

# Positive Pattern of Antibiotic Sensitivity in Blood Cultures Disease Caused by a Typhoid

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## ABSTRACT

**Objective:** The purpose of this study establish the antibiotic sensitivity pattern in blood culture positive typhoid illness.

**Study Design:** Retrospective study

**Place and Duration:** Mayo Hospital Lahore. April 2021-Dec 2021

**Methods:** There were a total of 98 male and female patients. Patients ranged in age from 8 to 60. After obtaining informed written permission, we collected demographic data on each patient, including age, gender, and BMI. All of the patients were suffering from a fever. All patients had their blood tested for the presence of salmonella species. Antibiotic susceptibility was determined using the Kirby Bauer Disc Diffusion technique and interpreted in compliance with National Committee for Clinical Laboratory Standards (NCCLS) standards. SPSS 24.0 was used to analyse all of the data in the study.

**Results:** Among 98 patients, 61(62.2%) were males and 37 (37.8%) females. Majority of the patients 38 (38.8%) were from age group 21-30 years. Frequency of typhi 69 (70.4%) was greater than that of paratyphi 29 (29.6%). According to our research findings, Azithromycin, chloramphenicol, cotrimoxazole, genramycin, and azithromycin all had better sensitivity than ciprofloxacin and ofloxacin (10.2%, vs 7.1%) . However, both medications have a significant level of resistance. Salmonella typhi was resistant to 91(92.9 %) of the nalidixic acid tested.

**Conclusion:** We found a wide range of antimicrobial sensitivity patterns, including exceptionally high sensitivity to antibiotics like chloramphenicol and cotrimoxazole that have been used in the past. Quinolones, which have been extensively used in the previous two decades, have been shown to have an extremely low sensitivity.

**Keywords:** Resistance, Sensitivity ,Typhoid fever, Antibiotics

## INTRODUCTION

Public health issues such as typhoid fever continue to be a concern in many developing nations.[1] A total of 14.3 million illnesses and over 136,000 fatalities were recorded globally year 2017. In the pre-antibiotic period, the death rate was over 20%; however, after the advent of antibiotics, the mortality rate has dropped substantially to less than 1% [2]. It has been over 30 years since typhoid fever therapy was revolutionised by antibiotics; yet, in that time, the development of drug-resistant typhoid bacteria in the 1980s has made treatment more difficult and expensive [3]. When treating MDR strains, fluoroquinolones were the treatment of choice. However, fluoroquinolone resistance has skyrocketed in recent years as a result of widespread abuse of these antibiotics [4]. Many investigations from Pakistan and other endemic locations, particularly in South Asia, found that 80-90 percent of patients were resistant to ciprofloxacin [5-7].

As far as antibiotic susceptibility goes, serologic testing for typhoid have a low level of sensitivity and specificity in endemic areas. There must be a constant supply of power to run blood culture and microbiological identification equipment. Even in remote regions of poor and middle-income nations, many healthcare institutions lack access to these [8]. Efforts to estimate the prevalence of enteric fever and antibiotic resistance in many resource-limited settings have been hindered by this.

The Widal test, initially proposed in 1896 by F. Widal, is frequently used to diagnose typhoid disease in many poor nations. As a result, it's a lot less expensive, easier to execute, and needs less training and equipment than other options. a total of seven S. typhi somatic Lipopolysaccharides O antigen (TO) and flagellar H antigen (TH) are shared by many different Enterobacteriaceae, hence the test values have been contested for a long time because of these common antigens. [9,10]In addition, the findings have proven difficult to understand because of the variety of cutoff thresholds used.[11]It is also important to note that convalescent phase samples cannot be used to delay patient therapy. A single acute-phase sample is used to determine which treatment option is best. [12]

From nation to country and even within the same country, there are a variety of differences in the clinical presentation, laboratory results, and antibiotic sensitivity patterns of organisms.

Most cases of antibiotic resistance may be attributed to the survival of organisms in the human body throughout the immunodeficiency period and their responsiveness despite the whole course of therapy. [13] S. typhi had developed multidrug resistance in southern Viet Nam by the end of 1992 and the beginning of 1993. [14,15 First-line antibiotics chloramphenicol, ampicillin, and cotrimoxazole were ineffective against these S. typhi isolates, although fluoroquinolones and third-generation cephalosporins were still effective.

