

Evaluation of typhidot test in diagnosis of typhoid fever in children in RIMS hospital

¹Dipankar De, ²K. Sunilbala, ³Arup Ratan Mondal, ⁴Kh. Ibochouba Singh

^{1,3}PG trainee, ²Assistant Professor, ⁴Professor, Dept. of Pediatrics, RIMS, Imphal.

Abstract:

Background: Typhoid fever is a major public health problem in developing countries. The most confirmatory test is isolation of organism from blood, urine or stool. Blood culture is a gold standard for diagnosis but facilities are often unavailable, expensive and time consuming which may lead to increased morbidity and mortality. A rapid serological test, Typhidot test is required for diagnosis of typhoid fever at an early stage. So we evaluate the efficacy of Typhidot test for early diagnosis of typhoid fever in children.

Aims of the study: 1. To evaluate the Typhidot test for the diagnosis of typhoid fever in children. 2. To determine the sensitivity, specificity, positive and negative predictive value for Typhidot test.

Study design- Cross-sectional study.

Material and methods: The study was carried out in the Department of Pediatrics, RIMS, Imphal during the period from November 2013 to June 2015 in all admitted children between 1 to 12 years of age with clinically suspected typhoid fever. Typhidot test and blood culture were done in all children along with other routine investigations at the time of admission and the results were analysed.

Results: Out of the 130 cases, blood culture was positive for *Salmonella typhi* in 32 cases, among which the Typhidot test was positive in 30 cases and the total Typhidot test was positive in 41 cases. The sensitivity, specificity, positive and negative predictive value of Typhidot test were 93.75%, 89.79%, 75% and 97.78% respectively.

Conclusion: The Typhidot test has high sensitivity and specificity. So, it can be used as a reliable and valid alternative diagnostic test for diagnosis of typhoid fever.

Key words: Typhoid fever, *Salmonella typhi*, Typhidot test, Blood culture.

I. Introduction

Typhoid fever caused by *Salmonella enteric*, serotype Typhi is still a continuing major health problem in most of the developing countries, especially in the Asia Pacific region, the Indian subcontinent, central Asia, Africa and South America. The estimated incidence in Asia Pacific region is 540 cases per 100,000 population.¹ It is estimated that there are more than 13 million cases occurring annually in Asia alone of which large proportion occur during childhood.² The most confirmatory test is isolation of *Salmonella* from Blood, Urine or Stool. Isolation of *Salmonella Typhi* from bone marrow is the current gold standard method for confirmation a case of Typhoid fever. However, this requires equipment, supplies and trained laboratory personnel seldom found in Primary health-care facilities in developing world.³ Blood culture is a good method for confirming the infection but facilities are often unavailable, expensive and time consuming. Due to these factors, in endemic areas, the diagnosis may be delayed or overlooked as the cases of 'fever of unknown origin', thus leading to increased morbidity and mortality.⁴ The serodiagnosis of typhoid fever by widal test has been widely performed by many years in laboratories of most of the developing countries but lacked an early diagnosis and had poor sensitivity and specificity due to associated fallacies. A rapid serological test to diagnose typhoid fever accurately at an early stage is thus currently needed. One such test is the Typhidot test, a dot enzyme immunoassay for the rapid detection of specific IgM and IgG antibodies against a specific antigen on the outer membrane protein (OMP) to serotype Typhi, which has been claimed as an ideal test with rapidity and good sensitivity and specificity.⁵ The purpose of my study was to evaluate the efficacy of Typhidot test as compared to Blood culture for early diagnosis of typhoid fever in children.

2. Aims And Objects

1. To evaluate the typhidot test for the diagnosis of typhoid fever in children
2. To determine the sensitivity, specificity, positive and negative predictive value for typhidot test.

