a mite borne infectious disease. This particular disease is acute febrile illnesses in various regions of Pakistan during season of autumn and this disease had manifestations ad headache, high fever, myalgia, and in most of the patients, an eschar and rash. There is involvement of multi-organs including the liver in this disease [1, 2]. There is quite common hepatic dysfunction in the patients suffering from scrub typhus (70.0% to 90.0%) [3-6]. Diagnosis of the complication of scrub typhus is based on exposure history, serologic assay and clinical features. But in some patients, there is much complication in the diagnosis of this disease because of difficulty in the identification of eschar or in non-availability of serologic test [7, 8].

When there is visit of the febrile patients in the emergency departments, abdominal CT may be considered for diagnosis of the disease. Some research works described the features of abdominal CT of the scrub typhus with the hepatic dysfunction to-date. Jeong in the year of 2007, for the very first time demonstrated the findings of abdominal CT of scrub typhus [9]. But the number of the patients was much low to certain the association of the hepatic dysfunction and abdominal CT manifestations with this disease. So, we performed this research work to interrogate the findings of abdominal CT in the patients of scrub typhus with anomalous activity of amino-transferase.

## METHODOLOGY:

This research work carried out from June 2015 to March 2020 at Allied/DHQ Hospital, Faisalabad. 349 patients over nineteen years of age were detected with the scrub typhus. We made the diagnosis, if the one of the following criteria was met;

1. Past history of outdoor exposure
2. An eschar
3. Single serologic test at first clinical visit. [7, 8].

We performed the serologic test for the diagnosis of scrub typhus with the utilization of a commercial ICT (Immuno-chromatographic Test) with negative or positive findings [10]. Patients suffering from diseases of liver as liver cirrhosis, hepatitis and liver malignancy were not included in this research work. 10 out of 349 patients diagnosed with the disease of scrub typhus were not included because of liver cirrhosis in 4, chronic HBV infection in four and chronic HCV infection in one and Klatskin tumor in one single patient. We investigated the signs, symptoms and findings of laboratory testing of all the patients with examining the electronic clinical records.

We took the abdominal CT in 7 days after manifestation of symptoms and signs of abdominal distress, particularly pain in abdominal cavity or hepatic dysfunction with febrile illness. 94 patients among 349 underwent abdominal computed tomography. One single radiologist reviewed the images of computed tomography. We concentrated on the following results in computed tomography of scrub typhus as enlarged lymph-node, inhomogeneous liver's enhancement, splenomegaly, ascites, less attenuation of periportal regions, thickening of the wall of gallbladder and splenic infarct [9, 10]. We defined the enlarged lymph node as abdominopelvic lymph-node with short-axis diameter of greater than ten millimeters. We defined the splenomegalyas maximal width of greater than eleven centimeters on the axial computed tomography scan [11].

Ethical committee of the Hospital gave the permission to conduct this research work. We expressed all the values in averages, standard deviations, median and ranges. The evaluation of the comparison of the baseline features in accordance to the number of computed tomography findings with the utilization of ANOVA & Kruskal-Wallis test. AST (Aspartate Amino-transferase) and ALT (Alanine Amino-transferase) was log transformed for parametric statistical analysis. We used the Bonferroni correction for the post-hocanalysis. We considered the P value less than 0.050 as significant. We used the SPSS V.23 for the statistical analysis of the collected information.

## RESULTS:

There were 41.50% (n: 145) male and 58.50% (n: 204) female patients. Average age of the patients was 63.70 ±16.20 years. Most important clinical manifestations were fever in 92.80%, chills in 78.50%, rash in 59.0%, myalgia in 57.30%, headache in 40.10%, vomiting or nausea in 19.50%, cough in 18.90%, pain in abdomen cavity in 18.60%, shock in 4.30%, and abnormal mental health in 3.20% and lymphadenitis in 1.70% patients. There was detection of an eschar in 245 patients (70.20%). There was positive ICT in 265 patients (75.90%) (Table-1).

