DNA-Gyrase/Topoisomerase-IV mutations and antibiotic susceptibility patterns of *Salmonella* Paratyphi A

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Less prevalent but not insignificant

- Caused by *Salmonella* Paratyphi A, B and C

- 3.4 million illness and 19000 deaths
  GBD 2017 Causes of Death Collaborators*
  GBD 2017 Disease and Injury Incidence and Prevalence Collaborators*

- Every 1 in 5 case is caused by *S. Paratyphi A* in Bangladesh
Same treatment, less investment


MDR = Ampicillin, Chloramphenicol and Cotrimoxazole resistant

All in the same basket

Typhoid = Paratyphoid?
Successful implementation needs evidence

Many studies and setups have certain limitations

1. Small number of cases.
2. Only covers healthcare facilities (IPD).
3. Short time spans.
4. Resources.
5. Expertise.
Our surveillance sites

Dhaka

Dhaka Shishu (Children) Hospital
Shishu Shasthya Foundation, and
Popular Diagnostic Center (N=3)

Mirzapur

Kumudini Womens Medical College

Chittagong

Chittagong Maa-O-Shishu Hospital

Strengths

Total 2141
S. Paratyphi A
Both OPD and IPD data
Low-cost RFLP
Objectives

Some of our goals…

1. **Susceptibility pattern (MIC)**
   - Ciprofloxacin
   - Ceftriaxone.

2. **Prevalence of multidrug resistance**
   - Ampicillin
   - Chloramphenicol
   - Cotrimoxazole

3. **Common mutations leading to quinolone resistance**
   - DNA-gyrase (*gyrA*-83, 87 and *gyrB*-464)
   - Topoisomerase-IV (*parC*-57, 80 and *parE*-420)
Susceptibility (Discs) of S. Paratyphi A (N=2141)

- Ampicillin, 99.7%
- Chloramphenicol, 99.9%
- Cotrimoxazole, 99.9%
- MDR, 0%
- Ciprofloxacin, 2%
- Ceftriaxone, 100%

MDR= Ampicillin, Chloramphenicol and Cotrimoxazole resistant

No MDR S. Paratyphi A!
Ciprofloxacin MIC trend (N=640)
Mutation profiles

![Graph showing mutation profiles of S. Typhi and S. Paratyphi A.](image)
Mutation profiles

S. Typhi (N=3280)

S. Paratyphi A (N=640)

Ciprofloxacin MIC (ug/ml)

Frequency
- 50
- 100
- 150
- 200
- 250
- 500
- 1000
- 1500
Ceftriaxone MIC trend (N=640)
Final thoughts and future directions

- High prevalence of DCS supported by mutations
- Both should not be grouped together
- Older drugs may buy us some time

- Whole genome sequencing may answer many questions
- No ceftriaxone resistance, but, monitoring for AMR should be continued.
- Vaccination in future.
Thank you!