To Study Level of Triglycerides and Other Haematological Findings to Determine the Development and Prevalence of Multi Organ Dysfunction (MODS) In the Patients of Scrub Typhus

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Abstract: Scrub typhus is an emerging infectious disease in many parts of the world, and is endemic to South Eastern and Far Eastern countries of Asia. Scrub typhus can be a very serious infection that often presents with non-specific symptoms, making it difficult to differentiate from other infections. The laboratory findings and clinical course may also vary significantly, making diagnosis and appropriate treatment difficult. Complications include jaundice, hepatitis, renal failure, ARDS, myocarditis, encephalitis, etc. Here we present a study of scrub typhus in our medical college at the outskirt of Udaipur city in the state of Rajasthan, India during the two year study period from September 2020 to August 2022, a total of 100 cases were included. Emphasis was given on the levels of triglycerides and other haematological findings to determine the development and prevalence of multi organ dysfunction (MODS) in the patients of scrub typhus. Prompt diagnosis and treatment is essential as a delay in treatment can result in significant mortality. From this study, it is concluded that more the levels of triglyceride, more is the development of MODS.

Keywords: Scrub typhus, Orientia tsutsugamushi, triglycerides, multi organ dysfunction (MODS)

I. Introduction

Scrub typhus is an emerging infectious disease in many parts of the world, and is endemic to South Eastern and Far Eastern countries of Asia (India, Sri Lanka, Pakistan, Japan, Thailand and Korea), also extending from Afghanistan down to northern Australia, the so-called Tsutsugamushi triangle. It is an important cause of acute undifferentiated febrile illnesses in the Indian subcontinent. Clinical features include acute onset of fever, headache, myalgia, multiple organ dysfunction and eschar at the site of inoculation, which is present in a variable percentage of patients. It can range in severity from a mild, self-limiting disease to, if untreated, a fatal illness in 30–50% of those it affects such as acute respiratory distress syndrome (ARDS), septic shock and multisystem organ failure concluding in death. It is a chigger mite-borne bacterial infection of humans caused by Orientia tsutsugamushi. Mammalian cells store excess fatty acids in the form of triglycerides within lipid droplets and the intracellular bacterium Orientia tsutsugamushi induces the formation of lipid droplets. The pathogen-infection induced the accumulation of triglycerides even without external supply of fatty acids. They caused decreased energy production and deficiencies in both remethylation sources and glutathione. In addition, they accelerated uncom energy production pathways (i.e., excess fatty acid and protein oxidation) in host body. Infection resulted in splenomegaly with distinct phospholipid and amino acid characterististics.

II. Method

A total of 100 patients were included over 18 years of age with scrub typhus admitted to Pacific Institute of Medical Sciences (PIMS), Udaipur between September 2020 to August 2022, a period of 2 years. Scrub typhus was confirmed by IgM ELISA test. Patients with scrub typhus positive test with or without eschar were included. Patients with past history of chronic renal failure, liver failure, malaria/ dengue/chikungunya/brucellosis positive and patients on dyslipidemic drugs (statins and fibrates) are excluded. A detailed history and clinical examination, including careful search for an eschar, was documented for each patient. Basic laboratory investigations were performed, including complete blood count, renal function test, glucose, liver function test, lipid profile and chest X-rays; additional investigations were performed in some patients including blood culture, quantitative buffy coat test for malarial parasite, abdominal ultrasound and serology for leptospirosis and dengue. Scrub Typhus Detect was used on serum samples for performing IgM ELISA and it was considered positive when optical density (OD) was found >0.5. The data will be entered in MS Excel software version 17 and analyzed using Statistical Packages for Social Sciences (SPSS). Descriptive data are given as the mean standard deviation (SD) or as the median and range. The quantitative data will be analyzed using Independent Student’s T test, Pearson’s correlation test, ANOVA test. The associations of clinical and laboratory features with the outcome were analyzed by univariate and multivariate logistic regression and 95% confidence intervals (95% CI) were calculated. A two sided p-value of 0.05 or less was considered statistically significant for all tests.

