

Multiple drug resistant Pattern of *Salmonella typhimurium* infections In Osogbo, South Western Nigeria

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Abstract: This study was carried out to find out the extent of multidrug resistance profile of *Salmonella typhimurium* to commonly used antibacterials and its infectious nature in our locality from different samples obtained from Ladoke Akintola University of Technology Teaching Hospital, Osogbo. In all, 23 non-duplicate *Salmonella typhimurium* isolates were recovered from different clinical samples of stool (204), urine (48), blood (52), cerebrospinal fluid (20), and high vaginal swab (10). Of all the positive isolates, 17(73.9%), were from patients with symptoms characterised as salmonellosis. High rates of resistance were found in most of the isolates studied. Resistance rates were 91.3%, for amoxicillin and cotrimoxazole, 86.9% for ampicillin, 82.6% for streptomycin and 30.4% for ciprofloxacin, respectively. [The Journal Of American Science. 2007;3(4):40-44]. (ISSN: 1545-1003).

Keywords: Multidrug resistance, symptoms, *Salmonella typhimurium*.

Introduction

Salmonellosis is an infection with *Salmonella* bacteria, often restricted to the gastro-intestinal tract and is often a self limiting disease. Most individuals infected with *Salmonella typhimurium* experience mild gastrointestinal illness involving diarrhoea, chills, abdominal cramps, fever, head and body aches, nausea, and vomiting (Honish 1999). Infections are usually self-limiting, and antimicrobial treatment is not recommended for uncomplicated illnesses (Aserkoff and Bennet 1969, Gill and Hammer 2001). However, extraintestinal infection can occur, particularly in very young, elderly, and immunocompromised patients (Angulo and swerdlow 1995, Thuluvath and McKendrick 1998). In these cases, effective antimicrobial treatment is essential (Cruchaga et.al., 2001). Every year, approximately 40,000 cases of salmonellosis are reported in the United States. The actual number of infections may be thirty or more times greater. (CDC, 2006). In Nigeria such cases are either not documented or because many milder cases are not diagnosed or reported. Cases, however, of systemic disease due to *Salmonella typhimurium* and other salmonellae have been reported, (Panhot and Agarwal 1982, Varma et.al., 2005). Salmonellosis have been reported to occur more in the winter than summer. Most times it is referred to as gastroenteritis or diarrhoea. Likewise more cases of diarrhoea caused by enterobacteriaceae especially *E.coli*, occurring more during wet season than dry season have also been reported. (Olowe et.al., 2003). Children are the most likely to get salmonellosis, however the elderly, and the immunocompromised are the most likely to have

severe infections. It is estimated that approximately 600 persons die each year with acute salmonellosis as reported by Centre for disease control, (CDC 2006).

The present study was undertaken to assess *Salmonella typhimurium* in cases of diarrhoea and to see how often they manifest in a systemic form in disease conditions. It was also intended to study the problem of drug resistance associated with this organism.

Materials and Methods

The study covered a period of nine months; Faeces, blood, cerebrospinal fluid, stool and urine were processed and screened for isolates following standard procedures for proper isolation and identification. (Cowan and Steel, 1970) The isolates of *Salmonella typhimurium* were identified biochemically following standard procedures.

The Antimicrobial susceptibility testing: Isolates were tested by the disk diffusion method on muller Hilton (Hi-Media, Mumbai) following the zone size criteria recommended by the National Committee for Clinical Standards (NCCL, 2000).

From the commercial antibiotics disc used for the studies of susceptibility testing, results were obtained from these: amoxicillin, streptomycin, tetracycline, kanamycin (30µg), ampicillin (10 µg), chloramphenicol (30 µg), ciprofloxacin (5 µg) and co-trimoxazole (25 µg), which are commonly used for the treatment of typhoid fever.

Results

Over a period of 9 months, 204 faecal and 52 blood samples, 48 urine samples, 20 CSF samples and 10 high vaginal swab samples were screened for presence of *Salmonella typhimurium* of which 23 isolates were identified to be *Salmonella typhimurium*.

Table 1. shows the distribution pattern of *S.typhimurium* from screened samples; faeces, blood, urine, cerebrospinal fluid, and high vaginal swab.

Table 2. illustrates the isolation frequency of *S. typhimurium* with respect to age.

Table 3. outlines the resistance pattern of the isolated strains to commonly used antibacterial.

Figure 1. outlines the symptoms profile of cases of salmonellosis in the study area. From the findings, salmonellosis occurred in six cases that had diarrhoea, followed by two with septicaemia, one case had meningitis and one had urinary tract infection, while none was reported for vaginal infection.

