Detection of Multidrug Resistant Salmonella Typhi and Salmonella Paratyphi A from enteric fever patients, in a tertiary care hospital of Dhaka city

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ABSTRACT

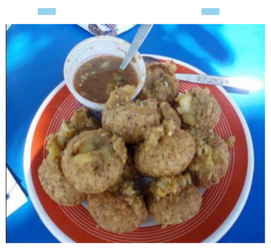
The present study was undertaken to detect multidrug resistant S. Typhi and S. Paratyphi A isolated from blood samples of enteric fever patients from a tertiary care hospital in Dhaka City. From November 2022 to May 2023, from clinically suspected patients. Blood culture was positive for Salmonella in 313 samples. Out of 313 isolates, 50 were randomly selected and Salmonella was confirmed by PCR targeting the InvA gene. Among these 313, biochemical and serological tests detected 263 isolates as S. Typhi and 50 as S. Paratyphi A. Antimicrobial susceptibility was conducted by Kirby–Bauer method. MDR Salmonella, defined as a combined resistance against three first-line antimicrobial agents, ampicillin, chloramphenicol and trimethoprim-sulfamethoxazole were detected in 42 strains of S. Typhi.

INTRODUCTION

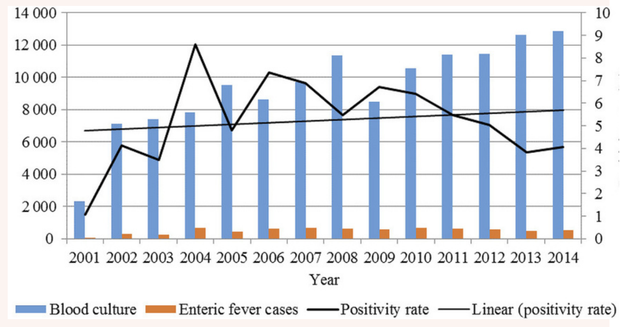
- The bacterial etiology of blood infections by *Salmonella* Typhi and Paratyphi A as the most frequently isolated organisms which have a high percentage of multidrug-resistant (MDR) strains.

Multidrug resistant (resistance against ampicillin, chloramphenicol, trimethoprim sulfonamides)

Consume contaminated rotten food → Consume undercooked food → Consume contaminated water (including urine)



- Aim of project is to detect multidrug resistant *Salmonella* Typhi and *Salmonella* Paratyphi A from enteric fever patients, in a tertiary care hospital of Dhaka city.



Graph 1: Estimated incidence of enteric fevers in Bangladesh

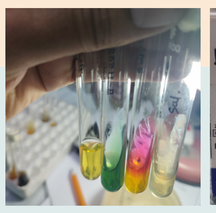
METHODS

Sample collection and processing

12,000 blood samples were received in the Microbiology department of Bangladesh Specialized Hospital over a period of 7 months from blood samples of enteric fever patients.

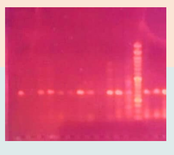
Bacterial isolation & characterization

Phenotypically 313 positive strains- sub cultured on MacConkey agar and Blood agar media . Identified by colony morphology, standard biochemical test and agglutination test.



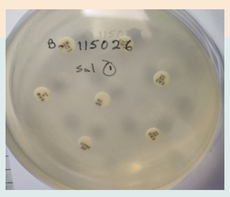
PCR for detection of InvA gene

Primer specific amplification using PCR & gel electrophoresis for determination of *Salmonella* genus specific InvA gene.



Determining Antibiotic resistance

Kirby Bauer Disc Diffusion Susceptibility testing with 15 antimicrobial agents to check MDR *Salmonella*.



Sample Data & Time Period

NOVEMBER 2022 (70) | DECEMBER 2022 (80) | JANUARY 2023 (38) | FEBRUARY 2023 (40) | MARCH 2023 (34) | APRIL 2023 (24) | MAY 2023 (27) | (MONTHS)

Number of Positive Samples of *Salmonella* species (Total 313 samples)

FINDINGS

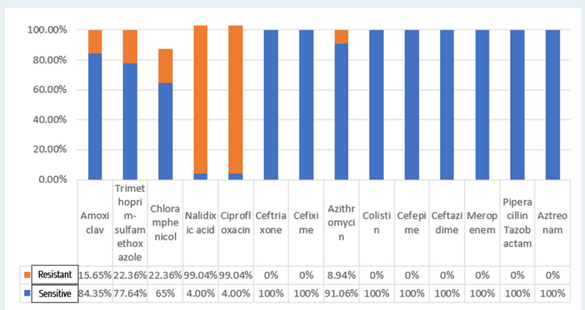


Table 1: Antimicrobial susceptibility pattern of typhoidal *Salmonella* isolates (n=313) by disc diffusion method.

