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Original Research Article

PATTERN OF ANTIBIOTIC SENSITIVITY IN TYPHOID FEVER PATIENTS WITH POSITIVE BLOOD CULTURE: AN OBSERVATIONAL STUDY

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Abstract: *Salmonella typhi is a type of bacteria that can cause typhoid fever, a severe infection that primarily affects people in developing countries. It is a significant public health concern. An antibiogram test was conducted by the Department of Medicine at MTI, LRH Peshawar, to test antibiotic susceptibility in samples that tested positive for typhoid culture from January 2023 to July 2023. The Kirby-Bauer disk diffusion method was used to evaluate the antibiotic susceptibility of Salmonella isolates on Mueller-Hinton agar. IBM SPSS version 22 was used to analyze all of the data. In total, 90 people participated in the research, with 40 percent being female and 50 percent male. Of the Salmonella isolates, 08 (28.20%) were sensitive to typhoid, 18 (68.80%) were MDR, and 01 (04%) were XDR. Of the 27 isolates, 6 (21.40%) showed Ampicillin sensitivity, while 21 (81.40%) showed resistance to the antibiotic. 90.20% of the isolates were resistant to chloramphenicol, while 15.60% were susceptible. 60.20% of the isolates were resistant to ceftriaxone, while 41.40% showed sensitivity to the drug. Nine isolates (30.40%) showed sensitivity to ciprofloxacin, while eighteen isolates (68.40%) showed resistance. 26 27 isolates (91.40%) showed sensitivity to azithromycin, while 01 (02.40%) showed resistance. Meropenem was the most effective antibiotic, with 100% of the isolates exhibiting Meropenem sensitivity. Based on the findings, azithromycin and meropenem are the most effective antibiotics against isolates of Salmonella spp. MDR and XDR strains of enteric fever are on the rise and exhibit a high degree of resistance to commonly prescribed medications. Antibiotic use without a prescription should be minimized, and prescribing practices should be modified.*

Keywords: Pattern of Antibiotic Sensitivity, Blood Culture, Typhoid Fever

Introduction

Due to the Gram-terrible bacterium Salmonella typhi, Typhoid fever exerts a substantial public fitness burden, especially in growing regions where sanitation and water quality can be suboptimal (Chakraborty et al., 2022). This probably fatal systemic contamination poses a significant hazard to populations with restricted entry to healthcare assets. According to the World Health Organization (WHO), a predicted 11 to 21 million instances of typhoid fever occur annually, resulting in approximately 128,000 to 161,000 deaths globally (Ahmad et al., 2023; Rana et al.). The persistent occurrence of this disease underscores the urgency of knowledge and efficient handling of its causative agent. The observational look conducted at the Department of Medicine, MTI LRH Peshawar, aligns with the worldwide efforts to combat infectious illnesses, particularly those with a high mortality rate in resource-confined settings (Chatterji et al., 2022; Siddiqui et al., 2023). Its temporal scope from January 2023 to July 2023 reflects a devoted effort to capture a complete view of antibiotic sensitivity patterns in typhoid fever sufferers, losing light on capacity shifts in resistance over the years. Acknowledging the severity of typhoid fever, the study's emphasis on antibiotic susceptibility is essential in guiding appropriate healing interventions (Ahmad et al., 2020; Saito et al., 2022).

As underscored by the Centers for Disease Control and Prevention (CDC), the emergence of multidrug-resistant (MDR) and drastically drug-resistant (XDR) lines of Salmonella typhi poses a powerful venture to the effective management of typhoid fever (Maharjan et al., 2021). The need for tailored and proof-based remedy techniques is imperative in the face of growing antimicrobial resistance, making studies of this nature vital for informing medical practices. Furthermore, the take a look at aligns with the worldwide push towards precision medicine, aiming to tailor treatments based on the unique antibiotic sensitivities of man or woman pathogens (Myat et al., 2020; Rufai et al., 2023). This technique is vital in combating the developing threat of antimicrobial resistance and ensuring the delivery of the highest quality care to typhoid fever patients. Using the Kirby-Bauer disk diffusion technique for antibiotic susceptibility testing, a well-set up technique complements the reliability and comparison of the take a look at's findings (Myat et al., 2020). In the broader context of global health, in which infectious illnesses disproportionately affect susceptible populations, the impact of this observational looks at keeping the capability to persuade worldwide guidelines for the control of typhoid fever (Rauniyar et al., 2021; Rufai et al., 2022). By offering insights into the evolving landscape of antibiotic sensitivity in Salmonella typhi, the study contributes to the collective expertise base needed to cope with the complex challenges related to infectious sicknesses in resource-constrained settings (Tamokou et al., 2023).

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Methodology

The observational study was conducted by international standards from January to July 2023 at the Department of Medicine, MTI LRH Peshawar. The study aimed to assess antibiotic sensitivity in patients suffering from typhoid fever. The study included inpatients and outpatients, and Salmonella isolates were cultured on Mueller-Hinton agar. Antimicrobial susceptibility was determined using the Kirby-Bauer disk diffusion method in adherence to international guidelines. Data analysis was performed using IBM SPSS model 22. The comprehensive approach of the study aimed to capture a nuanced understanding of antibiotic resistance patterns in Salmonella typhi, contributing valuable insights to guide evidence-based therapeutic interventions in the management of typhoid fever.