Table 1. Distribution Pattern Of *S. Typhimurium* From Screened Samples

SAMPLES	SCREENED	POSITIVE
Stool	204	17
Blood	52	2
Urine	48	3
CSF	20	1
HVS	10	--
TOTAL	334	23

Key:

CSF – Cerebrospinal Fluid

HVS – High Vagina Swab

Table 2. Illustrates The Isolation Frequency Of *S. Typhimurium* With Respect To Age

AGE (yr)	DISTRIBUTION	%
> 1- 5	16	69.6
>5- 12	3	13.4
ADULT	4	17.0
TOTAL	23	100

Table 3. Resistance Pattern Of The Isolated Strains To Eight Commonly Used Antibiotics (N= 23)

ANTIMICROBIALS	SENSITIVE (%)	RESISTANT (%)
AMOXICILLIN	2(8.7)	21(91.3)
AMPICILLI	3(13.1)	20(86.9)
CHLORAMPHENICOL	5(21.7)	18(78.3)
COTRIMOXAZOLE	2(8.7)	21(91.3)
STREPTOMYCIN	4(17.4)	19(82.6)
TETRACYCLINE	5(21.7)	18(78.3)
KANAMYCIN	12(52.2)	11(47.8)
CIPROFLOXACIN	16(69.6)	7(30.4)

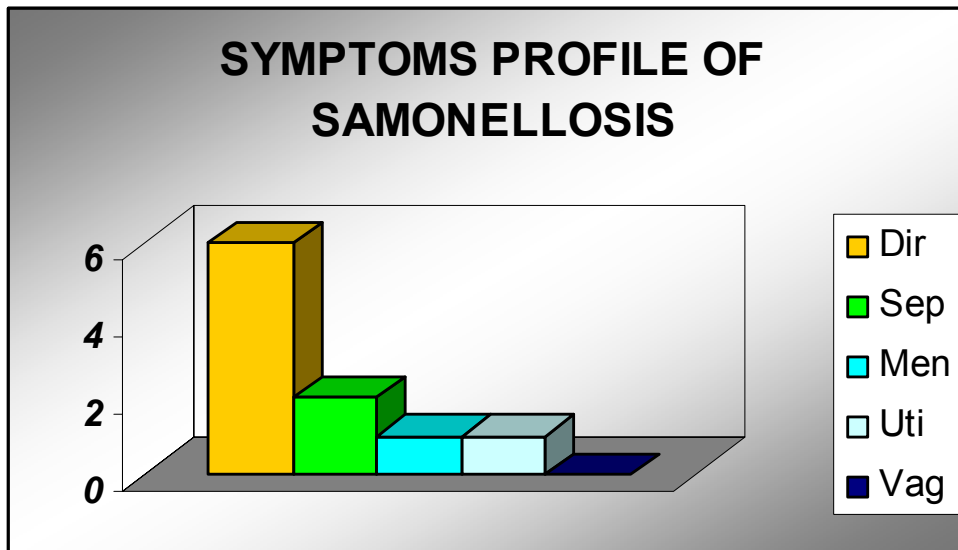


Figure 1.

Key:

- Dir - Diarrhoea
- Sep - Septicaemia
- Men - Meningitis
- Uti - Urinary Tract Infection
- Vag - Vagina infection

Discussion

The findings showed the occurrence of salmonella typhimurium in the entire samples investigated, except high vaginal swab. The incident rate is not too worrisome since the occurrence of salmonellosis due to *Salmonella typhimurium* is only about 10% of the cases of diarrhoea. More cases are seen in children compared with adult individuals in the study area and it conforms with earlier reports of (Olowe et.al., 2003, NCCLS 2000). Multidrug-resistant (MDR) strains of *Salmonella* are now encountered frequently and the rates of multidrug-resistance have increased considerably in recent years. (CDC 2006). Even worse, some variants of *Salmonella* have developed multidrug-resistance as an integral part of the genetic material of the organism, and are therefore likely to retain their drug-resistant genes even when antimicrobial drugs are no longer used, a situation where other resistant strains would typically lose their resistance. (CDC, 2006). This might be the reason for the high resistance value observed in this present study also. Most of the strains of *Salmonella typhimurium* isolated were resistant to drugs like streptomycin, amoxicilin, tetracycline, ampicillin, kanamycin and chloramphenicol. This data is very alarming since the isolates were already showing high resistance to drugs that are meant as alternate therapy to salmonellosis treatment; especially isolates from blood were resistant to the commonly used antibiotics. Similar drug resistance has been observed by (Verma et al, 2005), in urinary tract infection. Drug-resistant *Salmonella* emerged in response to antimicrobial usage in food animals, which has also contributed or resulted in major outbreaks of salmonellosis was reported by Guardian Unlimited 2006. Selective pressure from the use of antimicrobials is a major driving force behind the emergence of resistance, but other factors also need to be taken into consideration. For example, dirty and poor sanitary environment, poor drainage system characterised by majority of our system in this area, even the society as a whole encourage the spread of this organism in our environment. Likewise some *Salmonella* serotypes are more prone to develop resistance than others. Furthermore, major shifts in the occurrence of *Salmonella* serotypes in food animal and humans are regularly seen. A recent example is the global spread of a multidrug-resistant *S. typhimurium* phage type DT104 in animals and humans. While the spread of DT104 may have been facilitated by the use of antimicrobials, international and national trade of infected animals is thought to play a major role in international spread (WHO, 2005).

This work confirmed that salmonella isolates are present in our clinical specimens in this area and are seriously becoming a concern due to their multidrug resistance pattern observed in this study, and urgent steps should be taken to have an evaluation principle and documented analysis of trends of occurrence of this resistant isolates to help guide in administration of less commonly resisted antimicrobials when cases occur.

The high percentage of resistance to the antibiotics studied could be attributed to their prevailing usage and abuse in the area under study. The implication of the high percentage resistance recorded for the antibiotics is that only ciprofloxacin will effectively treat *S. typhimurium* infections, though some strains were resistant. These results call for intensive surveillance programme to monitor microbial trends and antimicrobial resistance patterns in other parts of Nigeria.

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