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The study of incidence of multidrug resistant typhoid fever in children 1-12 years with special reference to in-vitro antibiotic sensitivity and resistance pattern

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General Note
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ABSTRACT

Enteric Fever commonly called as Typhoid Fever is caused by Salmonella enteric serovar typhi (S.typhi) a gram negative bacterium [1]

Typhoid Fever is a distinctive acute multisystem febrile disease recognised as a major cause of morbidity and mortality.

MDR enteric fever is defined as typhoid fever caused by S. typhi strains which are resistant to all first line drugs i.e; Chloramphenicol, Ampicillin and Cotrimoxazole [2].

All children between age group 1-12 years, which were blood culture positive for enteric fever were taken.

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It was observed that an isolated cases of Typhoid Fever, sensitivity to third generation cephalosporins i.; Ceftriaxone, Cefotaxim and Cefixime was found to be 100% followed by sensitivity to Amikacin 92.5% which was second highest and ciprofloxacin was 20%, while sensitivity to first line antibiotic was Ampicillin 77.5%, Cotrimoxazole 77.5% and Chloramphenicol 80%, while MDRTF resistance to Ciprofloxacin was 80% and Amikacin was 20% and no resistance was found for third generation cephalosporins.
Hence, it can be concluded that third generation cephalosporin shows 100% sensitivity to S.typhi and can be used as first line of antibiotic for treatment of MDRTF.

Keywords
Enteric fever, Multidrug Resistant Typhoid Fever (MDRTF), S.typhi(Salmonella).

1. INTRODUCTION

Enteric fever commonly called typhoid fever is caused by salmonella enteric serovar typhi (s.typhi), a gram negative bacterium.[1] Willis in 1943 recognised typhoid fever as a disease. However willis described typhoid about 240 years back.[2]

The disease occurs by ingestion of organism due to faecal contamination of water and food. The incubation period is 7 to 14 days but can range upto 30 days. Many factors influence the severity and overall outcome of infection.

Various organs have been involved in the course of typhoid fever resulting in a wide array of presentation.

Typhoid fever is a distinctive acute multisystem febrile disease recognised as a major cause of morbidity. Worldwide there are 21.6 million cases anually and estimated 216500 deaths. In developing countries the attack rate as high as 1100 cases per 100000 populations. It remains a serious public health problem in developing countries.[3]

Several studies in areas of endemicity and outbreaks have shown that about one quarter to one third of pediatric typhoid fever cases are under five years of age.[4]

To complicate matters further, inthe last 2 decades, multidrug resistant (MDR) S. Typhi strains have emerged and spread worldwide, resulting in high rates of morbidity and mortality for children under 2 years of age.

Multi Drug Resistant Typhoid Fever (MDRTF)

Multidrug resistant typhoid fever (MDRTF) is defined as typhoid fever caused by S.Typhi strains which are resistant to all first line recommended drugs for the treatment of typhoid fever i.e. Chloramphenicol, ampicillin, and cotrimoxazole. (TMP-SMX).[1 – 8]

Since 1990s salmonella typhi has developed resistance to all the drugs used in the first line treatment. Chloramphenicol, ampipicillin, and cotrimoxazole. (TMP-SMX).

The emergence of drug resistant strains of salmonella has made the treatment of enteric fever more difficult. Tha last 2 decades have witnessed the appearance and spread of multidrug resistant strains of S.Typhi infection with these strains is associated with longer duration of illness and higher morbidity and mortality.[9 – 11]

The recent explosive emergence and spread of multidrug resistant typhoid fever with resistance to conventionally used antibiotics for the treatment of typhoid fever namely Chloramphenicol, ampicillin, and cotrimoxazole. (TMP-SMX) has caused significant therapeutic and public health problem.

Since the isolation of multidrug resistant strains of S.Typhi which show resistance to the classical first line antityphoid agents (Chloramphenicol, ampipicillin, and cotrimoxazole. (TMP- SMX) used in the 1980s, the fluoroquinolones class of antibiotics and two of the third generation cephalosporins have become the choice for empirical therapy od suspected typhoid fever.[12 – 14]. However, the rampant use of fluoroquinolones which were introduced in the mid 1990 [15] has lead to the emergence of documented resistance to this class of drugs. [16] This is a major setback in the empirical management of enteric fever.