The present study was done to compare the antimicrobial susceptibility of chloramphenicol to other anti-typhoid medications (cefixime, ofloxacin, azithromycin, and ceftriaxone) using the Kirby Bauer Disc Diffusion technique against Salmonella isolates (containing S. typhi and S. paratyphi A).

## MATERIAL AND METHODS

This retrospective study was conducted at Mayo Hospital Lahore and comprised of 98 patients. Informed permission was obtained before calculating the demographics of the patients that were enrolled. Those patients were not included in this research because they had not given their written permission in advance.

Patients were between the ages of 8 and 60 years. A disc diffusion method was used to determine the susceptibility pattern of all Salmonella Typhi isolates to Ampicillin (10 micrograms), Ciprofloxacin (5 micrograms), Cotrimoxazole (25 micrograms), Ceftriaxone (30 micrograms), Azithromycin (15 micrograms), Chloramphenicol (30 micrograms), Ceftazidim (30 micrograms), and Nalidixic acid (30 micrograms). NCCLS guidelines were followed for interpreting disc strength and zone-size measurements (NCCLS). Furthermore, the E-test for S. Typhi resistance to Ciprofloxacin was used to estimate the lowest inhibitory concentration of Ciprofloxacin. It was tested on Mueller Hinton agar. The antibiotic susceptibility of S. Typhi may now be measured directly using an epsilon meter. Immobilized along a plastic test strip is an exponentially increasing concentration of Ciprofloxacin. The test strip was put to the newly infected agar plate with the help of a brush. A teardrop-shaped (elliptical) inhibitory zone was observed during overnight incubation. To determine the minimal inhibitory concentration (MIC), a graded test

strip is used. SPSS 24.0 version was used to analyze complete data.

**RESULTS**

Among 98 patients, 61(62.2%) were males and 37 (37.8%) females. Majority of the patients 38 (38.8%) were from age group 21-30 years with mean age 26.6±13.62 years with mean BMI 21.4±5.41 kg/m<sup>2</sup>. (table 1)

Table 1: Enrolled patients with all details

Variables	Frequency	Percentage
Gender		
Male	61	62.2
Female	37	37.8
Age group		
8-20 years	25	25.5
21-30 years	38	38.8
31-40 years	20	20.4
>40 years	15	15.3
Mean age (years)	26.6±13.62	
Mean BMI (kg/m <sup>2</sup> )	21.4±5.41	

According to our research findings, Azithromycin, chloramphenicol, cotrimoxazole, genramycin all had better sensitivity than ciprofloxacin and ofloxacin (10.2%, vs 7.1%) . However, both medications have a significant level of resistance. (table 2)

Table 2: Frequency of sensitivity among enrolled cases

Variables	Sensitivity	Resistance
Antibiotics		
ciprofloxacin	10 (10.2%)	90 (89.8%)
ofloxacin	7 (7.1%)	91 (92.9%)
genramycin	98 (100%)	0
azithromycin	98 (100%)	0
cotrimoxazole	98 (100%)	0
chloramphenicol	98 (100%)	0

Salmonella typhi was resistant to 91(92.9 %) of the nalidixic acid tested.(fig 1)

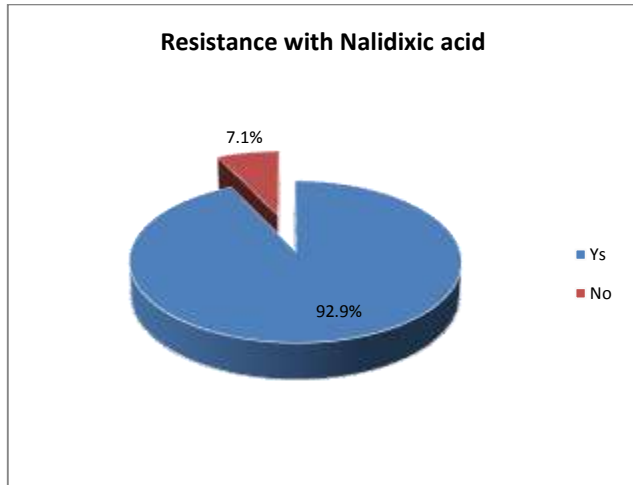


Figure 1: Frequency of resistance with nalidixic acid

**DISCUSSION**

In many impoverished nations, enteric fever is still a major public health concern. ' In the absence of early detection and treatment, it may be a debilitating condition with long-term consequences. Changing clinical characteristics of typhoid fever induced by medication resistant S. Typhi have been reported, making diagnosis more challenging. [16,17] It is well accepted that drug resistance is a significant contributor to the disease's high death

