

Original Research Article

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Seroprevalence of Rickettsial Infections in a Tertiary Care Center in South India

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ABSTRACT

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Rickettsial diseases are generally classified under the causes of Fever of unknown origin (FUO) and high prevalence of this disease is found in developing countries like India. Due to the difficulties in clinical diagnosis and lack of laboratory methods in many geographical areas it is an underestimated public health problem. Mortality may be as high as 30-40% if untreated. This is a retrospective study conducted to estimate the prevalence of rickettsial diseases among the patients visiting a tertiary care center in rural southern India for a period of 18 months. The sensitivity and specificity of Weil-Felix test is low but even today it is done as it's the most convenient and economical test available for the diagnosis of rickettsial infections. Out of 264 samples, 125 were positive by Weil-Felix test, out of which 65 were males and 60 were females. Prevalence of rickettsial diseases is significant in this region and greater clinical awareness in the differential diagnosis of fevers is required for early diagnosis and treatment.

Introduction

Rickettsia are group of small non-motile, obligate intracellular Gram negative coccobacilli which are transmitted by arthropod vectors like lice, fleas, ticks (Mita D *et al.*, 2016). Species of rickettsia can be categorised in to spotted fever, typhus and scrub typhus groups based on clinical manifestations. Rickettsial infections are distributed throughout the world and are re-emerging in the Indian Subcontinent, especially among children (Rwituja *et al.*, 2016). Many rickettsiae are transmitted transovarially in the arthropod, which serves as both vector and reservoir (Sudhindra K S *et*

al., 2017). Rickettsial infection has been one of the great scourges of mankind, occurring in devastating epidemics during times of war and famine. Napoleon's retreat from Moscow was forced by rickettsial disease breaking out among his troops. Lenin is said to have remarked, in reference to rickettsial disease rampant during Russian revolution, that 'either socialism will defeat the louse or the louse will defeat the socialism'. Rickettsial infections in the past have taken more lives than all the wars combined together (Narendra *et al.*, 2010). Low suspicion index and difficulties in diagnosing Rickettsial diseases are responsible for substantial proportion of undiagnosed febrile illnesses in humans in

many parts of the tropics. Untreated cases have fatality rates as high as 30-35%. They are widely prevalent in various parts of southeast Asia. Rickettsial diseases in India have been documented from Jammu and Kashmir, Uttaranchal and Himachal Pradesh, Rajasthan, Assam, West- Bengal, Maharashtra, Kerala and Tamil Nadu. The gold standard micro immunofluorescence test as well as ELISA are not readily available in India. At present, Weil Felix test which utilises antigens prepared from *Proteus* species remains the only laboratory test available to investigate these infections occurring in communities in India (Upasna *et al.*, 2015).

Family Rickettsiaceae comprise a group of microorganisms that phylogenetically occupy a position between bacteria and viruses. Family Rickettsiaceae comprises three genera namely Rickettsia, Orientia and Ehrlichia. Being obligate intracellular parasites, these organisms do not grow on cell free media and need tissue cultures and laboratory animals for their isolation. Rickettsiae are transmitted to humans by arthropod vectors through their bite or faeces. These organisms grow in alimentary canal of arthropods. Arthropods maintain the infection naturally by either transovarial transmission (passage of the bacteria from infected arthropods to progeny seen in spotted fever group and scrub typhus) where in arthropods act as vectors as well as reservoirs, or without transovarial transmission seen in typhus fever group, where arthropods act only as vectors (Narendra *et al.*, 2010).

Rickettsiae multiply in endothelial cells of small blood vessels and produce vasculitis. The cells become swollen and necrotic, there is thrombosis of the vessel, leading to rupture and necrosis. Disseminated intravascular coagulation and vascular occlusion may develop. Brain, heart and other organs may be involved. The clinical manifestations are

fever, headache with or without nausea, vomiting and cough. As the disease progresses macular, maculopapular, or vesicular rash, eschar, pneumonitis and meningoencephalitis occur (Sudhindra K S., 2017).

Rickettsial infections are attributed as one of the important causes of FUO and there is a need to differentiate it from other common febrile illnesses like enteric fever, malaria, dengue for appropriate treatment (Sanap *et al.*, 2017). Weil-Felix is not a very sensitive or specific test but with added clinical interpretation it helps in effective diagnosis and treatment (Mita D., 2016).

The study was undertaken at AIMS & RC, Bangalore rural to estimate the prevalence of rickettsial diseases in the community.