Multidrug resistance of salmonella typhi to antibiotics such as chloramphenicol, amoxicillin, cotrimoxazole and fluoroquinolones have emerged as new challenges to the treatment of typhoid fever.

Hence there is need for the study of incidence and susceptibility patterns of salmonella species to commonly prescribed antibiotics in an attempt to understand antibiotics susceptibility profile of the isolates and to prevent from the mergence of multidrug resistance.

This study intends to make an attempt to find out the incidence of MDR typhoid fever in children with special reference to invitro antibiotic sensitivity and resistance pattern.

2. AIMS AND OBJECTIVES

The aims and objectives of the study were as follows

A) To find out the incidence of multidrug resistant typhoid fever in children 1 to 12 years.
B) To study the invitro antibiotic sensitivity and resistance pattern of multidrug resistant typhoid fever.
C) To find out the changing pattern of clinical presentation in typhoid fever.
D) To find out the complications of typhoid fever in children.

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3. MATERIAL AND METHOD

This study was carried out in tertiary care hospital during the period of october 2012 to september 2014.

STUDY DESIGN

It is a hsopital based prospective cohort study.

SELECTION OF CASES

All the cases clinically diagnosed as typhoid fever, admitted in pediatric ward at tertiary care hospital during the period of october 2012 to september 2014 with following exclusion and inclusion criteria were included in the study. Typhoid fever was suspected clinically in patients who has sustained temperature >39 degree celcius for 5 or more days but did not have signs and symptoms suggesting other infections.

INCLUSION CRITERIA:

1) Age group of cases 1 to 12 years.
2) Clinically suspected enteric fever cases which are blood culture positive.

EXCLUSION CRITERIA:

1) Cases less than 1 year and above 12 years.
2) Those who had downgrade trend of temperature.

After selection, a complete history was obtained either from the patients or parents, a thorough general examination an systemic examination was done and findings were recorded in a specially designed proforma.

PLAN OF STUDY:

All the cases of clinically diagnosed typhoid fever were subjected for laboratory investigation - routine hemogram, widal test and blood culture for isolation of S.Typhi and their antibiotic sensitivity and resistance pattern.

Investigations

(A) WIDAL TEST

Widal test was done by conventional agglutination method.

Principle: The antibodies present in the serum react with the corresponding bacterial antigens to give an agglutination.

Procedure:

a) Specimen:Serum.Incasedelayintesting,storeserumat2to8degreecelcius.
b) ASSAY:
    1) for each serum sample arrange four horizontat rows of 6 test tubes each (10 x 75 mm) in a rack.
    2) Prepare master dilutions by taking 5 test tubes (15 x 125 mm). Mix well after each addition. Transfer 0.5 ml of diluted serum from master dilutiontubes to each test tube of the corresponding vertical row in a rack. Place 0.5 ml of normal saline in last (6 th) vertical row to serve as saline control.
    3) Add 0.5 ml of each S. Typhi 'O', S. Typhi 'H' and S. Paratyphi 'AH', S. Paratyphi 'BH'. Antigens to each of the six test tubes in each horizontal row.
    4) Mix well and incubate overnight at 37 degree celcius.
    5) Observe for agglutination.

INTERPRETATION : No agglutination is a negative test as observed in saline control tube. Visible agglutination is a positive test. The titre of test serum for each salmonella is read as the highest dilution of serum which gives clear cut agglutination. Antibody titre 1:80 or higher suggest infection. 'O' antigen brings agglutination while 'H'antigen brings floccular agglutination.

CLINICAL IMPORTANCE : In enteric fever antibodies to salmonella organisms are usually detectable in the patients blood 6 days after the onset of infection. Antibody titre 1:80 or above suggest infection. A rising titre of at least fourfolds is considered more significant than a single test.

