Nigerian Journal of Paediatrics 1992; 19(2): 19 - 23

Utilization and value of Widal test in febrile children

FS BONDI,* AE MOSES** AND MA ALHAJI***

Summary

Bondi FS, Moses AE and Alhaji MA. Utilization and value of Widal test in febrile children. *Nigerian Journal of Paediatrics 1992;* **19:19.** Rising cost of medical care in Nigeria prompted us to undertake a retrospective study of the utilization and value of the Widal test in 973 febrile children, in whom a total of 1135 of this test was performed. A majority (63.4 percent) of the 1135 blood samples tested negative for Widal (titre below 1:64). The remaining tests were reported as borderline (titre 1:64) in eight percent of 1135 tests and positive (titre above 1:64) in 29 percent of the tests. There were only 29 percent of the 973 children in the present series who were confirmed either from blood cultures, or from a four-fold rise in Widal titres, to have had typhoid fever. The post-Widal plan of management revealed that the results of the Widal test were under-utilized. There was only 44 percent of the 973 children whose Widal test results were used in their management. It is suggested from the findings in the present study that the Widal test would be strongly indicated in the older child with a long duration of a febrile illness and a high degree of pyrexia, as such a child is most likely to have typhoid fever. There is need, however, to develop clear-cut criteria for deciding on when to undertake Widal test in febrile children, as a large number of such children have non-typhoid febrile illness.

Introduction

IN the last few years in Nigeria, there has been a sharp rise in the cost of medical care. As in other countries, much of the cost is due to the widespread and repeated use of individually inexpensive laboratory tests.[1] However, the benefits of these tests to patient-management have often not been assessed. The Widal test is almost routinely performed in febrile children, especially in those in whom fever fails to subside after treatment with chloroquine. Since a majority of children attending hospitals in the tropics have fever-related diseases,[2] we undertook the present retrospective study to determine the utilization and value of the Widal test in febrile children, at the University of Maiduguri Teaching Hospital (UMTH), Maiduguri. In particular, we were concerned with pre- and post-Widal diagnostic impressions and how the results of the test affected the management of the cases.

University of Maiduguri

Department of Paediatrics
* Lecturer/Consultant
** Medical Laboratory Technologist
*** Senior House Officer

Correspondence: FS Bondi

Materials and Methods

All Widal test results of children who presented consecutively at the UMTH between July, 1988 and June, 1991 with a provisional

diagnosis of typhoid fever, were traced at the immunology laboratory, the only unit that Widal test is performed in our hospital. The case notes of each patient was also retrieved and information abstracted from them included: age, sex, symptoms, signs, duration of illness prior to presentation, prior treatment, Widal titres, whether titre results were recorded, or found in the case file and treatment instituted before and after obtaining the results of Widal test. At our institution, children with symptoms and signs of typhoid fever are initially evaluated by residents, or interns, who also request for Widal test in such patients. About 71 percent of the blood samples for the test were taken at the outpatient clinics.

Samples for Widal test were first subjected to screening by the slide agglutination method, after which the tube agglutination procedure was performed, using *Salmonella* antigen suspensions (Omage, UK).[3] In our laboratory, antibody titres of O antigen rising from 1:64 to 1:128 or more, or an initial value of 1:256 or more, are reported as positive reaction. Titres O antigen at 1:64 are reported as borderline and this requires a repeat of the test after a few days for confirmation. Titres below 1:64 are interpreted as negative. Student's 't'-test was used to compare two mean values.

Other terms used in the present article which require definitions include a Widal added-information to the management protocol, which means that the result was retrieved, or documented in the case file and it produced a major change in treatment; pre- and post-Widal plans of management primarily involved decisions about whether to use chloramphenicol, or chloroquine, or to admit the child to hospital. Results that were not found in the case notes and did not seem to have been applied in the management of the patient, were considered indifferent.

Results

During the three-year period of this review, 973 children (515 males, 458 females) with a provisional diagnosis of typhoid fever had 1135 Widal tests performed, including 130 (13.4 percent) patients who had multiple Widal estimations. The 973 cases (mean age $\pm$ SD was 7.6 $\pm$ 4.21 years) studied represented 32.4 percent of 3003 febrile children seen at the UMTH during the period of the review. The symptoms and signs of the 973 patients are summarized in Table 1. It will be observed that

