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11th International Conference on Typhoid & other invasive salmonellosis

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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
- Outbreaks 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
- 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
Records identified through “Ovid MEDLINE (R) ALL” and “EMBASE Classic + EMBASE” using the Ovid interface database (n =1389)

Records identified Promedmail (n= 1,301)

Records identified GIDON (n= 203)

Records after removal of duplication (n= 1,023)

Excluded with reasons (n= 1,023)

Records screened (n=2527)

Full text articles (n= 2,043)

Excluded with reasons (n= 1,778)

Included in analysis 265 papers 279 outbreaks
Number of Outbreaks per Year
Distribution of Outbreaks 1990-2016

Outbreak chart

Year

Number of Outbreak
1-49
50-99
100-199
200-299
300-399
400-499
500-999
1000-9999
10000-50000

Continent
Europe
North America
Oceania
South America
Africa

Asia
# Number of Outbreaks and Cases

<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>40</td>
<td>3</td>
<td>30,000</td>
<td>77,284</td>
<td>1,932</td>
<td>147</td>
<td>5,374</td>
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<tr>
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<td>1</td>
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<td>53,040</td>
<td>358</td>
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<td>860</td>
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<tr>
<td>North America</td>
<td>22</td>
<td>2</td>
<td>321</td>
<td>992</td>
<td>45</td>
<td>12</td>
<td>82</td>
</tr>
<tr>
<td>South America</td>
<td>5</td>
<td>3</td>
<td>15</td>
<td>41</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Oceania</td>
<td>37</td>
<td>2</td>
<td>1,200</td>
<td>4,021</td>
<td>109</td>
<td>25</td>
<td>225</td>
</tr>
<tr>
<td>Total/overall</td>
<td>279</td>
<td>1</td>
<td>30,000</td>
<td>136,238</td>
<td>488</td>
<td>49</td>
<td>2,283</td>
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</table>
Diagnostic Method Used in Outbreaks
Multidrug-Resistant Outbreaks
Reported Causes for Outbreaks

- **No cause reported**
- **Atleast contaminated water**
- **Solely foodborne**
- **Imported**
- **Person to person**

1. Atleast contaminated water: 109 (41%)
2. Soley foodborne: 41 (15%)
3. Person to person: 106 (40%)
4. No cause reported: 7 (3%)
5. Imported: 3 (1%)
Risk Factors for Contaminated Water Outbreaks

There were no outbreaks that attributed environmental damage only and no outbreaks that attributed environmental damage and educational, cultural, societal issues.
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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