(B) BLOOD CULTURE

About 2 to 5 ml of venous blood was collected aseptically with the syringe and needle and was aseptically transferred to appropriate blood culture bottle Bact/ALERT FA and PF supplied by BIOMERIUX, INC DURHAM NC 27704

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The these blood culture broths were placed into the Bact/ALERT Blood culture system (also called as automated and computerised blood culture systems.). This system was based on the principle of detecting the carbon dioxide produced by the organism as they grow in the broth. This was detected by the carbon dioxide sensitive chemical sensor that was separated from the blood broth mixture by a unidirectional carbon dioxide permeable membrane. In the presence of carbon dioxide the colour of sensor changes from green to yellow.

After investigations, all the cases were followed up during during the hospital stay to assess the response to antibiotic as an initial therapy or subsequent therapy, positivity of widal test, blood culture and sensitivity pattern and their complications (Table 1).

Table 1 total number of admissions of suspected typhoid cases in pediatric ward

Year	Total no. of admission	No of suspected typhoid cases admitted	
		n	%
2012-2013	4838	132	2.72
2013-2014	5513	118	2.14
2012-2014	10351	250	2.41

Table 2 symptoms of MOR typhoid fever cases

Symptoms	Number of cases	
	n	%
Fever	40	100
Abdominal pain	15	26.66
Anorexia, nausea, vomiting	20	50
Diarrhoea	09	22.5
Constipation	02	5
Cough	05	12.5
Headache	12	30
Joint pain	10	25
Altered Sensorium	2	5

Hospital admission rate of suspected typhoid fever cases in paediatric ward in tertiary care hospital during 2012-2013 was 2.72% and during 2013-2014 was 2.14% (Table 3).

Table 3 signs of typhoid fever

Signs	Number of canses	
	n	%
COATED TONGUE	24	60

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TOXIC LOOK	22	55
CHEILOSIS	03	7.5
ANAEMIA	07	17.5
ICTERUS	06	15
RESPIRATORY SIGNS		
Breathlesness	06	15
Crepts	04	10
GASTROINTESTINAL SIGNS		
Splenomegaly	04	10
Hepatomegaly	16	40
Distention of abdomen	01	2.5
Tenderness of abdomen	12	30
Guarding/rigidity	01	2.5
CNS SIGNS		
Meningism		
Delirium/psychosis	02	5
MUSCULOSKELETAL SIGNS		
Pain in joints		
Myalgia	05	12.5

In the present study the clinical signs such as coated tongue were present in 60% of cases, toxic look in 55% and anaemia in 17.5% of cases and icterus in 15%. Respiatory sign in the form of breathlessness was present in 15% and crepitationd in 10% of cases.

Gastrointestinal signs were present in the form of splenomegalys in 10%, hepatomegaly in 40% of cases tenderness of abdomen in 30%, guarding and rigidity in 2.5%.

CNS signs were present in the form of meninges in 7.5% of cases delirium / psychosis in 5% of cases Musculoskeletal signs in 25%.and renal signs in the form of hematuria in 25% of case (Table 4).

Table 4 Widal and blood culture positive cases

TOTAL CASE	WIDAL positive cases		BLOOD CULTURE positive cases	
	n	%	n	%
250	81	32.4%	40	16%

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Widal positivity was found to be 32.4% and blood culture positivity was found to be 16 % (Table 5).

Table 5 multidrug resistant typhoid cases in children

Total number of culture positive cases	n	MOR cases %
40	5	12.5

Out of 40 blood culture positive cases of S.typhi, MOR typhoid cases were found to be 05 (12.5%). In age group less than 3 years, 20% of cases had been found. In age group 3-5 years 60% of cases and in 6-12 years age group 20% of cases had been found. 80% cases of MOR typhoid fever had observed in the age s 5 years (preschool age); (Table 6).

Table 6 Symptoms of MOR typhoid fever

Symptoms	No of MOR Typhoid cases	
	n	%
Fever	05	100%
Abdominal pain	04	80%
Headache	01	20%
Decreased appetite/anorexia	05	100%
Dia rrhoea	02	40%
Constipation	00	00
Cough ·	03	60%
Joint pain/myalgia	03	60%
Altered sensorium	01	20%

Fever was present in 100% of cases, anorexia in 100% of cases abdominal pain and discomfort was present in 80% of cases, diarrhea in 40% of cases, headache in 20%, cough in 60%, joint pain in 60%, altered sensorium in 20% of cases (Table 7).

