in this study. Whole blood was collected from patients for PCR. DNA was extracted using a DNA extraction kit. A nested PCR was used to amplify a 1003-bp and 483-bp region of the 56-kDa antigen using primers were taken from gene encoding for the 56-kDa antigen of the Gilliam strain of *O. tsutsugamushi*. The PCR products were purified and DNA sequencing was performed and aligned using the CLUSTAL V program. A phylogenetic tree was constructed using neighbour-joining algorithms and analyzed using the sequences obtained in this study and those obtained from the GenBank database.

**Results:** Boryong-like strains pre-dominated overall and in all states studied (63.4%) followed by Karp-like (23.6%) and Gilliam-like (11.8%). We did not find any Kato-like strains and only one Kawasaki-like strain. Karp like strains showed >99% similarity to TH2033, TH2191, TH2208, Xinjiang & Neimeng strains and Gilliam-like strains showed >99% similarity to Clone ISS-11, Hualien 1, S072.

**Conclusion:** A previous study using PCR from eschars from south India showed a predominance of Kato-like strains but we could not find even a single Kato-like strain. Boryong-like strains predominated in our study. This shows that there is a huge diversity of *Orientalia tsutsugamushi* in India. Boryong strains should be included in diagnostic assays as well as vaccines for scrub typhus, especially for north Indian populations.

http://dx.doi.org/10.1016/j.ijid.2016.02.395

Type: Poster Presentation

Final Abstract Number: 41.207

Session: Poster Session I

Date: Thursday, March 3, 2016

Time: 12:45-14:15

Room: Hall 3 (Posters & Exhibition)

Emerging rickettsioses in Northeast India

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**Background:** In India, rickettsial infections were first reported from Assam and West Bengal lay back during 1947. Since then, sporadic cases have been reported from different parts of the country except in the north eastern (NE) states. However, after a gap of 68 years, scrub typhus was reported to resurge in three states of NE region in 2012. This long serenity may be due to lack of surveillance and low index of suspicion for scrub typhus and other rickettsial infections. Therefore, a two year study was undertaken to study the sero-epidemiology of rickettsial infections viz., Scrub typhus (ST), Spotted fever group rickettsia (SFGR) and typhus group rickettsia (TGR) in Northeast India.

**Methods & Materials:** We investigated scrub typhus reporting areas of three states viz., Assam, Arunachal Pradesh and Nagaland during 2013-2014. About 908 human blood samples were collected from healthy volunteers with informed consent. All collected human sera were screened for antibodies against ST, SFGR and TGR using a four step indirect ELISA with respective antigens. A sample whose total net absorbance was ≥1.00 was considered as sero-positive. Positive samples were further titrated using 1:100, 1:400, 1:1600 and 1:6400 sample dilutions.

**Results:** Overall, 33.5% (305/908), 11.2% (102/908) and 3.9% (35/908) were found to be seropositive for ST, SFGR and TGR respectively. Co-circulation of ST and SFGR was found in all the three states whereas TGR were detected in samples collected from Arunachal Pradesh only. People engaged in agricultural and forest sectors were predominantly affected with a higher male to female ratio. Rural setting and lack of hygiene was a notable feature in the affected areas.

**Conclusion:** Our findings indicated a wide circulation of rickettsial infections in this region. This is also the first evidence of SFGR and TGR circulation in NE region of India. Continuous surveillance, understanding eco-epidemiology of these diseases and consideration of these agents for diagnosis of febrile illness by public health workers is warranted in future.

http://dx.doi.org/10.1016/j.ijid.2016.02.396

Type: Poster Presentation

Final Abstract Number: 41.208

Session: Poster Session I

Date: Thursday, March 3, 2016

Time: 12:45-14:15

Room: Hall 3 (Posters & Exhibition)

Predictors of severity in dengue infection

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**Background:** Dengue epidemic has become a serious emerging infectious diseases and a major public health problem in India. Some of the Dengue Fever patients present with mild symptoms and some present with severe manifestations involvement of vital organs responsible for high morbidity and mortality. Exact pathogenic mechanism of severity is still not clearly understood. It is hypothesized that high level of serum TNF-alpha, IL-6 and soluble Thrombomodulin are associated with severe Dengue Fever, bleeding and shock.

**Methods & Materials:** It was a prospective observational case control study conducted at tertiary care hospital. All cases with either +ve for IgM or NS1 were enrolled for the study. Patients with shock were enrolled as cases and patients without shock were enrolled as control. We estimated serum TNF-alpha, IL-6 and sTM among shock and non-shock patients at the time of 1st visit and followed up till death, discharge or 14 days.

**Results:** Thirty Dengue patients with shock were enrolled as cases and 50 patients without shock were enrolled as control. Mean value of sTM was 15.8±4.6 ng/ml among shock and 6.4±4.4 ng/ml among non-shock and their difference was highly statistically significant (p<0.001). About 21 cases (70%) from shock and 3 cases (6%) from nonshock were found to have high sTM level (>15 ng/ml) and their association was also found to have statistically significant (<0.001). About 12 cases (39.9%) from shock and 10 cases (20%) from non-shock were found to have elevated TNF-alpha (>100 pg/ml). About 11 cases (37.7%) from shock and 15 cases (30%) from non-shock were found to have elevated IL-6 (>100 pg/ml). However serum level of TNF-alpha and IL-6 were not found to be significant. We found 22% incidence (11) of shock among Dengue Fever and found to have significant rise of sTM (13 ± 4.67) and IL-6 (136 ± 76.4) at the time of 1st visit and they all had normal blood pressure but subsequently developed shock.