and morbidity rates. To treat typhoid fever, chloramphenicol has been the go-to medication since its release in 1948. Toxicologically, S. Typhi has developed resistance to the medicine because it has been overused and the plasmid-mediated R factor has been acquired. [18]

In this study 98 salmonella species were presented. Among 98 patients, 61(62.2%) were males and 37 (37.8%) females. Majority of the patients 38 (38.8%) were from age group 21-30 years with mean age 26.6±13.62 years with mean BMI 21.4±5.41 kg/m<sup>2</sup>. Findings of our research was comparable to the previous studies. [19,2017,18] Our examination of chloramphenicol and cotrimoxazole-resistant typhoid patients revealed some surprising results. Antibiotic sensitivity was 100%, which is in line with previous studies on Chloramphenicol and Cotrimoxazole from the early days. [21] According to our findings, Salmonella typhi has displayed a remarkable reversal in its resistance pattern. The fluoroquinolone drugs Ciprofloxacin and Ofloxacin were shown to exhibit a 6.7 percent and 5.8 percent sensitivity, respectively, to Salmonella strains that were almost 100 percent susceptible to these medicines a decade or two ago.

According to our research findings, Azithromycin, chloramphenicol, cotrimoxazole, genramycin all had better sensitivity than ciprofloxacin and ofloxacin (10.2%, vs 7.1%) . However, both medications have a significant level of resistance.

Chloramphenicol and Cotrimoxazole showed 100% sensitivity, which is in conformity with previous trials that found similar results. [22,23] Salmonella typhi's resistance pattern has dramatically changed, according to our data. A decade or two ago, fluoroquinolone-resistant Salmonella bacteria were virtually 100 percent susceptible, but currently only 5.4 percent of Ciprofloxacin and Ofloxacin-resistant germs can be treated with these drugs. Antibiotic resistance to fluoroquinolones in NARST strains, which may be susceptible to them in vitro, is thought to exist in vivo[24]. This means that the fluoroquinolones themselves may be less sensitive. Third-generation Cephalosporin sensitivity was decreased by 82 percent in this research for Cefotaxime. In contrast, Azithromycin's sensitivity is 100 percent.

In current study, Salmonella typhi was resistant to 91(92.9 %) of the nalidixic acid tested. The antibiotics imipenem and meropenem were effective against almost all of the patients in line with the findings of the new research, it is worrying that the rise of Salmonella Typhi meropenem-resistant strains has become a public health problem due to the lack of antibiotics available for treating the XDR typhoid. The time to address this issue of public health is now, before it is too late. Only a few things should be done right away: typhoid vaccine, excellent cleanliness, ceasing the use of antibiotics, blood culture testing in patients with suspected Typhoid fever before commencing antibiotics, and long enough (10-14 days or afebrile more than five days) antityphoid antibiotic usage.

For both Ciprofloxacin and Ofloxacin, we found a substantial incidence of fluoroquinolone-resistant salmonella species. Even if these strains are vulnerable to fluoroquinolones in vitro, they will be resistant in vivo if they are resistant to Nalidixic acid, based on our data from the NARST strain, which had a resistance rate of 92,9 percent in our research. medicines like chloramphenicol and cotrimoxazole, used in the past or more recently like azithromycin, have all proven 100 percent sensitivity to the pathogens they were designed to treat.

**CONCLUSION**

We found a wide range of antimicrobial sensitivity patterns, including exceptionally high sensitivity to antibiotics like chloramphenicol and cotrimoxazole that have been used in the past. Quinolones, which have been extensively used in the previous two decades, have been shown to have an extremely low sensitivity.

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