DIAGNOSTIC ACCURACY OF TYPHIDOT TEST IN PEDIATRIC PATIENTS PRESENTING WITH ENTERIC FEVER IN TERTIARY CARE HOSPITAL

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ABSTRACT

Objectives: *To determine the diagnostic accuracy of typhidot test against the gold standard blood culture in the children with enteric fever.*

Materials and Methods: *This Cross-sectional validation study was conducted on 111 children having age range of 2-16 years with documented fever of equal or greater than 380C for 1 week or more were included.All patients were evaluated for enteric fever by clinical signs & symptoms and laboratory investigations. Typhidot test, blood culture and sensitivity, full blood count, malarial parasite test, liver functional test, urine examination was done. The specificity, Sensitivity, negative predictive value and positive predictive values along with diagnostic accuracy were calculated in SPSS v.22 and Medcalc software.*

Results: *The mean age was 8.02±3.357 years. Of total45(40.5%) were males while 66(59.5%) were female. There was no significant difference between typhidot and blood culture in diagnosis of enteric fever (p=0.877). The true positives were 50 (72.5%) and true negatives were 11(26.2%).The sensitivity of typhidot was 72.46% and specificity was 26.19%. The diagnostic accuracy was 54.95%.*

Conclusion: *Overall specificity and sensitivity of typhidottest is low*

Key words: *Typhoid fever, blood culture, Typhidot test, diagnostic accuracy, sensitivity, specificity*

INTRODUCTION

Typhoid is a infectious pathology of different systems and can be fatal if poorly treated.[1] The main causative organism is Salmonella typhi and Salmonella paratyphi.[2] The transmission is through feco-oral route due to poor hygienic conditions.[3] The diagnosis is confirmed on blood culture but positivity rate is 40-80%.[4] Bone marrow culture have higher sensitivitybut not practical in routine clinical practice for pediatricians.[5] Typhidot test is based on detection of IgM and/or IgG antibodies against specific antigens of Salmonella typhi within 4-5 days of appearance of fever and immunochromatographic tests (ICT) can provide result within 15-30minutes.[6] It is user friendly and time saving which makes it a priority than other tests.[7] The sensitivity of this test is 73-95% and specificity is 25-95%.[8,9] but the variability among studies is much higher. is In a study by Husain K et al[10] reported that Typhidot test was sensitive in 96% and specific in 33.3% in adult population.

Though a number of rapid diagnostic tests like. widal and Typhidot are available which require little expertise and time. The erroneous use of these tests can lead to the overuse of antibiotics and financial burden on patientsas well as health system. Most of the studies on the diagnostic accuracy of Typhidot are conducted on adult population. The aim of this study is to find out diagnostic accuracy of Typhidot in pediatric population as this test is commonly used

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in our setup.

MATERIALS AND METHODS

This diagnostic descriptive study was conducted [For Blinding]Peshawar from 1st January 2022 to 30thAugust 2022 on 111 children by non-probability consecutive sampling technique. Verbal informed consent was obtained from all parents of the participants. Ethical approval was obtained from concerned hospital.

The inclusion criteria were age 2-16 years, both genders, Pakistani nationals and with documented fever of more than or equal to 380C, for one or more than 1 week duration. Children with febrile illness diagnosed with other causes e.g. malaria, pneumonia, acute viral hepatitis, meningitis, dengue fever, urinary tract infection (UTI) and Children with known malignancies were excluded from the study.All patients were evaluated for typhoid fever by clinical signs, symptoms and laboratory investigations by a consultant pediatrician. Typhidot test, blood culture, full blood count, malarial parasite test, liver functional test, urine examination was done. The typhidottest was performed using ELISA strip on patient's serum to detect antibodies IgG/IgM againstouter membrane protein ofSalmonellatyphi. 11

After using aseptic procedure 5-10 ml of venous bloodwas collectedand preserved in blood culture bottle and sent to the hospital's laboratory. In laboratory the blood sample was inoculatedon chocolate,MacConkey, andbloodagar media for 7 days duration at 370C temperature.The growth of Salmonella typhi in the culture media was considered as positivebloodcultures.

Data analysis was done in SPSS 22. Mean and SD were computed for continuous data like age, duration of fever and hemoglobin. All categorical data were computed in form of percentages and frequencies. 2 x 2 table was created of typhidot against the gold standard blood culture for calculating true positive, true negative, false positive and false negative. These values were put in medcalc calculator (https://www.medcalc.org/calc/diagnostic_test.php) to calculate sensitivity, specificity and other diagnostic parameters.

RESULT

The mean age was 8.02±3.357 years, mean duration of fever was 17.50±12.546 SD and mean hemoglobin level was 10.05±192.