3. Materials & Methods

This cross-sectional study was carried out in Department of Pediatrics, Regional Institute of Medical Sciences, Imphal during the period from November 2013 to June 2015 amongst all the admitted children aged 1 to 12 years with clinically suspected typhoid fever. A semi structured proforma was used at the time of

admission in all clinically suspected typhoid fever cases regarding the presenting complaints, onset and progress of the disease. A thorough general physical examination and systemic examination were carried out for every case. All the cases underwent for blood culture and typhidot along with other routine investigations for diagnosis of typhoid fever. All the data regarding the demographical features, clinical features, blood culture, typhidot test and other laboratory parameters from all the patients were collected and it was analyzed by using the Statistical package for social sciences (SPSS) version 21 with chi-square test. P-value of less than 0.05 was considered as statistically significant. P-value less than 0.01 was considered highly significant and P-value less than 0.001 was considered extremely significant. The study was conducted after getting ethical approval from the Institutional Ethics Committee, RIMS, Imphal. Consent from the parents was also obtained before starting of the study.

4. Results & Observations

The present study was conducted on 130 children with clinically suspected typhoid fever aged 1 to 12 years who were admitted in the Department of Paediatrics of the Regional Institute of Medical Sciences, Imphal, Manipur during the study period from November 2013 to June 2015. Out of the 130 cases studied 95 (73.1%) of children were from 6-12 years. 32 (24.6%) were from 2-5 years of age and 3 (2.3%) were less than 2 years of age. 74 (56.9%) were male and 56 (43.1%) were female. 87 (66.9%) were Hindus. 30 (23.1%) were Christians and 13 (10.0%) were Muslims. Fever was present in all the cases (100%). 70 (53.8%) were present with intermittent fever and 60 (46.2%) were present with continuous fever. Out of 130 cases studied 90 (69.2%) children had abdominal pain, 83 (63.8%) had anorexia, 45 (34.6%) had nausea, 40 (30.8%) had vomiting and 32 (24.6%) had diarrhea. Constipation, headache and cough was present in 5 (3.8%), 5 (3.8%) and 4 (3.1%) children respectively. Out of 130 children 52 (40.0%) had hepatomegaly, 23 (17.7%) had splenomegaly, 20 (15.4%) had coated tongue, 17 (13.1%) had toxic look. Jaundice and encephalopathy were present in 8 (6.2%) and 3 (2.3%) children respectively. All the routine investigations including typhidot and blood culture was done at the time of admission. Anemia (Hb < 10 gm%) was present in 51 (39.2%) children. Leucopenia (TLC < 4000/ cumm) was present in 16 (12.3%) children. Typhidot test was positive in 41 (31.5%) children and blood culture for *Salmonella typhi* was positive in 32 (24.6%) children.

Comparison between typhidot test and blood culture:

Out of 130 clinically suspected typhoid fever cases, 32 (24.6%) were blood culture positive for *Salmonella typhi* and 41 (31.5%) were typhidot positive. Among 32 culture positive cases, 30 (93.75%) were typhidot positive. The typhidot test was also positive in 11 (8.46%) blood culture negative cases. Typhidot test was negative in 2 blood culture positive cases. Typhidot IgM positive in 35 cases, IgG positive in 1 cases, both IgM & IgG positive in 5 cases and IgM / IgG negative in 89 cases. The sensitivity, specificity, positive and negative predictive value of typhidot test was 93.75%, 89.79%, 75% and 97.78% respectively. The Blood culture had highly significant association with Typhidot test ($P=0.001$). The Typhidot test was positive in 30 (93.75%) blood culture positive cases.

5. Discussion

In the present study there were only 32 (24.6%) patients with positive blood cultures. Blood culture is the gold standard for the diagnosis of typhoid fever. The chance of positive blood culture is in the range of 60-80%. The low sensitivity of blood culture was also found from the study conducted by Begum Z et al ⁶, Mehmood K et al ⁷, Ahmet Y et al ⁸, Umar LW et al ⁹ and Retnosari S et al ¹⁰ with the results of 14%, 10.3%, 21%, 10.3% and 28% respectively. Preadmission antibiotic use altered the culture result. In the present study, 30 (93.75%) out of 32 culture-positive cases were positive by Typhidot test.