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Table 7 signs of MDR typhoid fever

SIGNS	Number of canses	
	n	%
COATED TONGUE	3	60%
TOXIC LOOK	5	100%
ANAMEIA	1	20
ICTERUS	2	40
RESPIRATORY SIGNS		
Breathlessness	1	20
Crepts	2	40
GASTROINTESTINAL SIGNS		
Splenomegaly	2	40
Hepatomegaly	4	80
Tenderness of abdomen	3	60
Guarding /rigidity	1	20
CNS SIGNS		
Meningism	2	40
Delirium/psychosis	1	20
MUSCULOSKELETAL SIGNS Myalgia	03	60
RENAL SIGNS Renal angle tenderness	01	20

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In the present study the clinical signs such as coated tongue were present in 60% of cases and anaemia in 20% of cases, toxic look in 100% of cases. Respiratory sign in the form of breathlessness were present in 20% and crepitations in. 40% of cases. Gastrointestinal signs were present in the form of splenomegaly in 40% of cases, hepatomegaly in 80% of cases.tenderness of abdomen in 60% guarding and rigidity in 20% of cases. CNS manifestation was in the form of meningism in 40% of cases and delirium/psychosis in 20% of cases. Musculoskeletal signs were observed in 60% ofcases in the form of pain injoints and myalgia. Renal signs were observed in 20% of cases in the form of renal angle tenderness and hematuria (Table 8).

Table 8 Complications of typhoid fever MOR

COMPLICATIONS	Number of cases	
	n	%
Respiratory system		
Bronchitis	02	40
Pneumonia	01	20
Pleural effusion	---	--
CNS	01	20
Encephalopathy		
Meningitis	00	----
Seizures	00	----
GASTROINTESTINAL SIGNS	04	80
Gastritis		
GI Bleed	00	---
Hepatitis	02	40
Pe.rforation peritonitis	00	---
Toxic ileus	00	---
RENAL		
Hematuria	01	20
Musculoskeletal		---

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Arthritis	00	---
Myalgia	03	60
Hematological	00	---

GIT complications were more i.e 80% than the other systems in the form of gastritis and hepatitis. Respiratory system complications were 40% in the form of pneumonia and bronchitis. Musculoskeletal complications were 60%. CNS complications in the form of encephalopathy and meningitis and Renal in the form of hematuria were seen in 20% of cases (Table 9).

Table 9 Complications of typhoid fever with MOR and without MOR

	Total cases	**Complication**	**Percentage**
Complications in MDR typhoid	5	5	100%
Complications in typhoid cases without MDR	35	12	34.28%

Total number of complications in MDRTF was 100 % where as total numbers of complications without MOR were 34 .28% (Table 10).

Table 10 Clinical response to initial therapy

DRUG	Patient treated		Patient responded		Period of defervecence in days 4.2±1.02	Range
	n	%	n	%		
Ceftriaxone	40	100	40	100		3-5

Ceftriaxone had shown 100% clinical response with period of defervecence was in the range 3-5 with mean standard deviation 4.2±1.02 (Table 11).

Table 11 In vitro antibiotic sensitivity and resistance pattern of isolated cases of S.typhi