Table I

Symptoms and signs in 973 children with suspected typhoid fever

Symptom	No. of cases	Percent of total	Sign	No. of cases	Percent of total
Fever	908	93.3	Pyrexia	899	92.4
Vomiting	464	47.7	Abdominal tenderness	190	19.5
Abdominal pain	359	36.9	Dehydration	103	10.6
Diarrhoea	312	32.1	Hepatomegaly	80	8.2
Headache	272	28.0	Neck stiffness	71	7.3
Convulsions	134	13.8	Unconsciousness	68	7.0
Anorexia	108	11.1	Jaundice	44	4.5
Constipation	90	9.2	Splenomegaly	43	4.4
Irritability	52	5.3	Rashes	33	3.4
Abnormal behaviour	24	2.5	Pulmonary creptitations	28	2.9

the commonest symptom was fever which occurred in 908 (93.3 percent) of the 973 patients. Pyrexia was present in 899 (92.4 percent) of the patients. Typhoid fever was the sole diagnosis made in 186 (19.1 percent) of the patients whereas, in the remaining 787 (80.9 percent) children, typhoid fever was one of the multiple clinical diagnoses, including malaria, bronchopneumonia, meningitis and gastroenteritis. Other laboratory investigations undertaken in order to confirm, or exclude typhoid fever in this series, were: full blood counts in 673 (69.2 percent) of the patients; blood film examination for malaria parasites in 359 (36.9 percent) of the patients; urine examination in 217 (22.3 percent) of the patients; stool examination in 300 (30.8 percent) of the patients and blood cultures in 205 (21.1 percent) of the cases. Chest radiographs and cerebrospinal fluid examination were performed as and when indicated.

A provision diagnosis of typhoid fever was made on all the 973 patients in the series and accordingly, antibiotic therapy, initially with chloramphenicol, was commenced soon after blood samples were obtained for the laboratory investigations. The blood samples for the tests were taken within a week of onset of the illness in 769 (79.0 percent) and in 204 (21.0 percent) of the remaining patients after one week. Antibiotics were given to 182 patients before presentation at the hospital. Widal titres (Table II) were negative in 720 (63.4 percent) of the 1135 test sera. The remaining blood samples showed borderline titre level in 94 (8.3 percent) and positive in 321 (28.3 percent) of the 1135 tests. Thus, borderline and positive reactions occurred in 415 (36.6 percent) of the entire samples in the series. The overall findings was that in only 432 (44.4 percent) of 973 patients, the Widal results added further information to that provided by the history and physical examination and, thus, to the post-Widal plan management, which meant the hospitalization of 284 cases of typhoid fever that were confirmed either from the blood culture, or from a four-fold rise in Widal titres. Appropriate treatment for malaria fever, or other infections was started on the remaining 148 patients. In the remaining 541 (55.6 percent) patients, the post-Widal plan of management was indifferent to the Widal titres recorded in the laboratory. These cases had single Widal tests. After a careful review of the presenting symptoms,

Table II

Results of Widal test

Titre level	Antigen		Laboratory Report
	O	H	
No reaction	254	218	Negative
1:64	466	492	Negative
1:64	94	103	Borderline
1:128	169	66	Positive
1:256	78	47	"
1:512	27	31	"
1:1024	26	22	"
1:2048	10	134	"
1:4096+	11	22	"
Total	**1135**	**1135**	–

signs and the clinical course of disease in these 541 children, it was noted that 503 (93.0 percent) of them had alternative diagnoses for their respective and presenting illness. These other diagnoses were often malaria, or acute respiratory tract infections.

The mean (± SD) duration of symptoms among the 432 cases with confirmed diagnosis of typhoid fever was 11.2 ± 2.79 days, while that of 541 others was 4.4 ± 3.63 days ($P<0.001$). Similarly, the mean age (± SD) for the 432 confirmed cases was 7.5 ± 4.42 years and 5.9 ± 7.1 years for others ($P<0.001$). The mean temperatures for the two groups were 38.8 ± 1.25°C and 38.5 ± 0.75°C, respectively ($P<0.001$). Most of the patients who did not seem to have benefitted from the results of the Widal test were outpatients, who were more likely to have received treatment for both malaria infection and typhoid fever prior to presentation at the hospital. The fee for a single Widal test during the period under review was fifty Naira (₦50.00). Thus, the total cost for the 541 children in whom the test was not utilized in their management, was twenty-seven thousand and fifty Naira (₦27,050.90).

Discussion

Despite diverse causes of fever in children in the tropics, the Widal test has, recently, become an almost routine laboratory procedure in febrile patients in Nigeria and, often, the results of the tests are misinterpreted with a resultant over-diagnosis of typhoid fever.[4] With the sharp rise in the cost of medical care in the last few years in the country and the fact that patients pay for most of the cost for laboratory investigations, there is a growing need amongst clinicians to evaluate the usefulness of laboratory tests generally, on the clinical decision-making process. It was this concern that prompted us to undertake the present study, in order to know how frequently and under what circumstances, the results of Widal test carried out on children led to changes in pre-Widal diagnosis and plan of management.