- Out of 313 Typhoidal *Salmonella*, 263 (84.03%) were identified as *Salmonella* Typhi and 50 (15.97%) were *Salmonella* Paratyphi A.
- 42 (13.42%) were detected as Multidrug resistant *Salmonella* Typhi and 70.61% were detected as non- MDR. In case of, *Salmonella* Paratyphi A isolated, all strains were found sensitive to ampicillin, trimethoprim-sulfamethoxazole and chloramphenicol (100% non-MDR).

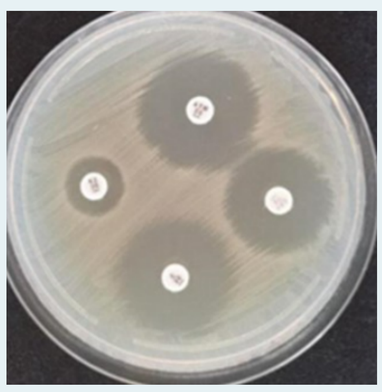
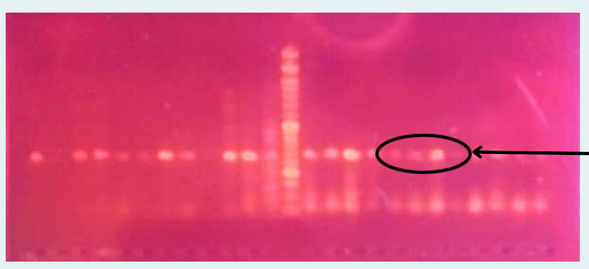


Figure 1: Determination of resistant isolate *Salmonella* Typhi and Paratyphi *by* Kirby Bauer disc Diffusion method.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 (DNA Ladder 15)

300bp →
250bp →



Gene product of sample isolate corresponding to 284bp primer specific amplicon

Figure 2: Gel Electrophoresis results of PCR amplification for detecting the presence of InvA gene

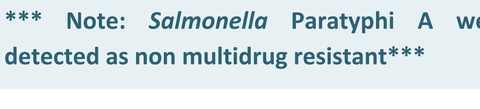


Figure 3: Slide agglutination test with O and H antigen

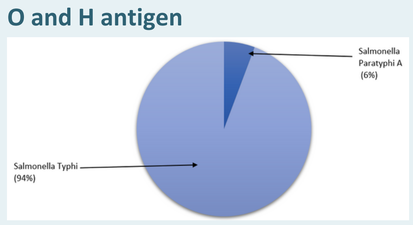


Figure 4: Distribution of *Salmonella* Typhi and *Salmonella* Paratyphi A [(n=313)%]

ANTIBIOTICS RESISTANT	SALMONELLA TYPHI	SALMONELLA PARATYPHI A	TOTAL
AMPICILLIN	49	0	49
CHLORAMPHENICOL	66	0	66
TRIMETHOPRIM-SULFONAMIDE	70	0	70
MULTIDRUG RESISTANT	42	0	42

Table 2: Identification of MDR *Salmonella* Typhi and Paratyphi A

Total 42 MDR *Salmonella* species were found. Resistant to ampicillin, trimethoprim-sulfamethoxazole and chloramphenicol were 15.65%, 22.36% and 21.09% respectively

***** Note: *Salmonella* Paratyphi A were detected as non multidrug resistant*****

CONCLUSION

- Comparing to a study conducted by Dr. Nasrin Sultana (2020), where 26.82% Salmonella isolates from were found MDR. After statistical analysis, comparing to Dr. Nasrin Sultana MDR samples, 2.7% of MDR Salmonella species were increased within 2 to 3 years .
- Muhammad Zakir et al. (2021) revealed that multidrug resistance was 24.5 % in 2021 where Syed Asim Ali Shah et al. (2019) reported that multidrug resistance was 20 % in 2019 Pakistan. 4.5% of mdr *Salmonella* within 2 years.

REFERENCE

Asma Haque1 , Abdul Haque2 , Yasra Sarwar3 , Aamir Ali4 , Saira Bashir5 , Ayesha Tariq6 , Mushkoor Mohsin7.Identification of drug resistance genes in clinical isolates of *Salmonella* Typhi for development of diagnostic multiplex PCR. · October 2005