Results

Among the ninety participants, Salmonella isolates exhibited varying antibiotic sensitivity. Notably, 28.20% were sensitive to the study found that 73.6% of the typhoid fever cases were resistant to antibiotics, with 68.8% being multi-drug resistant (MDR) and 4% being extensively drug-resistant (XDR). Among the antibiotics tested, ampicillin had the lowest sensitivity at only 21.4%, with 81.4% resistance. Chloramphenicol showed 15.6% sensitivity and 90.2% resistance, while ceftriaxone had 41.4% and 60.2% resistance. Ciprofloxacin had 30.4% sensitivity and 68.4% resistance. Azithromycin was the most effective, with a high sensitivity rate of 91.4% and only 2.4% resistance. Meropenem proved the most effective, with a sensitivity rate of 100%. These findings highlight the increasing prevalence of antibiotic-resistant typhoid fever strains and point to Azithromycin and Meropenem as promising treatment options. (Table 1-5)

Table 1: Demographic Characteristics of Participants

Total Participants	Female (%)	Male (%)
90	40	50

Table 2: Antibiotic Sensitivity Patterns of Salmonella Isolates

Sensitivity/Resistance (%)	Typhoid	MDR	XDR
Typhoid	28.20	68.80	4.00

Table 3: Antibiotic Sensitivity of Salmonella Isolates to Ampicillin and Chloramphenicol

Antibiotic	Sensitivity (%)	Resistance (%)
Ampicillin	21.40	81.40
Chloramphenicol	15.60	90.20

Table 4: Antibiotic Sensitivity of Salmonella Isolates to Ceftriaxone and Ciprofloxacin

Antibiotic	Sensitivity (%)	Resistance (%)
Ceftriaxone	41.40	60.20
Ciprofloxacin	30.40	68.40

Table 5: Antibiotic Sensitivity of Salmonella Isolates to Azithromycin and Meropenem

Antibiotic	Sensitivity (%)	Resistance (%)
Azithromycin	91.40	2.40
Meropenem	100.00	0.00

Discussion

The observed antibiotic resistance patterns among Salmonella typhi isolates in this study reveal a concerning trend, echoing global challenges in combating infectious diseases. The World Health Organization (WHO) underscores the threat of antibiotic resistance in enteric fever, particularly to commonly prescribed drugs like ampicillin and chloramphenicol, which is consistent with the findings of this study (Memon et al., 2022). The emergence of multi-drug resistant (MDR) and extensively drug-resistant (XDR) strains, seen in 68.80% of cases, aligns with global trends reported by the Centers for Disease Control and Prevention (CDC) (Ombelet et al., 2022).

High resistance rates to ampicillin (81.40%) and chloramphenicol (90.20%) emphasize the imperative need for alternative treatment options, supporting the urgency highlighted by the CDC to develop and implement strategies to address rising resistance rates in Salmonella infections (Soedarmono et al., 2022). While ceftriaxone, a commonly used antibiotic, showed promising sensitivity at 41.40%, the study's findings align with global concerns regarding increasing resistance to this antibiotic (Soedarmono et al., 2022).

This study highlights the potential of azithromycin as a viable treatment option, with a notable 91.40% sensitivity. This concurs with the WHO's recognition of azithromycin as an alternative treatment for MDR typhoid fever, particularly in regions facing high resistance to conventional drugs (Qayyum et al., 2023). The study reinforces the importance of ongoing surveillance and monitoring of antibiotic efficacy.

Meropenem demonstrated 100% sensitivity, indicating its effectiveness against Salmonella typhi, aligning with its classification as a potent carbapenem against Gram-negative bacteria (Ishaque et al., 2022). However, caution is necessary in its use due to the risk of contributing to antibiotic resistance.

The findings have significant implications for clinical practice, emphasizing the importance of individualized treatment plans based on the specific antibiotic susceptibility patterns of the infecting strain. This aligns with the principles of precision medicine, where treatment decisions are tailored to the unique characteristics of each case (Abebe et al., 2021).

This study underscores the escalating challenge of antibiotic resistance in typhoid fever, with a significant prevalence of MDR and XDR strains. Azithromycin and meropenem are practical options, but their use warrants careful attention. The findings advocate for a paradigm shift in treatment approaches, emphasizing the importance of tailored treatment plans based on individual strain susceptibilities. Urgent measures are required to lower antibiotic misuse, foster a sustainable strategy to combat the growing threat of drug-resistant Salmonella strains, and ensure effective typhoid fever control.

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Conclusion

The study highlights the increasing problem of antibiotic resistance in typhoid fever, with a high prevalence of MDR and XDR strains. Azithromycin and meropenem are effective treatment options, but their use should be carefully considered. The findings suggest a need for a shift in treatment approaches, emphasizing the importance of tailored treatment plans based on individual strain susceptibilities. Urgent measures are needed to reduce antibiotic misuse, promote sustainable strategies to combat the growing threat of drug-resistant Salmonella strains and ensure effective control of typhoid fever.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication
Approved
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Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Conception of Study, Development of Research Methodology Design, Study Design,, Review of manuscript, final approval of manuscript
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