As has been shown above, the Widal test was performed in about a third (32.4 percent) of all febrile children who attended the hospital during the three-year period. Diagnosis of typhoid fever was confirmed by blood culture in 21.1 percent of the cases and by two or more Widal tests in 13.4 percent. Other workers[5] have shown that the Widal test is of limited value in typhoid-endemic areas and for this reason, blood culture remains the standard diagnostic test for typhoid fever. The prevalence of active *Salmonella* infection in childhood population in Maiduguri is considerably low amongst febrile cases, as a majority (63 percent) of the Widal test results in the present series were negative. Diagnosis of typhoid fever was confirmed in only 29 percent of the cases. This finding is in agreement with reports from elsewhere in Africa, that a majority of patients treated for typhoid fever have non-typhoid febrile illness, such as malaria and viral diseases.[4,6] There is thus, a need to develop clear-cut criteria for diagnostic evaluation, so as to utilize the limited health budget appropriately and economically. One approach is for clinicians to always consider and exclude the more common causes of fever in the tropics such as, malaria and bronchopneumonia,[7] before performing a Widal test. Here in Nigeria, this approach is particularly important now than ever, because of the presence of chloroquine-resistant malaria,[8,9] which could mimic typhoid fever. In Malaysia, Rose and Abraham[10] have developed some criteria for predicting typhoid fever without resorting to sophisticated microbiological techniques.

In the present series the post-Widal test plan to management was indifferent to, or uninfluenced by the Widal results in 56.6 percent of the patients, thus supporting the contention that in our children with fever, the re-

quest by physicians for the Widal test frequently lacks sound clinical basis. The total cost of Widal tests performed on 541 children in whom the results were not utilized in their subsequent management was twenty-seven thousand and fifty Naira. While this amount may be low by international standards, it is large by local standards. In comparing the age, duration of illness and admission temperature of the 432 cases whose post-Widal plan of management was influenced by the Widal results with the 541 others who did not seem to have benefitted from the Widal test results, it is evident that, the former group of patients were significantly ($P<0.001$) older; they also had a higher mean duration of illness and admission temperature ($P<0.001$). These are therefore, important factors that should be considered in deciding on a Widal test for febrile children. The present study has shown that there is no justification for a Widal test to be undertaken in a considerable number of febrile children as such patients frequently have non-typhoid febrile illnesses. Therefore, in deciding on the type of children who is likely to benefit from the test, age, duration of illness and the temperature, should be taken into consideration.

Acknowledgements

We wish to thank the staff of the Medical Records department for retrieving the case notes, Mrs Beatrice Okonkwo for secretarial assistance, Professor Idris Mohammed and Dr Adulkareem Airede for their encouragement.

References

1. Moloney TW and Rogers DE. Medical technology: a different view of the contentious debate over costs. N Engl J Med 1979; **301**: 1413-9.
2. Bamgboye EA and Familusi JB. Morbidity trends at the children's emergency room, University College Hospital, Ibadan, Nigeria. Afr J Med Sci 1990 **19**: 49-56.
3. Idoko JA, Anjorin FI and Lawande RV. Typhoid fever in Zaria, Nigeria. Nig Med Pract 1988; **15**: 21-4.
4. Onuigbo MAC. Diagnosis of typhoid fever in Nigeria: Misuse of the Widal test. Trans Roy Soc Trop Med Hyg 1990; **84**: 129-31.
5. Pang T and Puthuchery SD. Significance and value of the Widal test in the diagnosis of typhoid fever in an endemic area. J Clin Pathol 1983; **36**: 471-5.
6. Kustner HGV, Van Wyk IE, Sternberg WJ and Collie A. Widal testing for typhoid. South Afr Med J 1987; **72**: 511.
7. Hendrickse RG, Hassan AH, Olumide LO and Akinkunmi A. Malaria in early childhood: an investigation of 500 seriously ill children in whom a "clinical" diagnosis of malaria was made on admission to the children's emergency room at the University College Hospital, Ibadan. Ann Trop Med Parasistol 1971; **65**: 1-20.
8. Salako LA and Aderounmu AF. In-vitro chloroquine and melfloquine-resistant *Plasmodium falciparum* in Nigeria. Lancet 1987; **1**: 572-3.
9. Lege-Oguntoye L, Abuna JU, Werblinska B, Ogala WN, Slotboom AB and Olurinola PR. Chloroquine-resistant *Plasmodium falciparum* with reduced sensitivity in-vitro to melfloquine and quinine in Zaria, Northern Nigeria. J Trop Med Hyg 1991; **94** 73-5.
10. Ross IN and Abraham T. Predicting enteric fever without bacteriological culture results. Trans Roy Soc Trop Med Hyg 1987; **81**: 374-7.