Table 1 shows that 45 (40.5%) were males while 66 (59.5%) were female. Urban residents were 62(55.9%) where the 49(44.1%) were from rural area. Most common age group was 6-10 years having 59(53.2%) participants. Typhidote test was positive in 81(73%) patient while blood culture was

Table 1: Frequency of demographics, tests results and clinical features

variable	Characteristics	n(%)
Gender	Male	45(40.5)
	Female	66(59.5)
Residence	Urban	62(55.9)
	Rural	49(44.1)
Age group (years)	1-5	25(22.5)
	6-10	59(53.2)
	Above 10	27(24.3)
Typhidot test	Positive	81(73)
	Negative	30(27)
blood culture	Positive	69(62.2)
	Negative	42(37.8)
Anemia	Yes	55(49.5)
	No	56(50.5)
Thrombocytopenia	Yes	46(41.4)
	No	65(58.6)
Hepatitis	Yes	14(12.6)
	No	97(87.4)
UTI	Yes	13(11.7)
	No	98(88.3)
Vomiting	Yes	50(45)
	No	61(55)
Diarrhea	Yes	43(38.7)
	No	68(61.3)
Anorexia	Yes	102(91.9)
	No	9(8.1)
Hepatomegaly	Yes	17(15.3)
	No	94(84.7)
Splenomegaly	Yes	5(4.5)
	No	106(95.5)
Coated tongue	Yes	66(59.5)
	No	45(40.5)
Pain Abdomen	Yes	92(82.9)
	No	19(17.1)
Malaria	Yes	1(0.9)
	No	110(99.1)

positive in 62.2% patients.

The frequency of anemia , thrombocytopenia, hepatitis, urinary tract infections, hepatomegaly, anorexia, splenomegaly, Pain abdomen and malaria are given in Table 2. There was no significant difference between typhidot and blood culture in diagnosis of enteric fever (p=0.877). The true positives were50 (72.5%) and true negatives were 11(26.2%). (Table 2)

The sensitivity of typhidot was 72.46% and specificity was 26.19%. The diagnostic accuracy was 54.95%. Rest of parameters is given in table 3.

DISCUSSION

The current study was aimed to determine the diagnostic accuracy of typhidot against the gold standard blood culture. Our finding showed the sensitivity of typhidot was 72.46% and specificity was 26.19%. The diagnostic accuracy was 54.95%.

The diagnosis of typhoid fever is an essential part of clinical practice to avoid the unnecessary use of antibiotics[12], for this purpose different diagnostic tools have been used in different jurisdictions with variable sensitivity and specificity. We considered those patients for the study whose Typhidot IgM and blood culture were positive.

Typhidot is rapid and easy test which doesn't need any specialized trained staff or any complicated equipment. It detects antibodies within initial five days of fever onset and can give test result within half an hour.[7] Recent infection is considered when IgM is positive while IgG can be positive in old infection. Both IgM and IgG are positive in acute infection.

Table 2: Cross tabulation of typhidot against the gold standard blood culture

		Blood Culture		p-value*
		Positive	Negative	
Typhidot	Positive	50 (72.5)	31(73.8)	0.877
	Negative	19(27.5)	11(26.2)	

*chi-square test

Table 3: Diagnostic accuracy parameter of typhidot against the gold standard blood culture

Statistic	Value	95% CI
Sensitivity (%)	72.46	60.38 to 82.54
Specificity(%)	26.19	13.86 to 42.04
Positive Likelihood Ratio	0.98	0.78 to 1.24
Negative Likelihood Ratio	1.05	0.56 to 1.99
Disease prevalence (%)	62.16	52.46 to 71.20
Positive Predictive Value (%)	61.73	56.13 to 67.03
Negative Predictive Value (%)	36.67	23.46 to 52.23
Diagnostic Accuracy (%)	54.95	45.22 to 64.41

Blood culture and sensitivity test which is mostly used for the bacterial infection, to confirm the diagnosis and for appropriate use of antibiotics. For diagnosis of enteric fever the gold standard is culturing blood of the affected patient. The sensitivity of blood culture in enteric fever is 40-80% while the specific is almost 100 %.[4]

It had been noted in a study done in Nepal that the Typhidot test was 92.3% sensitive while its specificity and diagnostic accuracy were 49.1% and 53.6 % respectively.[13] The study done in Bangladesh in which the sensitivity of Typhidot was 60% and specificity was 80 %.[14] AnAfrican study showed that Typhidot test had 75% sensitivity and 61% specificity while its positive predictive value and negative predictive value were 57% and 78% respectively.[15] Another study reported that 100% sensitivity and 63% specificity of Typhidot test on Indian population.[16] A Pakistani study reported 26.7% sensitivity and 61.5% specificity of Typhidot test while in this study only 10.3% cases were positive for blood culture.[17]

The literature shows the specificity and sensitivity of typhidot is variable across the population and even within the same country. Our findings show the specificity or in other words the detection of negative cases is very low in our set up so use of this test for diagnosis of enteric fever can lead to overuse of antibiotics and we highly recommend blood cultures. But this study is limited to single center and on small number of patients so the results should be interpreted with cautions.

CONCLUSION

Within the limitations of this study it can be concluded that due to low specificity typhidot cannot be recommended for diagnosis of enteric fever in children

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