

# The Menace of Typhoid / Paratyphoid Fever – The Abuja Experience: A 5 Year Retrospective Study

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## Abstract

Typhoid / paratyphoid fever is caused by  
*Salmonella typhi*  
and

*Salmonella paratyphi*

A, B and C respectively. A 5 year retrospective study on blood (Oxoid signal blood culture system) and faecal cultures at the Medical Microbiology Laboratory of National Hospital, Abuja was carried out. Of the 2,818 blood cultures, only 90 (3.2%) had positive cultures for

*Salmonella*

species while the 10,007 faecal samples cultured, only 159 (1.58%) were positive for

*Salmonella*

species. Identification was by biochemical and serological methods. The sensitivity pattern in both blood and faecal isolates show Cefotaxime (97.9% and 98.1%), Ceftriaxone (98.0% and 95.4%), Cefotaxime (97.6% and 93.7%), Gentamicin (80.9% and 78.5%), Augmentin (76.1% and 69.5%), Amoxycillin (45.5% and 56.4%), Chloramphenicol (40.6% and 75.2%), Tetracycline (100% and 51.1%), Ampicillin (35.3% and 32.6%) and Cotrimoxazole (34.4% and 76.6%). Our results indicate a very low rate of typhoid / paratyphoid fever and the need for isolation and proper sensitivity testing before the commencement of therapy. Appropriate specimens (faeces, urine, or blood) from suspected patients should be cultured for the presence of salmonellae.

## INTRODUCTION

Typhoid / paratyphoid fever is caused by *Salmonella typhi* and *Salmonella paratyphi* A, B and C respectively. It is customary in our society that any feverish condition is first treated for malaria. If this fails, then treatment for typhoid automatically follows and if the patient at this stage fails to respond, it is only then that laboratory investigations are remembered<sup>(1)</sup>. Salmonellosis is responsible for a variety of clinical syndromes, including gastroenteritis, enteric (typhoid) fever and extraintestinal manifestations.

Typhoid fever remains one of the most prevalent acute infectious diseases in the developing world including Nigeria. It continues to exist as an endemic disease due to poor (improper) sanitation and low socio-economic status of the people<sup>(1)</sup>.

The Widal test (Widal's agglutination reaction) is routinely

employed for the serodiagnosis of typhoid fever by most Medical Laboratories in Nigeria. However, several workers within the Medical community have expressed doubt regarding the reliability of the test. There are several contributing factors for this uncertainty. Some have started calling for the discontinuance of Widal test as a diagnostic test for typhoid fever. Their argument is based on;

1. The difficulty of interpreting Widal test result in areas where typhoid fever is endemic and where the baseline titre of the normal population are not known.
2. The typhoid febrile agglutination test (Widal test) is often positive (raised O and H titres) in patients with infections caused by other bacteria, because of cross-reacting antibodies or previous vaccination with TAB or typhoid vaccine; chronic liver disease associated with raised globulin levels, and disorders such as rheumatoid arthritis, rheumatic

fever, multiple myeloma, nephrotic syndrome, and ulcerative colitis.

3. The differential behavioural pattern of isolates of *Salmonella* species to various antibiotics as seen from our susceptibility test results.

The aim of this work therefore is to re-emphasize the importance of using appropriate specimens (faeces, urine and blood) in the laboratory diagnosis of *Salmonella* species and its antimicrobial susceptibility pattern prior to treatment for typhoid / paratyphoid fever.

## MATERIALS AND METHODS

A 5-year retrospective study on blood (Oxoid Signal blood culture system) and faecal cultures at the Medical Microbiology Laboratory of National Hospital, Abuja was carried out.

### BLOOD CULTURE

The Oxoid Signal Blood Culture System (produced by Oxoid Limited, Wade Road, Basingstoke, Hampshire, RG24 8PW, England) was used to culture samples of blood collected from patients where the condition of bacteraemia is suspected.

**Figure 1**

Figure i: Picture of Oxoid Signal Blood Culture System



### PROCEDURE FOR BLOOD CULTURE

ml of blood is inoculated into Oxoid Signal Blood Culture System. This is a semi-automated system that recognizes bacterial growth in the blood culture by gas production. The inoculated bottle is placed at 36°C (+/-) 1°C for 1 hour before inserting the Signal device. It is continuously shaken for 24

hours. Incubate at 36C (+/-) 1°C for at least 7 days.

A positive bottle is indicated by upward movement of fluid into the signal device while a negative bottle is indicated by absence of fluid in the signal device.

All positive bottles are sub cultured onto Chocolate agar, 3 Blood agar and MacConkey agar plates and incubated for 24 hours at 36 (+/-) 1°C. When applicable, it is re-incubated for a further 18 – 24 hours. The second Blood agar plate is incubated at 10% CO<sub>2</sub> while the third Blood agar plate is incubated anaerobically (AnO<sub>2</sub>) for 48 hours.