DRUG	**n**	**%**	**n**	**%**
AMPICILLIN	31	77.5%	09	22 .5

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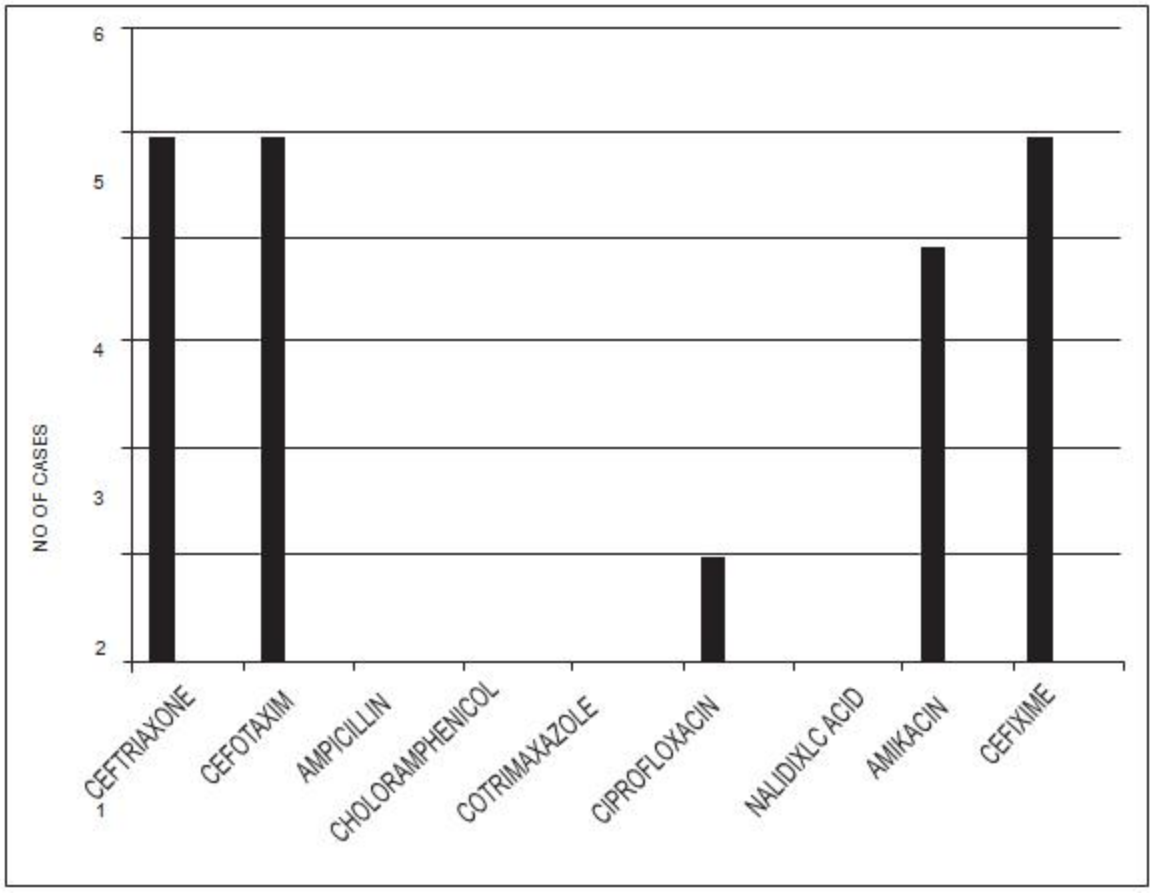
COTRIMOXAZOLE	31	77.5%	09	22.5
CHLORAMPHENICOL	32	80%	08	20
CEFTRIAXONE	40	100%	00	00
CEFOTAXIM	40	100%	00	00
AMIKACIN	40	92.5%	03	7.5
CIPROFLOXACIN	11	27.5%	29	72.5
NALIDIXIC ACID	00	00%	40	100
CEFIXIME	40	100%	00	00

Table 12 In vitro antibiotic sensitivity pattern of MDR typhoid fever



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All isolate cases of S.typhi were found to be sensitive to Ceftriaxone, Cefotaxim and Cefixime followed by sensitivity to Amikacin i.e 92.5%, sensitivity to Ampicillin and Cotrimoxazole was 77.5% and to chloramphenicol is 80%. Ciprofloxacin was found to be sensitive to 27.5% while sensitivity to nalidixic acid was found to be zero. Resistance to nalidixic acid was highest i.e 100 % followed by resistance to Ciprofloxacin i.e 72.5%, resistance to ampicillin was found to be 22.5%, resistance to cotrimoxazole was found to be 22.5% an chloramphenicol had 20% while amikacin had 7.5% resistance. Resistance to Ceftriaxone, Cefotaxim and Cefixime was found to be zero (Table 13).

