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10th International Conference on Typhoid & other invasive salmonellosis

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Contents

- Why typhoid outbreak review?
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Why Enteric Fever Outbreaks Review?

- Outbreaks are not often included in disease burden studies
- May not be captured in surveillance studies
- Enhances the comprehensiveness of disease burden
- Outbreak are not systematically collected and reported: under reported
- Helpful in geo-spatial risk-prediction models
Systematic Literature Review

- PRISMA guidelines
- Medical literature databases PUBMED and EMBASE
- Epidemiology-specific databases GIDEON and ProMEDmail (https://www.gideononline.com/, http://www.promedmail.org/)
- From January 1st 1990 to December 31st 2016
- English language
- Outbreak definition: Author defined
- Diagnostic criteria (Any: culture, serology, clinical)
Search Methodology

- **Search terms**
  
  "("typhoid" OR "typhoid fever" OR "salmonella typhi" OR "s. typhi" OR "salmonella infection" OR "enteric fever" OR "paratyphi" OR "paratyphoid" OR "paratyphoid fever") AND ("outbreaks" OR "resurgence" OR "re-emergence" OR "relapse")")

- **Duplicates removed**

- **Unique outbreaks identified**

- **Linked to GIS using google map**

- **Predefined data extraction**

- **Two researchers involved**
Identification

Records identified PubMed (n=589) → Records after removal of duplication (n=1,126) → Records screened (n=2,630) → Full text articles (n=1,562) → Included in analysis 256 papers 226 outbreaks

Records identified Embase (n=656) → Records identified Promedmail (n=1,301) → Records identified GIDON (n=203) → Excluded with reasons (n=1,068) → Excluded with reasons (n=1,306)

Screening

Eligibility

Included

Records identified PubMed (n=589) → Records after removal of duplication (n=1,126) → Records screened (n=2,630) → Full text articles (n=1,562) → Included in analysis 256 papers 226 outbreaks

Records identified Embase (n=656) → Records identified Promedmail (n=1,301) → Records identified GIDON (n=203) → Excluded with reasons (n=1,068) → Excluded with reasons (n=1,306)
Distribution of Outbreaks 1990-2016

Number of Outbreak

- 1-49
- 50-99
- 100-199
- 200-299
- 300-399
- 400-499
- 500-999
- 1000-9999
- 10000-50000
<table>
<thead>
<tr>
<th>Region</th>
<th>No. outbreaks</th>
<th>Min. cases</th>
<th>Max. cases</th>
<th>Sum of cases</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>45</td>
<td>4</td>
<td>42,564</td>
<td>107,030</td>
<td>2,378</td>
<td>144</td>
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<tr>
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<td>55,998</td>
<td>415</td>
<td>83</td>
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<td>277</td>
<td>856</td>
<td>32</td>
<td>16</td>
<td>53</td>
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<tr>
<td>North America</td>
<td>17</td>
<td>2</td>
<td>321</td>
<td>932</td>
<td>55</td>
<td>12</td>
<td>91</td>
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<tr>
<td>South America</td>
<td>5</td>
<td>13</td>
<td>44</td>
<td>102</td>
<td>20</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Oceania</td>
<td>37</td>
<td>2</td>
<td>1,200</td>
<td>3,852</td>
<td>104</td>
<td>28</td>
<td>219</td>
</tr>
<tr>
<td>Total/overall</td>
<td>266</td>
<td>1</td>
<td>42,564</td>
<td>159,347</td>
<td>632</td>
<td>50</td>
<td>2,590</td>
</tr>
</tbody>
</table>
Typhoid and Paratyphoid Outbreaks
Diagnostic Method Used in Outbreaks

The map illustrates the distribution of diagnostic methods used in outbreaks across the world. The legend shows the number of outbreaks classified by different diagnostic methods:

- **DIAGNOSIS BY VM/DAL CLINICAL (N=2)**
  - Green (219): 1-500
  - Green (7516): 501-1000
- **DIAGNOSIS BY UNKNOWN METHODS (N=142)**
  - 1-500
  - 501-1000
  - 1001-5000
  - 5001-50000
- **DIAGNOSIS BY CULTURE OR ISOLATE METHOD (N=122)**
  - Blue (2-2000)
  - Blue (2001-6000)
  - Blue (6001-10000)
  - Blue (10001-30000)
Multidrug-Resistant Outbreaks
Reported Causes for Outbreaks

- Atleast contaminated water: 109 (41%)
- No cause reported: 106 (40%)
- Soley foodborne: 41 (15%)
- Imported: 7 (3%)
- Person to person: 3 (1%)

Legend:
- Blue: No cause reported
- Red: Atleast contaminated water
- Green: Soley foodborne
- Teal: Person to person
- Light purple: Imported
There were no outbreaks that attributed environmental damage only and no outbreaks that attributed environmental damage and educational, cultural, societal issues.
Discussion

- Reported outbreaks overlap the geographical areas that are typhoid endemic

- Contaminated water is the most important cause for outbreak

- Value of monovalent typhoid vaccine in Asia as typhoid and paratyphoid appears to be more common
Limitations

- Outbreaks are author defined, could not verify against WHO definition

- Different health systems have different capacity to identify and report outbreaks - underestimation

- Known typhoid endemic areas may not report outbreaks - underestimation

- Data bases, particularly ProMEDmail may have underreporting bias for LMICs
Conclusion

- Enteric fever outbreak burden remains high in endemic LMICs
- Outbreak data should be taken into account when prioritising resources and public health policies and actions
- Typhoid vaccination should be considered to control outbreaks as recommended by WHO, as well as improving water and sanitation is important
- Need to standardize detection, reporting, and monitoring of outbreaks in a consistent manner
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Co-authors: Kang Sung Lee, Jean-Louis Excler, Sushant Sahastrabuddhe, Florian Marks, Jerome H Kim

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ASANTENI!

THANK YOU!
Any Question?