Isolates are identified by gram stain, biochemical reactions (Kliegar Iron Agar – KIA, Urea, Citrate, MRVP) as well as sero-typing using *Salmonella* Polyvalent O sera and Monovalent A, B, C, and D sera. vi sera is also available for typing.

Antibiotic susceptibility test (disc diffusion technique) is carried out on isolates.

### PROCEDURE FOR FAECAL CULTURES

Faecal samples were cultured on *Salmonella* /*Shigella* Agar (SSA) or Deoxycholate Citrate Agar (DCA) and Selanite Fluid (SF) and incubated at 37°C for 18 – 24 hours. The Selanite fluid preparation is sub cultured on SSA or DCA and further incubated at 37°C for 18 – 24 hours.

Non Lactose Fermenting Colonies (NLFs) isolated are subjected to identification as stated above under the blood culture methodology.

## RESULTS

### BLOOD CULTURE

Of the 2,818 blood cultures, only 90 (3.2 %) had positive cultures for *Salmonella* species.

**Figure 2**

Table i : Occurrence rate of Blood species

Year	Sample Size	<i>Salmonella</i> isolates	% Occurrence
2002	361	8	2.22
2003	532	12	2.25
2004	724	16	2.21
2005	808	37	4.57
2006	393	17	4.3
<b>TOTAL =</b>	<b>2818</b>	<b>90</b>	<b>3.2</b>

## ANTIBIOTIC SUSCEPTIBILITY TESTING OF BLOOD AND FAECAL ISOLATES

Ten (10) antibiotic discs were used for the susceptibility testing. Viz; Amoxycillin, Ampicillin, Augmentin, Cefotaxime, Ceftazidime, Ceftriaxone, Chloramphenicol, Cotrimoxazole, Gentamicin, and Tetracycline.

Note: Only six (6) antibiotic discs are used for testing at any given time!

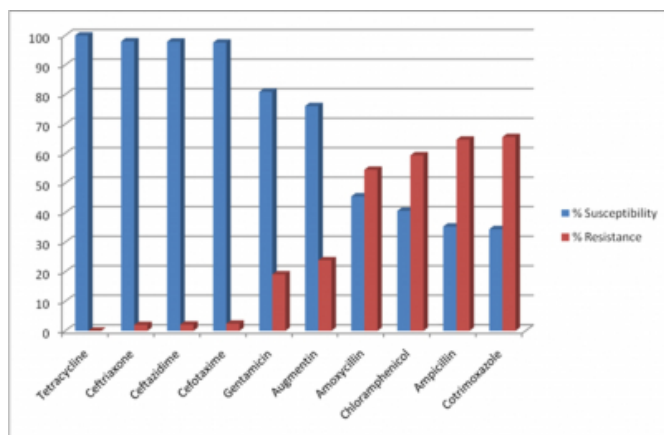
**Figure 3**

Table ii: Susceptibility Pattern of Blood isolates

Drug	No. of <i>Salmonella</i> spp Tested Against Drug	% of usage (of 90 isolates)	No. Susceptible To (% Susceptibility)	No. Resistant To (% Resistance)
Amoxycillin	44	48.9%	20 (45.5%)	24 (54.5%)
Ampicillin	17	18.9%	6 (35.3%)	11 (64.7%)
Augmentin	71	78.9%	54 (76.1%)	17 (23.9%)
Cefotaxime	41	45.6%	40 (97.6%)	1 (2.4%)
Ceftazidime	48	53.3%	47 (97.9%)	1 (2.1%)
Ceftriaxone	51	56.7%	50 (98.0%)	1 (2.0%)
Chloramphenicol	64	71.1%	26 (40.6%)	38 (59.4%)
Cotrimoxazole	32	35.6%	11 (34.4%)	21 (65.6%)
Gentamicin	47	52.2%	38 (80.9%)	9 (19.1%)
Tetracycline	5	5.6%	5 (100%)	0 (0.00%)

**Figure 4**

Figure ii – Graphical representation of susceptibility pattern of blood *Salmonellae* isolates



## FAECAL CULTURES

Of the 10,007 faecal samples cultured, only 159 (1.58%) had positive cultures for *Salmonella* species.

**Figure 7**

Figure iii – Graphical representation of susceptibility pattern of faecal *Salmonellae* isolates

Year	Sample Size	<i>Salmonella</i> isolates	% Occurrence
2002	1934	19	0.98%
2003	2539	66	2.59%
2004	2211	46	2.08%
2005	2633	14	0.53%
2006	690	14	2.02%
Total -	<b>10007</b>	<b>159</b>	<b>1.58%</b>

