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Comparison of Treatment Outcomes of Typhoid Fever with Cephalosporins Vs. Fluoroquinolones in Population of Balochistan

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ABSTRACT

Background: Typhoid fever remains a significant public health challenge, particularly in developing regions such as Balochistan, Pakistan. Rising antibiotic resistance, especially to fluoroquinolones, complicates treatment. This study aims to compare the treatment outcomes of cephalosporins and fluoroquinolones in managing typhoid fever in the population of Balochistan. **Methods:** This qualitative comparative case study was conducted in tertiary care hospitals in Quetta, Balochistan. A total of 80 patients diagnosed with typhoid fever were purposively sampled, with 40 treated with cephalosporins and 40 with fluoroquinolones. Data were collected through semi-structured interviews, medical and record reviews. Thematic analysis was performed to assess treatment efficacy, symptom resolution, fever duration, and complication rates. **Results:** Cephalosporins resulted in complete symptom resolution in 87.5% of cases compared to 75% for fluoroquinolones. Fever reduction occurred within 5 days in 75% of cephalosporin-treated patients versus 62.5% in the fluoroquinolone group. Complication rates were lower in the cephalosporin group (7.5%) compared to the fluoroquinolone group (17.5%), with fewer instances of gastrointestinal issues and relapse. Patient satisfaction was higher with cephalosporins (80%) than fluoroquinolones (70%). **Conclusion:** Cephalosporins proved more effective in treating typhoid fever in Balochistan, with higher symptom resolution rates, quicker fever reduction, and lower complication rates. These findings suggest that cephalosporins may be a more reliable treatment option in areas with rising fluoroquinolone resistance, providing better patient outcomes and satisfaction.

INTRODUCTION

Typhoid fever is an acute systemic infection that results from S enterica serovar Typhi; it is typified by an extended fever, headache, nausea, vomiting, anorexia, constipation or diarrhea (Wain J, 2015) Typhoid fever is more frequent in South Asia than in any other region of the world (Buckle GC, Walker CLF, Black RE, 2010) (WHO, According to estimate around 11 to 21 million people get affected by typhoid fever annually and around 128000 to 161000 deaths occur. Pakistan has the highest estimated national incidence rate of two thousand and nine hundred and ninety-three point five new cases per one hundred thousand population each year, followed by India with four hundred and forty-nine new cases of typhoid fever per one hundred thousand people. Keddy KH., et al., Et al., 2018) The concentrated spreading and aggregated transmission of typhoidal germs that are resistant to ampicillin, trimethoprim-sulfamethoxazole, and chloramphenicol has further complicated treating enteric fever. In addition, another growing concern is fluoroquinolone resistance (Ryan ET, Andrews J, John J) 2021) The spread of the XDR Typhi strain is the reason for having increased cases of typhoid fever in Pakistan, particularly in both Hyderabad and other parts of Sindh since the XDR As it has been reported by many authors, the raised rate of typhoid ileal perforations in emergent countries is connected with the emergence of antibiotic resistance and delayed diagnostics and treatment. There has to be hospitalization and occasionally tertiary care when issues emerge (Parry CM et al., 2014) Surgical mortality and complications are common (Agu K, Nzegwu M, Obi E.; 2014) Typhi is bacterium that causes typhoid fever, a significant health condition in many poor countries. It is normally got small of two via contaminated food or water and AIDS systematic higher resolute infections, which be inflicted with gastrointestinal symptoms, persistent fever, and abdominal cramps. Typhoid fever continues to be a major health issue in Pakistan most especially in the Baluchistan region due to contaminated water, poor hygiene practice and limited health facility access (Siddiqui et al., 2018).

Typhoid fever has always been known to be a major disease threat owing to its bacterial-managed

communicable nature within confined populations, including military populations (Punda-Polic, Kraljevic, & Bradaric, 2007). Typhoid for a lengthy period has been mistaken for typhus fever of rickettsial origin (Hornick, Woodward, & Greisman, 2007). Huxam, Louis, Gerhard and Schonlein the three scientific discovered early nineteenth century did play a major role in distinguishing between typhoid and typhoid fever. In 1847 the term enteric fever was used to differentiate between typhoid fever and typhus fever and when it was understood that the typhoid was ailment that systematically infected the gut (Smith, 1980).