**Table-I: Baseline Characteristics of the 349 Patients with Scrub Typhus**

| Characteristic | Median (range) | Proportion of abnormality |
|---|---|---|
| Male | 145 (41.5) | |
| Female | 204 (58.5) | |
| Age | 63.7 ± 16.2 | |
| AST (IU/L) | 71 (12 –>2600) | 274/349 (78.5) |
| ALT (IU/L) | 55 (9 –>2600) | 220/349 (63.0) |
| ALP (IU/L) | 88 (17 – 1492) | 94/346 (27.2) |
| Total bilirubin (mg/dL) | 0.8 (0.2 –>30.0) | 56/347 (16.1) |
| Albumin (g/dL) | 3.2 (1.7 – 4.5) | 120/346 (34.7) |
| PT(INR) | 1.00 (0.26 – 8.05) | 9/295 (3.1) |
| White blood cells (/μL) | 6400 (1100 – 26900) | 150/348 (43.1) |
| Hemoglobin (g/dL) | 12.6 (8.5 – 17.9) | 114/348 (32.8) |
| Platelet (x103/μL) | 133 (24 – 537) | 227/348 (65.2) |
| C-reactive protein (mg/L) | 64.2 (0.15 –>200) | 300/308 (97.4) |
| Positive results of Scrub typhus antibody test | 265 (75.9) | |
| Days of hospitalization | 5 (2 – 208) | |

Values are presented as number (%) or mean ± SD.

AST, aspartate aminotransferase; ALT, alanine aminotransferase; ALP, alkaline phosphatase;

PT (INR), prothrombine time-international normalized ratio.

Majority of the patients present with scrub typhus had hepatocellular patterned dysfunctions. Proportion of amino-transferases disorders (78.50% of AST and 63.00% of ALT greater than 40.0 IU/L) was higher than the amount of the patients with anomalous ALP (27.20% greater than 130.0 IU/L) & total bilirubin (16.10% greater than 1.20 mg/dL) (Table-1). 94 patients underwent CT of abdomen cavity, particularly because of the work-up for febrile illness with the hepatic dysfunction. Findings of abdominal CT were the enlarged lymph node in 53.20%, inhomogeneous liver's enhancement in 47.90%, splenomegaly in 46.80%, ascites in 28.70%, less attenuation of periportal regions in 27.70%, thickening of the wall of gallbladder in 17% and splenic infarct in 6.40%. There was no abnormal CT finding in 10.60% (n: 10) patients. There was not any patient that appeared with the all afore-mentioned findings of computed tomography (Table-2, Figure-1 and Figure-2).

**Table-II: Abdominal CT Findings In 94 Patients with Scrub Typhus**

| Findings of CT | N (%) | Number of CT findings | N (%) |
|---|---|---|---|
| Enlarged lymph node | 50 (53.2) | 0 | 10 (10.6) |
| Inhomogeneous enhancement of liver | 45 (47.9) | 1 | 21 (22.3) |
| Splenomegaly | 44 (46.8) | 2 | 28 (29.8) |
| Ascites | 27 (28.7) | 3 | 14 (14.9) |
| Low attenuation of periportal areas | 26 (27.7) | 4 | 12 (12.8) |
| Gallbladder wall thickening | 16 (17.0) | 5 | 5 (5.3) |
| Splenic infarct | 6 (6.4) | 6 | 4 (4.3) |

Enlarged lymph node is defined as short-axis diameter of more than 10mm. Splenomegaly is defined as maximal width of more than 11cm on the axial scan.