**Figure 6**

Table iv : Susceptibility Pattern of Faecal isolates

Drugs	No. of <i>Salmonella</i> spp Tested Against Drug	% of Disc usage (of 159 isolates)	No. Susceptible To (% Susceptibility)	No. Resistant To (% Resistance)
Amoxycillin	55	34.6%	31 (56.4%)	24 (43.6%)
Ampicillin	34	21.4%	11 (32.6%)	23 (67.4%)
Augmentin	118	74.2%	82 (69.5%)	36 (30.5%)
Cefotaxime	32	20.1%	30 (93.7%)	2 (6.3%)
Ceftazidime	54	33.9%	53 (98.1%)	1 (1.9%)
Ceftriaxone	65	40.9%	62 (95.4%)	3 (4.6%)
Chloramphenicol	129	81.1%	97 (75.2%)	32 (24.8%)
Cotrimoxazole	64	40.3%	49 (76.6%)	15 (23.4%)
Gentamicin	65	40.9%	51 (78.5%)	14 (21.5%)
Tetracycline	88	55.3%	45 (51.1%)	43 (48.9%)

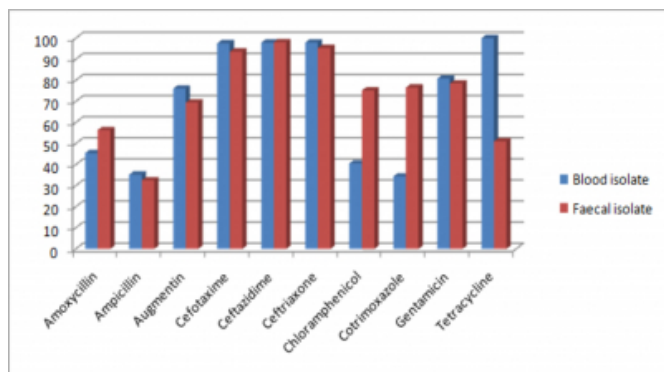
**Figure 8**

Table v : Comparison of Antibiotic Susceptibility Pattern of Blood and Faecal isolates

Drug	Blood isolate	Faecal isolate
Amoxycillin	45.5%	56.4 %
Ampicillin	35.3%	32.6 %
Augmentin	76.1 %	69.5 %
Cefotaxime	97.6 %	93.7 %
Ceftazidime	97.9 %	98.1 %
Ceftriaxone	98.0 %	95.4 %
Chloramphenicol	40.6 %	75.2 %
Cotrimoxazole	34.4 %	76.6 %
Gentamicin	80.9 %	78.5 %
Tetracycline	100.0 %	51.1 %

**Figure 9**

Figure iv: Graphical representation of the comparison of antibiotic susceptibility pattern of blood and faecal isolates



{image:9}

## DISCUSSION

Of the 2,818 blood cultures, only 90 (3.2%) had positive cultures for *Salmonella* species while the 10,007 faecal samples cultured had only 159 (1.58%) positive cultures for *Salmonella* species. Far away from Dong Thap Province, Mekong Delta Region of Vietnam, Lin et al;<sup>(2)</sup> reported blood culture *Salmonellae* positivity of 8.5%. Akinyemi et al;<sup>(3)</sup> reported a 16% blood culture positive rate from Lagos. Asuquo et al;<sup>(4)</sup> reported a 6% positivity of *Salmonella* species from blood samples in Calabar, Nigeria.

In 1995, Oboegbulam et al;<sup>(5)</sup> reported 16% positive stool cultures from suspected enteric fever patients in South Eastern Nigeria. However, in their report, Asuquo et al;<sup>(4)</sup> stated a 12.3% positive rate from stool cultures.

The sensitivity pattern in both blood and stool isolates show Ceftazidime (97.9% and 98.1%), Ceftriaxone (98.0% and 95.4%), Cefotaxime (97.6% and 93.7%), Gentamicin (80.9% and 78.5%), Augmentin (76.1% and 69.5%), Amoxycillin (45.5% and 56.4%), Chloramphenicol (40.6% and 75.2%), Tetracycline (100% and 51.1%), Cotrimoxazole (34.4% and 76.6%) and Ampicillin (35.3% and 32.6%).

The wide variation of susceptibility pattern in blood and

faecal isolates for Chloramphenicol, Tetracycline and Cotrimoxazole cannot be explained.

Our results indicate a very low rate of typhoid / paratyphoid fever amidst varying susceptibility pattern of antibiotics to the isolates. The use of Widal agglutination test as a basis for diagnosing typhoid / paratyphoid fever and treatment of same based on a high titre value will definitely lead to drug misuse, emergence of drug resistant strains, as well as complications. Bacterial agglutination tests are often used to diagnose diseases in which the bacterial agent is difficult to cultivate in-vitro.

Agglutination tests for certain diseases such as typhoid fever have become less useful with the ability of most laboratories to cultivate and identify the causative agent. The typhoid febrile agglutination test (Widal test) is often positive in patients with infections caused by other bacteria, because of cross-reacting antibodies or previous immunization (vaccination) against typhoid. Appropriate specimens (stool, urine, or blood,) from suspected patients should therefore be cultured for the presence of *salmonellae*.

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