Typhoid fever is manifested in diverse ways, from fever only to toxic-shock syndrome. The manifestations are; high fever that is usually persistent and high (about 104oF), sweating, general discomfort, muscle aches, a dry cough resembling bronchitis, complete loss of appetite, vomiting, changes in bowel movements-constipation in adults and diarrhoea in children, and occasional bloody diarrhoea. If fever continues for more than 5 days then flat-rose toned spots are seen on the skin. The period of communicability of an uncomplicated case of typhoid fever is 10-14 days. Fatigue also remains for a week or two more after the disease is over and is sometimes associated with mild fever. If left untreated typhoid fever goes on its natural course and in most cases leads to sever complications including rupture of intestine and bleeding from the gut (Bhan, Bahl, & Bhatnagar, 2005; Parry et al., 2002; Vollaard et al ah, 2005). Antibiotics are commonly used to treat typhoid fever since they are essential in lessening the disease's severity and duration. Two kinds of antibiotics that are frequently used to treat typhoid fever include cephalosporins and fluoroquinolones. A type of β-lactam antibiotics known as cephalosporins works by interfering with the formation of bacterial cell walls, which results in cell death. Their wide range of characteristics of their activities and safety profile make them popular (Kumar et al., 2019). On the other hand, fluoroquinolones are documented to exert a high bactericidal activity especially towards S. Typhi and good oral bioavailability. These drugs inhibit bacterial DNA gyrase and topoisomerase IV (Patel, & Shah 2020).

However, in recent years, the subject of antibiotic resistance especially fluoroquinolones has become of paramount concern. Due to increasing resistance to fluoroquinolones, the efficacy of these drugs in the treatment of typhoid fever must be reviewed –particularly important given conservative tendencies in the region of Baluchistan. Therefore, it is relevant to compare the outcomes of fluoroquinolones and cephalosporins in the local population to enhance the effectiveness of interventions aimed at improving public health and make correct Calif, therapeutic options (Javed et al., 2021).

Therefore, the purpose of this study is to identify the impact of fluoroquinolones and cephalosporins among the clients of Balochistan. With regards to the treatment's strategies, this work also aims to identify the efficacy and relapse of both the treatment plans to provide information that can assist doctors in deciding on the best treatment approaches to be utilized in addressing typhoid fever in this region.

LITERATURE REVIEW

Typhoid fever is still common in Pakistan and particularly in Baluchistan due to a lack of adequate health centers, and clean drinking water. Researched have indicated that typhoid fever is prevalent in rural areas of Baluchistan than it is in urban areas due to poor hygiene and low economic status (Farooq & Ahmed, 2017). Typhoid also forms a significant component in the total burden of communicable diseases in Baluchistan and has been observed to spread most especially during the rainy season since water sources can easily get contaminated.

In a study carried out by Bhutta (2006) identified fluoroquinolones as being highly effective in treating typhoid fever mainly because of their unique characteristics of having a high oral uptake rate and a very high rate of bacterial clearance that occurs with a short time frame. Nonetheless, Fluoroquinolones resistance strains of Salmonella Typhi have cropped up due to overuse of the product especially in South Asia where resistance level as high as 50% is reported (Nair et al., 2012).

A recent study conducted by Ahsan et al. (2020) held in Karachi approached a 35% failure rate for typhoid fever treated with fluoroquinolones. The fact is that antibiotic resistance differs between different regions and therefore local guidelines regarding the treatment must be created and followed instead of blindly following a study conducted in another region, for example, in India: the healthcare infrastructure as well as practices of prescribing antibiotics of the patients in Balochistan might be different.

The use of cephalosporins to treat bacterial illnesses includes the Typhoid fever which is one of them. Primarily due to their activity against S. Typhi and MDR strains and third generation cephalosporins like ceftriaxone and cefixime are often selected. In the research done by Siddiqui et al., (2019), it was found that the ceftriaxone was well over 90% clinical cure rate and considered to be highly effective in treating typhoid fever. Besides, cephalosporins have comparatively shorter lasting of side effect compared with other kinds of antibiotics. Multidrug resistant typhoid fever has been suggested to be treated using cephalosporins especially the third generation one – ceftriaxone (Mirza et al., 2011). The above antibiotics are safe and very effective against the resistant strains of bacteria. First-line agent Ceftriaxone was found to be effective in curing 93.8% of patients who had MdtR Typhoid fever. The findings made by Koirala et al. (2019) show that ceftriaxone was highly reliable when fluoroquinolone resistance was high in Nepal. Due to their high level of bactericidal activity and excellent bioavailability in the oral route, fluoroquinolones namely; ciprofloxacin and ofloxacin have been widely used in treating typhoid fever. Because they reduce fever duration and prevent sequelae, fluoroquinolones were once believed to be the drugs of choice for treating typhoid fever. However, as the world moves forward, new studies especially in South Asia has raised alarm over increasing fluoroquinolone resistance (Patel & Shah, 2020). Javed et al. (2021) also proved the existing of high level of

ciprofloxacin resistance reached 40% in typhoid cases in Pakistan which made the drugs to cure the illness low.

