Current antimicrobial sensitivity pattern of typhoidal salmonellae in a referral diagnostic centre

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Summary

Background: Infections caused by typhoidal salmonellae are an important public health concern in Pakistan. Inappropriate and injudicious use of fluoroquinolones has reduced their efficacy due to development of high level resistance.

Aim: To ascertain the current susceptibility pattern of typhoidal salmonellae thus guiding the physicians for better management of typhoid patients.

Materials and Methods: A study was conducted at our institution from January 2012 through December 2013 to investigate current susceptibility pattern of typhoidal salmonellae.

Results: Out of 200 isolates, 107 (53.5%) were identified as Salmonella Typhi and 93 (46.5%) as Salmonella Paratyphi A. Sensitivities of Salmonella Typhi were as follows: ampicillin (48.6%), chloramphenicol (45.8%), co-trimoxazole (40.1%), ciprofloxacin (11.2%). Sensitivities of Salmonella Paratyphi A were: ampicillin (80.6%), chloramphenicol (89.2%), co-trimoxazole (90.3%), and ciprofloxacin (16.1%). No resistance was detected against third generation cephalosporins.

Conclusions: Typhoidal salmonellae are still entirely susceptible to third generation cephalosporins in our setting. Marked rise in resistance to fluoroquinolones has reduced their empirical usage. Sensitivity of Salmonella Paratyphi A to conventional antityphoid drugs was encouraging.

Introduction

Infections caused by typhoidal Salmonellae are an important public health concern worldwide. The World Health Organization (WHO) has estimated that annually 21.7 million people contract typhoid fever out of which 217,000 succumb to the disease. Paratyphoid fever, usually caused by Salmonella Paratyphi A and occasionally by Salmonella Paratyphi B and C, accounts for 5.4 million new cases worldwide each year (10). Indiscriminate use of antibiotics during the previous century rendered S. Typhi and S. Paratyphi A resistant to the conventional antityphoids like ampicillin, chloramphenicol and co-trimoxazole. Resistance to newer drugs like ciprofloxacin soon followed; initially with development of low level resistance and lastly of high level resistance in typhoid endemic countries (7,10,11). This has narrowed down the therapeutic options to third generation cephalosporins, as resistance to these antibiotics has been reported less frequently. In the last few years, azithromycin has also been used to treat uncomplicated typhoid fever and several clinical and in vitro studies have demonstrated its efficacy against typhoidal salmonellae (3,6,9). Recent studies have shown reemerging susceptibility to conventional drugs previously rendered useless by excessive resistance (5,13).

This study was carried out to evaluate the current susceptibility pattern of typhoidal salmonellae against antityphoidal drugs and to provide physicians with a guideline for the proper choice of antibiotics against infections by these bacteria.

Materials and Methods

This study was conducted at the Armed Forces Institute of Pathology, Rawalpindi, Pakistan from January 2012 through December 2013. By using the BACTEC 9120 (Becton, Dickinson and Company, Franklin Lakes NJ, USA) continuous monitoring blood culture system and bottles provided by the manufacturer consecutive, non-duplicate typhoidal salmonellae were included in the study. Isolates were identified by colony characteristics on 5% sheep blood (Oxoid, Basingstoke, UK) and MacConkey agar (Oxoid), biochemical reactions on API 20E (bioMerieux, Marcy-l’Étoile, France) and specific Salmonella antisera (Denka Seiken, Tokyo, Japan). Antibiotic susceptibility testing was carried out on Mueller-Hinton agar (Oxoid, UK) by the Kirby-Bauer...
disc diffusion method; incubating plates aerobically at 35°C±2 for 18-24 hours and interpreting inhibition zones according to Clinical and Laboratory Standards Institute (CLSI) guidelines (4). Antibiotic discs (Oxoid, UK) used were ampicillin (10 µg), chloramphenicol (30 µg), trimethoprim-sulfamethoxazole (1.25/23.75 µg), nalidixic acid (30 µg), ceftriaxone (30 µg) and cefixime (5 µg). Salmonella Typhi ATCC 700931 and Salmonella Paratyphi A ATCC 9150 were used as controls.