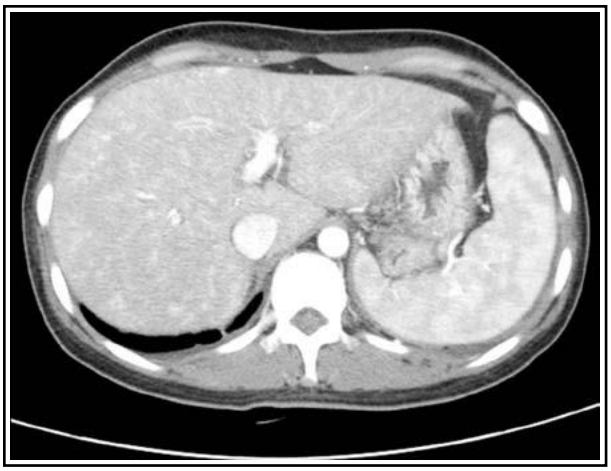

Fig 1

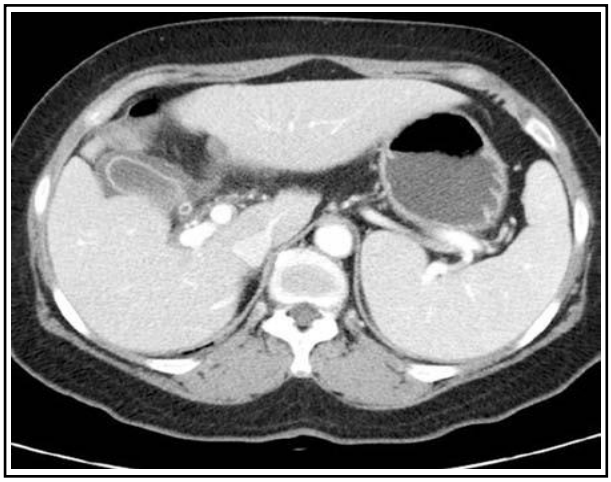

Fig 2

We classified the patients into 4 groups who underwent computed tomography according to the number of findings of CT; 0 = ten of 94 (10.60%); 1=21 of 94 (22.30%); 2=28 of 94 (29.80%); 3 or higher= 35of 94 (37.20%). We provided the comparison of the association between these mentioned groups and parameters elaborated in Table-1. There was increase in the amino-transferases according to number of findings of CT and log transformed for statistical analysis of parameters (AST, P=0.0280; log-AST, P=0.0110) (Table-3). Post-hoc statistical of the log-AST showed an important difference in average difference between 0 and '3 or higher' groups (P=0.0410).

**Table-III: Level of Aminotransferase According to The Number of Abdominal CT Findings (N = 94)**

| Number of CT findings | 0 | 1 | 2 | 3 or more | P |
|---|---|---|---|---|---|
| N (%) | 10 (10.6) | 21 (22.3) | 28 (29.8) | 35 (37.2) | |
| AST (IU/L) | 77.7±56.5 | 116.3±100.1 | 128.6±137.0 | 282.3±465.1 | 0.028 |
| Log AST | 1.8004±0.28941 | 1.9608±0.29214 | 1.9234±0.41122 | 2.1857±0.43884 | 0.011 |
| ALT (IU/L) | 66.6±54.4 | 89.2±81.4 | 97.4±128.9 | 221.2±443.0 | 0.103 |
| Log ALT | 1.6801±0.39648 | 1.8295±0.31212 | 1.7486±0.44636 | 2.0151±0.49694 | 0.051 |

Values are presented as mean ± SD.

P-values derived from the Kruskal-Wallis Test for AST and ALT.

P-values derived from the one-way ANOVA after transformed log for parametric statistics.

## DISCUSSION:

Some countries are the victims of the endemic of scrub typhus as Pakistan, India, Thailand, China, Australia and Malaysia. This disease is a serious burden on health facilities in these countries [12-15]. This disease has occurrence in USA, Europe and Canada and can be imported by the tourists from these regions of endemic [16]. Some research works conducted in past have stated that hepatic dysfunction in the cases suffering from scrub typhus was discovered to be hepatocellular patterned abnormality [3-6]. This finding is consistent with the results of this current research study. Scrub typhus can increase the amount of amino-transferases because of direct cytopathic damage to liver [4, 17, and 18]. Most frequent findings were enlarged lymph-node (53.20%) in current research work and splenomegaly (79.0%) was the most common finding in research works conducted in past.

In endemic regions, it is much complicate to detect the scrub typhus when there was presence of an eschar [2, 5, 6, and 19] or when there are positive findings in the serologic tests [13, 20-22]. In this current research work, total 70.20% patients appeared with an eschar and 75.90% patients presented with positive serology and this amount was much similar with the results of

research works conducted in past. There are some limitations of this research work as it was a study conducted in a single center. The number of the patients was much less. Another limitation was data collection retrospectively. There is need of further research works to consolidate the findings of this current research work.

## CONCLUSION:

This current research work showed that majority of the patients present with scrub typhus had hepatocellular-patterned dysfunction with a clear dominant AST elevation & elevation of ALT. Features of abdominal CT were the enlarged lymph-node, ascites, inhomogeneous liver's enhancement, splenomegaly, less attenuation of periportal regions, thickening of the wall of gall-bladder and splenic infarct. We also found that there was variation and non-specification with elevation of amino-transferase in manifestations of abdominal CT of the scrub typhus.

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