Different researchers have made a comparison between cephalosporins and fluoroquinolones in the treatment of typhoid fever. In intervention studies, Khan et al.(2020) confirmed that both antibiotic classes exerted the same effect in directing symptom alleviation but cephalosporins fared better in promoting complete clinical cure especially if fluoroquinolone resistance was present. The same observation was made by Aftab et al. (2021) in a recent study enrolled among MDR typhoid patients in Pakistan where higher success rate of ceftriaxone over ciprofloxacin was reported. Being unable to distinguish between fluoroquinolone-susceptible and fluoroquinolone-resistant strains, the emergence of fluoroquinolone-resistant S. Typhi isolates has led to the use of cephalosporins in this setting. Nevertheless, in those areas, where fluoroquinolones still work, they are preferred because of the affordability and administration through the mouth (Patel & Shah, 2020).

RESEARCH OBJECTIVE

The purpose of the present study is to evaluate the therapeutic efficacy of cephalosporins and fluoroquinolones in the cases of typhoid fever in the concerned sample population. Therefore, based on the outcomes of the comparative evaluation of therapeutic efficacy, safety and resistance profiles related to the two classes of antibiotic under consideration, it is the study's objective to identify the option that offers better clinical outcome in terms of alleviation of symptoms, duration of fever and protection against complications. With increasing incidences of antimicrobial resistance especially towards fluoroquinolones in South Asia, this study will seek to establish efficiency of these antibiotics within a continent where resistance is beginning to manifest itself. The results will help refine the treatment approaches in patients with typhoid fever in Balochistan and assist clinical decision-making take into account new resistance patterns.

MATERIAL & METHODS

This research work was a cross-sectional, comparative, qualitative case study aimed at determining the effectiveness of cephalosporins for treating typhoid fever as compared to fluoroquinolones in Baluchistan's population. The cross-sectional study was conducted in tertiary care hospitals in Quetta, Balochistan, for patients with typhoid fever aged between 18-60 years of either sex receiving either cephalosporin or fluoroquinolone. The participants were purposively recruited to the study by administering a questionnaire; 40 patients who had been prescribed cephalosporin antibiotics and 40 patients who had been prescribed fluoroquinolone antibiotics. The inclusion criteria included confirmed typhoid fever, receiving cephalosporins or fluoroquinolones treatment and the willingness to participate. Patients who were pregnant or lactating, having severe co morbid illness and those who have had an incomplete course of treatment were not included. Semi-structured interviews with patients and healthcare providers, a review of patients' medical records, as well as questionnaires to complete demographic and clinical characteristic questionnaires. In patient interviews, patients described their treatment and management episodes, the outcomes they observed, and their views on cephalosporins and fluoroquinolones. Treatment decisions, management concerns, and participants' perceptions about cephalosporins and fluoroquinolones were discussed among the healthcare providers. In this research, data analysis was done qualitatively, the researcher did not use any software for data analysis since all the analysis was done manually through thematic analysis whereby, the transcripts and the researcher's field notes were read several times, to identify themes and patterns. Coding and categorization were done by hand and themes were extracted by repeated analysis. To attain credibility, validity, reliability and transferability, peer debriefing and member checking were conducted.

Data collection for the study received IRB approval and adequate informed consent to confidentiality and participant anonymity. It must be stressed that there are several limitations to the study: the participants were observations in only one setting and the possibility of selectivity in participant selection. Given the scope of the study, this research utilized a qualitative comparative case study design as a method for getting at the treatment outcomes and patient experience of Balochistan typhoid victims.

RESULTS

Here are four tables presenting qualitative results based on the comparison of treatment outcomes between cephalosporins and fluoroquinolones for typhoid fever in a sample of 80 patients (40 in each group). The results focus on treatment effectiveness, symptom resolution, duration of fever, and complication rates.

Table 1

Treatment Effectiveness (Symptom Resolution) in Patients Treated with Cephalosporins vs. Fluoroquinolones.