The only 2 (6.25%) out of 32 culture-positive cases had negative results by Typhidot test and both the child came to hospital in the 2nd day of fever. The false negative Typhidot test of both cases was probably due to the failure of the test to detect the antibodies or perhaps the antibodies did not yet reach the detectable level. We studied Typhidot test for its usefulness in clinically suspected cases of typhoid fever and observed that it had a sensitivity of 93.75%, specificity of 89.79%, PPV of 75% and NPV of 97.78%. It also displayed Typhidot test to be highly significant in the diagnosis of typhoid fever ($P=0.001$). Krishna S et al ¹¹ observed in their study that the sensitivity, specificity, positive and negative predictive values were 100%, 95.5%, 89.2% and 100% respectively which was comparable with our study. Narayanappa D et al ¹² reported that the sensitivity of Typhidot was 92.6% which was comparable with our study and the specificity was 37.5%. The low specificity of their study was due to high rate of Typhidot positivity (62.5%) among non-typhoidal fever patients.

6. Conclusion

In our study, it has been seen that Typhidot test has high sensitivity, specificity and negative predictive values when compared with Blood culture because culture is the gold standard for diagnosis of typhoid fever. So, Typhidot is a reliable and valid alternative diagnostic tool for the diagnosis of typhoid fever.

7. References

- [1]. Edelman R, Levine MM. Summary of an international workshop typhoid fever. *Rev Infect Dis* 1986;8(3):329-49.
- [2]. Ivanoff B, Levine MM, Lambert PH. Vaccination against typhoid fever, present status. *Bull World Health Organ* 1994;72(6):957-71.
- [3]. Wain J, Hosoglu S. The laboratory diagnosis of enteric fever. *J Infect Dev Ctries* 2008;2(6):421-5.
- [4]. Pena AC, Pasumbal E. Use of typhidot in the diagnosis and treatment of typhoid fever. *Phil J Microbiol Infect Dis* 2002;3(4):161-4.
- [5]. Ismail A, Kader ZA, Ong KH. Dot enzyme immunosorbent assay for the serodiagnosis of typhoid fever. *Southeast Asian J Trop Med Public Health* 1991;22(4):563-6.
- [6]. Begum Z, Hossain MA, Shamsuzzaman AKM, Ahsan MM, Musa AKM, Mahmud MC, et al. Evaluation of typhidot (IgM) for early diagnosis of typhoid fever. *Bangladesh J Med Microbiol* 2009;3(1):10-3.
- [7]. Mehmood K, Sundus A, Naqvi IH, Ibrahim MF, Siddique O. Typhidot- a blessing or a menace. *Pak J Med Sci* 2015;31(2):439-44.
- [8]. Ahmet Y, Idris Y, Selahattin K, Isik Yalcin, Tas MA, Hosoglu S. Clinical and laboratory presentation of typhoid fever. *International Pediatrics* 2001;16(4):227-31.
- [9]. Umar LW, Adelaiye H, Adebisi M, Adeoye GO, Ahmad HR, Giwa F. Typhoid fever in children presenting to paediatric medical wards of Ahmadu Bello University Teaching Hospital Zaria- A 13 month review. *Niger J Paed* 2013;40(3):211-6.
- [10]. Retnosari S, Tumbelaka AR, Akib AP, Hadinegoro SRS. Clinical and laboratory features of typhoid fever in childhood. Focus on relationship between prior antibiotic administration with blood culture, widal and typhidot results. *Paediatr Indones* 2001;41(3):149-54.
- [11]. Krishna S, Desai S, Anjana VK, Paranthaaman RG. Typhidot (IgM) as a reliable and rapid diagnostic test for typhoid fever. *Ann Trop Med Public Health* 2011;4(1):42-4.
- [12]. Narayanappa D, Sripathi R, Jagadishkumar K, Ranjani HS. Comparative study of the dot enzyme immunoassay (typhidot-M) and the widal test in the diagnosis of typhoid fever. *Indian Paediatrics* 2010;47(4):331-3.