Table 13 In vitro antibiotic sensitivity and resistance pattern to MDR typhoid fever

DRUGS	SENSITIVITY		RESISTANCE	
	n	%	n	%
CEFTRIAXONE	05	100	00	00
CEFOTAXIM	05	100	00	00
AMPJCILLIN	00	00	05	100
CHLORAMPHENICOL	00	00	05	100
COTRIMOXAZOLE	00	00	05	100
NALIDIXIC ACID	00	00	05	100
CIPROFLOXACIN	01	20	04	80
AMIKACIN	04	80	01	20
CEFIXIME	05	100	00	00

Antibiotic sensitivity when studied in MDRTF it is seen that sensitivity to Ceftriaxone. Cefotaxim and Cefixime was found to be 100% while amikacin is 80% sensitive and ciprofloxacin 20% sensitive. In MDRTF resistance to ciprofloxacin was found to be 80% while resistance to amikacin is 20% .No resistance was found to ceftriaxone, cefotaxim and cefixime.

4. SUMMARY AND CONCLUSION

This study was designed as a hospital based prospective cohort study, carried out at tertiary care hospital during period october 2012 to september 2014. Study population included 40 cases of blood culture positive typhoid fever admitted in pediatric ward at tertiary case hospital.

The aims and objectives of the study were as follows

1. to find out the incidence of multidrug resistant typhoid fever in children of 1 to 12 years of age.
2. To study the invitro antibiotic sensitivity and resistance pattern of multidrug resistant typhoid fever.
3. To find out the changing pattern of clinical presentation in typhoid fever.
4. To find out the complications of typhoid fever in children.

In the study 57.5% of typhoid cases were observed in male and 42.5% were observed in female.

In age group less than 3 years, 12.5% of the cases had been found. In age group 3 to 5 years, 37.5% cases seen, in 6 to 9 years, 27.5% cases found and 10 to 12 years, 22.5% cases had been found. 50% cases of typhoid fever had been observed in the age _< 5 years. (preschool age)

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In the study fever was present in 100% cases, highest number of patients presented with gastrointestinal symptoms than symptoms of respiratory and central nervous system.

In the present study the clinical signs such as coated tongue were present in 60% cases, toxic look in 55% and anemia in 17.5% cases and icterus in 15%. Gastrointestinal signs were present in highest number of cases than respiratory and sentral nervous system signs.

In the present study widal positivity was found to be 32.4% and blood culture positivity was found to be 16%.

Out of 40 blood culture positive cases S.Typhi MDR Typhoid cases were found to be 05 (12.5%).

02 (40%) case of MDR typhoid fever were observed in males and 03 (60%) cases were observed in females.

In the age group less than 3 years, 20% cases had been found. In the age group 3 to 5 years, 60% cases seen. And 6 to 12 years, 22.5 % cases had been found. 80% cases of MDR typhoid fever had observed in the age _<5 years. (preschool age).

Fever was present in 100% cases of MDRTF, anorexia in 100% of cases, abdominal pain and discomfort was present in 80% cases, diarrhea in 40% of cases, headache in 20%, cough in 60%, joint pain in 60%, altered sensorium in 20% of cases.

In the present study in MDRTF the clinical signs such as coated tongue was present in 60% of cases and anemia in 20% cases, toxic look in 100% of cases. Gastrointestinal signs were present in highest number of cases than respiratory and central nervous system signs.

Ceftriaxone had shown 100% clinical response with period of defervescence was in the range 3 to 5 days with mean standard deviation 4.2_+1.02.

In the present study in isolated cases of S.Typhi sensitivity to ceftriaxone , cefotaxim and cefixime was found to be 100% followed by sensitivity to amikacin i.e. 92.5%. Sensitivity to chloramphenicol was 80% and to ampicillin and cotrimoxazole was 77.5% respectively. Ciprofloxacin was found to be 27.5% sensitive and sesnitivity to nalidixic acid was found to be zero.

