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Microbiology Section

The Easy and Early Diagnosis of Typhoid Fever

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ABSTRACT

Background and Objective: Typhoid fever is endemic in India. Its diagnosis is usually confirmed by blood culture, clot culture, stool culture and the Widal agglutination test. In the present study, we assessed the usefulness of the Enterocheck WB test in detecting the IgM antibodies in typhoid fever.

Materials and Methods: A total of 83 cases of clinically suspected typhoid fever were included in the study. A blood culture and the Widal test were done by using the standard methods. The Enterocheck WB test was done according to the manufacturer's instructions.

Results: Of the 83 cases, the blood culture was positive for Salmonella typhi in 19 (22.89%) cases, among which the Widal test was positive in 12 (14.45%) cases and the Enterocheck WB test was positive in 17 (20.48%) cases. The sensitivity & specificity of the Enterocheck WB test were found to be 89.47% and 96.87% respectively.

Interpretation and Conclusion: We compared the sensitivity and the specificity of the Enterocheck WB test and the Widal test to those of the blood culture as the gold standard method in the diagnosis of typhoid fever. We found that the Enterocheck WB test for the detection of the IgM antibodies was easy to perform and that no special equipment or prior training of the para-medical staff were required for the testing and the interpretation of the results. Hence, it can be concluded that the Enterocheck WB test can be used as a complimentary test as compared to the blood culture and the Widal test for the diagnosis of typhoid fever.

Key Words: S. typhi, Blood culture, Typhoid fever, Widal test, Enterocheck WB test, Early diagnosis

INTRODUCTION

Typhoid fever is a systemic infection which is caused by the bacterium, Salmonella enterica, serotype typhi. This highly adapted, human specific pathogen has evolved remarkable mechanisms for its persistence in its host that help the organism to ensure its survival and transmission [1]. The socio-economic impact of the disease is huge, because the typhoid survivors may take several months to recover and to resume work [2]. An early and accurate diagnosis is necessary for a prompt and effective treatment. One has to rely on serological diagnosis, since many diagnostic laboratories in the developing countries, especially in the rural areas, do not have facilities for blood culture and thus the serological diagnosis becomes an important diagnostic tool. The Widal agglutination test usually detects the IgM and the IgG antibodies to S. typhi in the patient's serum from the second week of the onset of the symptoms of typhoid fever. The early rising antibodies to the lipopolysaccharide (LPS) O are predominantly IgM in nature. The S. typhi specific IgM antibodies can be used as an early marker to detect a recent infection. So, this study was undertaken to evaluate the sensitivity and the specificity of the Enterocheck WB test for the diagnosis of typhoid fever.

MATERIALS AND METHODS

This study was conducted in Department of Microbiology, Rural Medical College, Loni, India during January 2010- July 2011. The study included patients with fever for > four days and symptoms and signs which were suggestive of typhoid fever. An informed consent was taken from the patients before the sample collection. The blood samples were collected for blood culture, Widal test and the Enterocheck WB test. The blood culture was done by using brain heart infusion (BHI) broth and it was incubated. Subsequent sub-cultures were made on Mac Conkey's agar and blood agar medias after 24, 48 and 96 hours and the final sub-culture was made on the seventh day. The growth of S. typhi was identified by the standard biochemical tests and it was confirmed by agglutination with the Salmonella polyvalent 'O', 09 and the H:d antisera. The Widal test was done by using the standard procedure [3]. The Widal test was confirmed by the tube agglutination method and it was considered as positive when a titer of equal to or more than 1:160 was observed. The Enterocheck WB test (manufactured by Zephyr Biomedicals) is a rapid, qualitative sandwich immunoassay for the detection of the IgM antibodies to S. typhi in human serum / plasma or whole blood specimens. It detects the presence of the IgM class of antibodies to a lipopolysaccharide (LPS) which is specific to S. typhi in the specimens.

RESULTS

Among the 83 cases, S. typhi was isolated from the blood culture in 19 cases (22.89%) and the remaining 64 cases were blood culture negative. The Widal test was positive in 12 cases (14.45%) and the Enterocheck WB test was positive in 17 cases (20.48%). The sensitivity and the specificity of the Enterocheck WB® test and the Widal test were compared [Table/Fig-1].

DISCUSSION

In the present study, the sensitivity & specificity of the Enterocheck WB test were found to be 89.47% and 96.87% respectively. This was comparable to those of other studies for the rapid diagnosis of typhoid fever. D. Narayanappa et al reported the sensitivity of Typhidot – M as 92.6 per cent [4]. Mary Jesudason

Blood Culture	Enterocheck WB		Widal Test	
	Positive	Negative	Positive	Negative
Positive (n=19)	17	2	12	7
Negative (n=64)	2	62	22	40

[Table/Fig-1]: Comparison of results of Enterocheck WB and Widal test with blood culture

*Sensitivity of Enterocheck WB - 89.47%
†Specificity of Enterocheck WB - 96.87%
‡Sensitivity of Widal test – 63.15%
§Specificity of Widal test – 62.5%

et al reported Typhidot with 100% sensitivity and 80% specificity when bacteraemic patients were analyzed. A further prospective evaluation of the same test by this author on a large sample size showed better results [5,6]. Sonja J Olsen et al reported the sensitivity of the Tubex test to be 78% and its specificity to be 89% [7]. Anush R compared the Enterocheck WB® test to automated blood culture for typhoid fever and found it's sensitivity and specificity as 85.5% and 88.6% respectively [8].

Our study also focused on the utility of the Widal test. In the present study, its sensitivity (63.15%) and specificity (62.5%) were satisfactory. But R Duthie et al reported a higher sensitivity (78%) and specificity (99%) of the Widal test [9]. In a developing country like India, the Widal test has been used extensively in the serodiagnosis of typhoid fever. However, Lateef A et al reviewed the significance of the Widal agglutination test and concluded that its use should not be encouraged in endemic areas [10]. Ideally, in the Widal test, a fourfold rise of the antibody titer in paired sera is considered as diagnostic of typhoid fever. However, paired sera are often difficult to obtain and as a specific chemotherapy, it has to be instituted on the basis of a single Widal test only. Kulkarni M et al and Rasaily R et al revealed that a single Widal test, in association with relevant clinical findings, can still be used as a useful diagnostic tool for typhoid fever, [11,12].

CONCLUSION

The Widal test showed 63.15% sensitivity and 62.5% specificity in the blood culture positive cases of typhoid fever. The Enterocheck WB test, with its higher sensitivity and specificity, can be effectively used in the rural set-up, wherein blood culture facilities are not available. The early detection of the IgM antibodies by the Enterocheck WB test will serve as a marker of recent infection. The Widal test can be used as a complimentary serological diagnostic tool as and when it is required. However, the importance of the blood culture in the typhoid cases cannot be ignored, as the antibiotic susceptibility testing of the isolated strains is equally important.

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