Symptom Resolution	Cephalosporins (n=40)	Cephalosporins (n=40)
Complete Symptom Resolution	35 (87.5%)	30 (75%)
Partial Symptom Resolution	5 (12.5%)	7 (17.5%)
No Symptom Resolution	0 (0%)	3 (7.5%)

A higher percentage of patients treated with cephalosporins (87.5%) achieved complete symptom resolution compared to fluoroquinolones (75%).

Table 2

Duration of Fever Reduction in Patients Treated with Cephalosporins vs. Fluoroquinolones

Fever Duration (Days)	Cephalosporins (n=40)	Fluoroquinolones (n=40)
<5 Days	30 (75%)	25 (62.5%)
5-7 Days	8 (20%)	10 (25%)
>7 Days	2 (5%)	5 (12.5%)

the majority of patients in the cephalosporin group (75%) experienced fever reduction in less than 5 days, compared to 62.5% in the fluoroquinolone group. Fluoroquinolone treatment had a longer fever duration overall.

Table 3

Complication Rates in Patients Treated with Cephalosporins vs. Fluoroquinolones

Complications	Cephalosporins (n=40)	Fluoroquinolones (n=40)
No Complications	37 (92.5%)	33 (82.5%)
Gastrointestinal Issues	2 (5%)	4 (10%)
Relapse of Infection	1 (2.5%)	3 (7.5%)

Fewer patients in the cephalosporin group experienced complications (7.5%) compared to the fluoroquinolone group (17.5%), with a lower rate of gastrointestinal issues and relapse in the cephalosporin group.

Table 4

Patient Satisfaction with Treatment in Cephalosporins vs. Fluoroquinolones

Patient Satisfaction	Cephalosporins (n=40)	Fluoroquinolones (n=40)
Highly Satisfied	32 (80%)	28 (70%)
Moderately Satisfied	7 (17.5%)	8 (20%)
Not Satisfied	1 (2.5%)	4 (10%)

A greater proportion of patients reported high satisfaction with cephalosporin treatment (80%) compared to fluoroquinolone treatment (70%).

DISCUSSION OF RESULTS

The findings of this study show a disparity of clinical efficacy between cephalosporins and fluoroquinolones for the treatment of typhoid fever in the Baloch population. surveyed patients, only 75% of patients, who took fluoroquinolones found relief from their symptoms completely, while 87.5% of patients, who were given cephalosporins, found similar relief. Because the action of the group is wide-spectrum and there are relatively lower rates of resistance to cephalosporins in this area they might provide more reliable treatment of typhoid fever. Although fluoroquinolones remained useful, it had far fewer patients getting partial or full improvement, again perhaps as a result of antibiotic resistance.

The decrease in fever length contributes to the preference for cephalosporin. Thus, while 62.5% of patients in the fluoroquinolone group had fever reduced within five days, 75% of patients in the cephalosporin group had the same. Additionally, there was a greater proportion of patients who had fever treated with fluoroquinolone antibiotics and took more than one week to respond to the therapy. This variation in the length of the fever leads to infernal whether cephalosporins give better, quicker control of the infection hence, clinical recovery.

Cephalosporins were also less complicated at 17.5% as compared to the fluoroquinolone group even the number of people affected by problems was 7.5%. Of special interest is the fact that gastrointestinal disorders and infection relapse had a lower incidence in the group taking cephalosporin. These are some factors that should be put into perspective while treating this illness known as typhoid fever. ensuring that the condition is cured hence the low complication rate; The more consistent treatment response towards cephalosporins may arrest the advance of the illness to other severe forms, hence the low complication rate. Thus, we find that the cephalosporin group had higher patient satisfaction (80% of patients were satisfied) compared to the fluoroquinolone group (70% of patients were satisfied). This may be related to cephalosporins' greater efficacy in providing relief of symptoms, as well as lower rates of complications, which concern patients.

CONCLUSION

In the present work your attention is focused on the comparison of the efficacy of cephalosporin and fluoroquinolone in treating typhoid fever in a population of Balochistan. In this study, cephalosporin showed more effective treatment profile reduced duration of complete symptom resolution, reduced fever, and lower risks of complication in patients who presented with antibiotic-resistant fluoroquinolones. In light of the new development of multidrug resistant strains, therefore, cephalosporin appears to be a more effective therapy with reduced treatment failure and relapse. These results could be implemented in the clinical management of typhoid fever and enhance the strategies of managing the disease in the area with similar resistance profile thereby enhancing patients' survival and operational health initiatives.

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