Results

During the study period 200 isolates of Salmonella Typhi and Salmonella Paratyphi A were dealt in the department. The typhoidal isolates were subjected to susceptibility testing against conventional and newer antityphoid drugs.

The mean age of patients was 19 years (range 4 to 66 years); 126 (63%) patients were males. One hundred and seven isolates (53.5%) were identified as Salmonella Typhi and 93 (46.5%) as Salmonella Paratyphi A.

Sensitivity of Salmonella Typhi isolates to various antimicrobials tested was: ampicillin 48.6%, chloramphenicol 45.8%, co-trimoxazole 40.1%, nalidixic acid 8.4%, ciprofloxacin 11.2%, ceftriaxone and cefixime 100%. The sensitivity pattern of Salmonella Paratyphi A was as follows: ampicillin 80.6%, chloramphenicol 89.2%, co-trimoxazole 90.3%, nalidixic acid 9.7%, ciprofloxacin 16.1%, ceftriaxone 100% and cefixime 100%.

Discussion

Typhoid fever is a common cause of bloodstream infections in developing countries like Pakistan. This is mainly due to poor sanitation conditions, unsafe drinking water supply and inadequate surveillance systems for food borne infections (13). Salmonella Typhi and Salmonella Paratyphi A are more prevalent in our country whereas infections caused by serotypes Paratyphi B or C are rare (1,15).

In the present study, males were found to be more prone to contracting typhoid fever probably as a result of outdoor working and eating and drinking food from street vendors. Similar statistics have been regionally reported by Gupta et al. from India and by Karkey et al. from Nepal (6,10).

Among typhoidal salmonellae, S. Typhi was more common than S. Paratyphi A. S. Typhi is still the leading typhoid Salmonella, but the frequency of Paratyphi A isolates has significantly increased over the past years, as observed by various authors (8,15). Typhoid vaccines (Vi polysaccharide and live oral Ty21a) have been used extensively in our country in the recent years. As these preparations do not provide protection against S. Paratyphi A, this could have lead to relative rise in Paratyphi A infection rates (16).

In our study, sensitivities of S. Typhi and S. Paratyphi A to ciprofloxacin were low. This could partially be due to revision of zone interpretation criteria of CLSI (document M100; 2013) from 21 mm to 31 mm for being susceptible, thus classifying the majority of our isolates in our setting was susceptible to conventional antityphoid drugs, such as chloramphenicol (95.3%), ampicillin (94.5%) and co-trimoxazole (94.5%) (12). In comparison, much lower susceptibilities were seen in our study. Lakshmi et al. reported increasing sensitivity of chloramphenicol against both S. Typhi and S. Paratyphi A and similar trend was reported by another Indian study (12,13). The sensitivities of S. Paratyphi A isolates in our study to chloramphenicol, ampicillin and co-trimoxazole were similar to a study conducted by Gupta et al. from India (6).

The sensitivity results of typhoidal salmonellae to conventional anti-typhoid drugs, though encouraging, are not sufficient to re-employ these drugs as empirical treatment. Resistance against third generation cephalosporins is still uncommon with only sporadic cases reported from Bangladesh and India (17). All isolates of S. Typhi and S. Paratyphi in our study were sensitive to ceftriaxone and cefixime. Other regional studies also reported excellent sensitivity to ceftriaxone in S. Typhi (2,15).

Conclusions

Among typhoidal salmonellae, a notable proportion of S. Paratyphi A isolates in our setting was susceptible to conventional antityphoid drugs. The increase in resistance to fluoroquinolones has rendered them unsuitable for empirical treatment of typhoid fever and the susceptibility profile should be interpreted according to latest guidelines. Resistance to third generation cephalosporins was not detected but injudicious use may lead to this menace in the near future.

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