Materials and Methods

Study setting and design

This study was conducted at the central laboratory at AIMS & RC, Devanahalli.

The samples that were received in the microbiology laboratory from January 2015 to July 2017 for Weil- Felix test were included in the study.

Weil-Felix test is based on the principle that some strains of *Proteus* share common somatic constituents with certain species of rickettsia. Sera from patients infected with rickettsia will, therefore, produce agglutination with *Proteus* antigen suspensions. Antigen suspensions of proteus OX 19 antigen reacts strongly with sera of patients with the typhus group rickettsia and rocky mountain spotted fever, proteus OX 2 with the sera of patients with spotted fever infections, while the proteus OXK with the sera of patients infected with Scrub typhus. Titres of > 1:80 for OX 2, OX 19 and OX K

were considered diagnostically significant (Sanap *et al.*, 2017).

The blood samples were collected in a B D (Becton Dickinson) vacutainer with proper aseptic precautions. The serum was separated by centrifugation of the blood sample at 1000 rpm for three minutes. Antigens were procured from Omega Diagnostics LTD and the Weil Felix test was done using standard protocol with doubling dilutions of 1:20 to 1:320. The titres of 1:80 or more were considered to be highly suggestive of rickettsial infection. The co-infections like dengue, malaria, enteric fever and leptospirosis if present were also recorded.

The Ethical clearance from the institutional ethical committee was obtained.

Results and Discussion

The total number of Weil-felix tests done during the period was 264 and the number of positives was 125 with a positivity of 47.34%.

Out of 125, 60 were females and 65 were males. The incidence of rickettsia was slightly higher in males (Ramyashree *et al.*, 2015, sanap *et al.*, 2017). Forty four were in below 13 years of age. Literature search revealed that no data with respect to baseline titre in rickettsial diseases in this region was available (Table 1 and 2).

Serological tests still remain an indispensable tool in the diagnosis of rickettsial infections (Mahajan S K *et al.*, 2005). Many immunological tests that are accurate and

sensitive are available for the diagnosis of rickettsial diseases. Among these specific tests, micro immunofluorescence is considered the best approach, followed by latex agglutination (LA), indirect hemagglutination (IHA), immunoperoxidase assay (IPA) and Enzyme-linked immunosorbent assay (ELISA).

These specific immunological tests are not easily available in developing countries like India. They require highly trained personnel and production of antigens may vary among different laboratories leading to inconsistencies in the interpretation of results. Weil-Felix test serves as a useful and affordable tool for laboratory diagnosis of rickettsial diseases in resource-poor countries (Raghu Kumar *et al.*, 2015).

The test has low sensitivity and specificity, but it is cost effective and widely available. In spite of all its drawbacks, Weil-Felix test still serves as an economical and useful diagnostic tool for laboratory diagnosis of rickettsial diseases provided the test is interpreted in the correct clinical context (Mita D *et al.*, 2016).

Our study is the first of its kind from this region. The age group of 20-50 years in males was found to be more susceptible for rickettsial infections in a study conducted by Sanap *et al.*, in 2017. Udyan *et al.*, from coastal Karnataka also had similar findings. Males appear to be at a higher risk probably due to the greater recreational or occupational exposures to vector habitats.

Table.1 Total number of Weil-Felix tests with reactivity

Positive samples No (%)	Negative samples No (%)	Total No
125 (47.34)	139 (52.65)	264

Table.2 Sex-wise distribution of total samples

Gender	Positive samples No (%)
Male	65 (52)
Female	60 (48)
Total	125

In this study the total number of positives for Weil-Felix test was 125, out of which 65 were male with male preponderance which is similar to studies done by Raghu Kumar *et al.*, (2015) and Anuradha Sood *et al.*, (2013).

Weil-Felix test still remains an indispensable tool for diagnosis of rickettsial infections. In recent years micro immunofluorescence assay (IFA) has become the reference test. The procedure appears to be the most sensitive and specific test for the diagnosis of rickettsial infections. Hechemy *et al.*, demonstrated 70% agreement between WF test and micro IF results especially with higher titres in Weil-Felix test.

Rickettsial infections are prevalent in and around Devanahalli and need to be considered among the differential diagnosis of patients with PUO.

Greater clinical awareness, a high index of suspicion, better use of available diagnostic tools would increase the frequency with which rickettsial diseases are diagnosed which is necessary for their prevention and control.

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