III. Discussion

Trombiculid mites (such as Leptotrombidium delicense and L. palladium) found in long grasses and in dirt-floor homes are the natural host of the organism, and the disease is transmitted to humans through infected larval stages (chiggers) of the mites during feeding. Most of the cases are from rural area due to favourable environment for the growth of mites. Outbreaks usually occur during rainy season. The incubation period is usually between six to twenty-one days from exposure. The pathophysiological hallmark of scrub typhus is disseminated vasculitis with subsequent vascular injury that involves organs such as skin, liver, brain, kidney, meninges and the lung. In some cases, the pathogens multiply at the site of entry, forming an inflammatory lesion known...
as an eschar with regional lymphadenopathy, which is characteristic of the disease. Within a few days, patients develop rickettsemia and causes disseminated intravascular coagulation (DIC) with platelet consumption, vascular leak, pulmonary edema, shock, hepatic dysfunction and meningoencephalitis. The clinical picture is characterized by sudden onset fever with chills, headache, backache and myalgia, profuse sweating, vomiting and enlarged lymph nodes, associated with rash and often an eschar. After five to eight days of fever, a macular or maculopapular rash appears on the trunk and later extend to the arms and legs in few patients. Although the eschar is reported to be less frequently observed in South Asian patients than in East Asian or Caucasians, 55% of patients had an eschar in a recent study from South India. In a large retrospective analysis of 418 patients with confirmed scrub typhus and an eschar, a significant difference in the distribution of eschar was noted between males and females. In females, it was mostly seen over the chest and abdomen (42.3%), while in males, it was seen in the axilla, groin and genitalia (55.8%). Unusually eschar were found over the cheek, ear lobe and dorsum of the feet. Laboratory confirmation of scrub typhus is generally by serological methods, with the indirect fluorescent assay being the most commonly used test; paired titres are usually required to make a confirmatory diagnosis. ELISA and passive haemagglutination assay are also available. Complications of scrub typhus infection include pneumonia, acute respiratory distress syndrome (ARDS), myocarditis, encephalitis, hepatitis, DIC, hemophagocytic syndrome, acute kidney injury, acute pancreatitis, transient adrenal insufficiency, subacute painful thyroiditis and presentation as an acute abdomen. Several neurological manifestations have been observed in the setting of scrub typhus infection. The most common neurological presentation in scrub typhus is as meningitis, meningoencephalitis or encephalitis. Others include cerebral venous thrombosis, GuillainBarre Syndrome, transient Parkinsonism and myoclonus, opsoclonus, cerebellitis, transverse myelitis, polyneuropathy, facial palsy, abducens nerve palsy and bilateral optic neuritis. Patients with mild disease presenting with fever without organ dysfunction require antipyretics along with antibiotics. Patients presenting with organ dysfunction would need organ support depending on the nature and extent of organ dysfunction. Patients with respiratory failure are supported either by means of non-invasive or invasive mechanical ventilation based on standard criteria in the management of respiratory failure. Those patients in shock are treated by fluids and vasoactive therapy if the blood pressure does not improve with fluids. Renal replacement therapy is required in patients having acute kidney injury with scrub typhus. Those patients with DIC associated with clinical bleeding may require transfusion of blood or blood products depending on the nature of coagulation derangement. Antibiotics used are doxycycline, chloramphenicol, azithromycin, rifampicin, roxithromycin and tetracycline. Conventionally, the treatment of scrub typhus involves the use of the tetracycline group of antibiotics or chloramphenicol. Since these drugs are contraindicated in pregnancy and in children, alternative agents such as quinolones and macrolides are used. Doxycycline is the preferred drug in the treatment of scrub typhus. A therapeutic response to doxycycline therapy is used as a diagnostic test. In less sick patients oral doxycycline can be administered at 100 mg twice daily. The duration of treatment is 7 days. In critically ill patients, like those in shock, absorption of enteral doxycycline may be problematic, therefore use of intravenous doxycycline is recommended; if unavailable, intravenous azithromycin can be used alone or in combination with enteral doxycycline. In pregnancy Azithromycin is the recommended drug instead of doxycycline. Rifampicin may be considered in case of doxycycline resistance.

IV. Result

We studied 100 patients with scrub typhus confirmed on the basis of antibody test out of which 84% patients had hypertriglycerideremia. Patients presented with symptoms like fever with chills, nausea, breathlessness, cough, vomiting and generalized body ache. Eschar was present in 22% patients on examination along with organomegaly in few of them. Liver function, renal function, leucocyte count and platelet count were found deranged. 56% patients developed MODS with mortality of 13% patients and it has been found that patients with high levels of triglycerides developed MODS.

<table>
<thead>
<tr>
<th>Triglyceride levels (mg/dl)</th>
<th>Number of patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;165</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>166–265</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>266–365</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>366–465</td>
<td>18</td>
<td>18</td>
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<tr>
<td>466–565</td>
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<td>566–665</td>
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<td>666–765</td>
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<tr>
<td>&gt;765</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Number and percentage of patients in different triglyceride level ranges

![Graph showing triglyceride levels, MODS, and mortality](image-url)
Scrub typhus can be a very serious infection that often presents with non-specific symptoms, making it difficult to differentiate from other infections. The laboratory findings and clinical course may also vary significantly, making diagnosis and appropriate treatment difficult. Complications include jaundice, hepatitis, renal failure, ARDS, myocarditis, encephalitis, etc. Prompt diagnosis and treatment is essential as a delay in treatment can result in significant mortality. From this study, it is concluded that more the levels of triglyceride, more is the development of MODS.

<table>
<thead>
<tr>
<th>Values</th>
<th>Number of patients</th>
<th>Normal range</th>
<th>Deranged</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>RFT</td>
<td>48</td>
<td>52</td>
<td>52</td>
<td></td>
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<tr>
<td>LFT</td>
<td>43</td>
<td>57</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>WBC Count</td>
<td>40</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Platelet</td>
<td>46</td>
<td>54</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Number and percentage of patients with normal and deranged range of haematological levels. (RFT- Renal function test, LFT- Liver function test, WBC Count- White Blood Cell count)

V. Conclusion

From this study, it is concluded that more the levels of triglyceride, more is the development of MODS.

VI. Reference