In the present study in isolated cases of S.Typhi, resistance to nalidixic acid was highest i.e. 100% followed by resistance to ciprofloxacin i.e. 72.5%, resistance to ampicillin was found to be 22.5%, resistance to cotrimoxazole was found to be 22.5% and chloramphenicol had 20% resistance while amikacin had 7.5% resistance. No resistance was found to ceftriaxone, cefotaxim & cefixime. In the present study antibiotic sensitivity when studied in MDRTF it is seen that sensitivity to ceftriaxone, cefotaxim & cefixime was found to be 100% while amikacin was 80% sensitive & ciprofloxacin 20% sensitive.

In present study in MDRTF resistance to ciprofloxacin was 80% while resistance to amikacin was 20%. No resistance was found to third generation cephalosporins i.e ceftriaxone, cefotaxim & cefixime.

In the present study in MDRTF cases GIT complications in the form of gastritis and hepatitis were more i.e. 80% than the other systems. Respiratory system complications were 40% in the form of pneumonia and bronchitis followed by central nervous system complications.

It was demonstrated that complications in cases with MDRTF were 100% and without MDRTF were 34.28%.

REFERENCES

1. Behman RE, Kliegman RM, Jenson HB, Stanton FB (eds). Nelson Textbook of Pediatrics, 18th ed. Philadelphia : WB Saunders; 2008 : 1182-1191
2. Gupta A. Multidrug – resistant typhoid fever in children : epidemiology and therapeutic approach. Pediatr Infect Dis J.1994; 13 : 134-140.
3. Memon IA, Billoo AG, Memon HI et al. Cefixime : an oral option for the treatment of multidrug resistant enteric fever in children. South Med J. 1997; 90: 1204-1207.
4. Zaki SA, Shanbag P. Clinical manifestations of dengue and leptospirosis in children in Mumbai: an observational study. Infection.2010; 38: 285-291.
5. Kumar R Gupta N. Shalini et al. Multidrug- resistant typhoid fever. Indian J. Pediatr.2007;74:39-42.
6. WHO : Background document: The diagnosis, treatment and prevention of typhoid fever. Geneva, World Health Organization Communicable Disease Surveillance and Response.
7. Kato Y, Fukayama M, Adachi T, Imamura A, Tsunoda T, Takayama N et al. Multidrug resistant typhoid fever outbreak in travelers returning from Bangladesh. Emerg Infect Dis.2007;13: 1954-1955.
8. Kumar S, Rizvi M, Berry N et al. Rising prevalence of enteric fever due to multidrug resistant Salmonella: an epidemiological study. J Med Microbiol.2008;57:1247-1250.
9. Park K. Park's textbook of preventive and social medicine. 19th ed. Jabalpur (India) : Bhanot Publisher;2007:195-198.
10. Crump JA, Luby Sp, Mintz ED et al. The global burden of enteric fever. Bull World Health Organ.2004; 82: 346-353.
11. Kothari A, Pruthi A, Churgh TD et al. The Burden of Enteric Fever. J. Infect Dev Ctries.2008;2: 253-259.
12. Hasan R, Zafar A, Abbas Z, Mahraj V, Malik F, Zaidi A et al. Antibiotic resistance among Salmonella enteric serovar typhi and paratyphi A in Pakistan (2001-2006). J. Infect Developing Countries. 2008; 2: 289-294.
13. Chau TT, Campbell JI, Galindo CM, Van Minh Hoang N, Diep TS, Nga TT et al. Antimicrobial drug resistance of Salmonella enterica serovar typhi in Asia and molecular mechanism of reduced susceptibility to the fluoroquinolones. Antimicrob Agents Chemother.2007; 51: 4315-4323.
14. Mohany S, Renuka K, Sood S, Das BK, Kapil A et al. Antibiogram pattern and seasonality of Salmonella serotypes in a North Indian tertiary care hospital. Epidemiol Infect.2006; 134: 961-966.

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15. Butt T, Ahmad RN, Salman M, Kazmi SY et al. Changing trends in drug resistance among typhoid Salmonellae in Rawalpindi, Pakistan. East Mediterr Health J.2005; 11: 1038-1044.
16. Crump JA, Mintz Ed. Global trends in typhoid and paratyphoid fever. Clin Inf Dis.2010; 50: 241.

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