

A comparative study of blood culture with Widal test in the diagnosis of enteric fever in febrile patients

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Abstract: -

Background:

Enteric/Typhoid fever is a major health problem in developing countries like India and its diagnosis only on clinical basis is difficult. All cases enteric fever and pyrexia for more than one week is screened by widal test along with other blood investigation routinely. Typhoid fever has been estimated to cause about 26 million (typhoid) and five million (paratyphoid A) illnesses, with 190,000 enteric fever deaths in 2010 globally¹. The incidence of the disease as high as 2/1000 population/year under five yr of age and 5.1/1000 populations/year under 10 yr of age². It is a systemic infection caused by organism *Salmonella* serovar *S. typhi*, *S. Paratyphi A*, *S. Paratyphi B*, & *S. Paratyphi C*. Rising titre in Widal test is the commonly used test for diagnosis of enteric fever. Hence, we are comparing widal test & blood culture for correlation of the results. ^{1,2,3}

The main aim of this study was to compare the result of Widal test and blood culture in the diagnosis of typhoid fever in febrile patients.

Methods: Blood samples were collected from 548 febrile patients with clinical symptoms of enteric fever from october 2019 to March 2020. Blood culture was used to isolate *S.typhi* and *S.paratyphi*. Slide agglutination test and tube agglutination tests were used for the determination of antibody titre. An antibody titre of anti TO $\geq 1:80$ and anti TH $\geq 1:160$ were taken as a cut of value to indicate recent infection of typhoid fever.

Results: a total of 207 culture isolates were isolated both from (84) blood Among which *S. typhi* isolates were 45(53.5%),18(21.4 %) Coagulation negative staphylococcus aureus, 12 (9.7%) klebsiella species, 7 (8.3%) *E.coli*, 2 (2.3%) *Pseudomonas* species.171(31.2%) widal positive test is an tube agglutination test for the O and H antigens of *S. typhi*, and H antigens

Conclusion

Since culture is the gold standard and most reliable diagnostic method. As culture facilities are not available in all the health care set up and diagnosis will be usually based on the clinical findings with widal test can be used as an aid for cost effective & early diagnosis.

Keywords: Enteric fever, *Salmonella typhi*, *Salmonella paratyphi*, Widal test.

INTRODUCTION

Enteric fever is a systemic infection caused by *Salmonella* serotypes; *S. typhi*, *S. paratyphiA*, *S. paratyphiB*, *S. paratyphiC*. Isolation of the organism from bone marrow (85-95%), blood (70%) and stool (45-65%) is currently considered the most reliable diagnostic method.¹¹As culture facilities are not available in all the hospitals, diagnosis will be usually based on the clinical findings along with Widal test. The commonly used Widal test is an tube agglutination test for the O and H antigens of *S. typhi*, and H antigens of *S. paratyphi A* and *S. paratyphi B*, which should show an significant rise in titre subsequently. (Senewiratane B et al, Editorial Br. Med J 1978:1:389) Negative Widal test is considered as reliable than the positive one.⁴ This study

was carried out to evaluate the value of a single acute-phase Widal test result by blood culture for the diagnosis of typhoid fever in febrile patients

Clinical presentation

incubation period is 1-14 days, It is characterized by malaise, high fever, abdominal discomfort, transient rash, splenomegaly, hepatomegaly, bradycardia, and leucopenia. non-specific prodrome symptoms associated with typhoid fever such as chills, persistent headache, constipation, diarrhea, weakness, dizziness, nausea. Complications - perforation of the gut wall, gastrointestinal hemorrhage, ileal perforation, cerebral dysfunction and shock.⁴Natural infection induces antibodies both in serum and intestines, induce lifelong protection.⁸

Materials and Methods:

This study was conducted in the department of microbiology of Rajarajeswari Medical College and Hospital over a period of 6 months. Ethical committee clearance was taken from our institutional ethical committee.

TYPE OF STUDY; Retrospective study

Inclusion criteria – All suspected cases of enteric fever and persistent pyrexia for 1 week of all age group.

Exclusion criteria – fever more than 2 weeks, patients already on antibiotic therapy.

Sample size; 548 blood samples were collected under aseptic condition for culture and serum of the same patient for widal test which were suspected to enteric fever.

Blood sample collection and inoculation

Blood Samples were collected using aseptically and before the start of any antimicrobial therapy and as soon as possible after a spike of fever. Using a sterile syringe and needle, about 8–10 ml of blood from each adult study subject and about 3–5 ml of blood from each young child was collected. Then 5–7 ml from adults and 2-3 ml of blood from children was dispensed into the culture medium bottle containing brain heart infusion broth and then incubated at 37°C. After overnight incubation positive cultures were proceed further while Negative broth cultures were incubated for seven days and sub cultured before reported negative. Suspected colonies obtained on the above media were screened by biochemical tests using & identified as CLSI guidelines 2020.

Widal test

Serum was separated for widal test, serum sample which were positive in slide agglutination test was confirmed with tube agglutination. Test was performed by using the commercially available antigen from span diagnostics. Serial dilutions of patient serum for somatic antigens of Salmonella typhi (TO) and flagellar antigens of Samlonella typhi (TH), Salmonella paratyphi A (AH) and Salmonella paratyphi B (BH) from 1:20 to 1: 640 was prepared. The tubes were incubated overnight at 37°C. Reading was taken in comparison with the controls. The tube with highest dilution showing agglutination was taken as titre of the serum.^{10, 11}

RESULT

A total of 548 samples from all patients suspected cases of enteric fever and persistent pyrexia of 1 week of all age group. Over all 45(53.5%) isolates of S.typhi was isolated, 171(32.3%) widal titres suggestive of enteric fever.

Table 1; Department wise distribution.

Sl.no	Department	No of samples	No of blood isolates	Widal titre suggestive enteric fever
1	Pediatric	129	26	41
2	medicine	357	42	121
3	obg	39	6	3
4	surgery	12	8	5
5	others	11	2	1
6	Total	548	84	171

Blood culture

Among 548 blood cultures, 84 isolates are follows S. typhi 45(53.5%),18(21.4 %) Coagulation negative staphylococcus aureus, 12 (9.7%) klebsiella species, 7 (8.3%) E.coli, 2 (2.3%) Pseudomonas species.

Gender wise 63 (75 %) male and 21 (25%) female.

Maximum of widal test were from 121(70.7 %) medicine ward, 41(23.9%) from pediatric wards.

Discussion

Rising titre in conventional Widal test is the commonly used test for diagnosis of enteric fever picked up 171(32.3%) of over all cases, while blood culture was positive in 45(53.5%) of cases. This shows blood culture still remains gold standard test for the diagnosis of enteric fever which also gives further data on antimicrobial sensitivity pattern.²¹Precise timely diagnosis of typhoid fever in early stages aims at identifying aetiological agent and carriers who might serve as source of transmission during outbreak. As the world continue fighting against antimicrobial resistance, correct, rapid and accurate diagnosis is needed toward archiving the goal.²²

Conclusion

Widal test has poor agreement with the blood culture, this means Widal test should not be used alone but in combination with blood culture test should be performed, using Widal test as the only laboratory test for the diagnosis of typhoid fever will result in misleading diagnosis.

Gold standard for the diagnosis of typhoid fever is blood culture. Results of Widal should be confirmed by blood culture and sensitivity should tested especially in those settings where the organism has become resistant to antibiotics. However, Widal test is a good alternative to blood culture if it performed within 2nd week of infection. Clinician should property diagnose and treat enteric fever to mimic its resistance to antibiotic

General measures - Sanitation and educating hygiene play a major role in reducing the burden of enteric diseases as well.

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