Fighting Typhoid: The Importance of Evidence for Effective Prevention and Control

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Typhoid remains a significant public health challenge in Asia and Africa.

Estimated typhoid fever incidence by country, 2022

- 9 million fall sick from typhoid fever annually, killing 110,000 people.

Emergence of antibiotic-resistant S. typhi

Typhoid control is threatened by dynamic forces

<table>
<thead>
<tr>
<th>Climate change</th>
<th>Conflicts</th>
<th>Urbanization</th>
<th>Water shortages</th>
<th>Drug resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 20 million people being forced to leave their homes due to extreme weather events each year</td>
<td>108 million people already displaced by violence and armed conflicts</td>
<td>By 2050, 7 out 10 people in the world will be living in cities</td>
<td>2 billion people do not have safe drinking water</td>
<td>4.95 million deaths per year associated with antimicrobial resistance</td>
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The typhoid conjugate vaccine (TCV) has proven to be a highly effective vaccine which can help prevent and control typhoid.
TCV introduction will contend with multiple priorities in high incidence countries

- Multiplicity of global health agendas
- Low and stretched health budgets
- Overburdened health systems
- Siloed health programs
- Competing new and underutilized vaccines
Typhoid vaccine coverage will be limited by the pre-existing inequities in routine immunization.

10 countries account for 58% of zero-dose children.

Number of zero-dose children in millions by country in 2022:

- Nigeria: 2.30
- India: 1.10
- Ethiopia: 1.10
- DR Congo: 0.75
- Philippines: 0.67
- Angola: 0.61
- Indonesia: 0.57
- Pakistan: 0.43
- Brazil: 0.43
- Mozambique: 0.38

Source: WHO Web site

Countries with high typhoid incidence rates > 100 / 100,000
Countries with low typhoid incidence rates
Zero-dose children represent households with multiple deprivations including lack of WASH.

Disaggregated data from slums in three largest metropolitan cities in Pakistan

<table>
<thead>
<tr>
<th>Illiterate mothers</th>
<th>Makeshift housing</th>
<th>No household toilet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karachi</td>
<td>Lahore</td>
<td>Islamabad</td>
</tr>
<tr>
<td>92</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>83</td>
<td>60</td>
<td>36</td>
</tr>
<tr>
<td>81</td>
<td>86</td>
<td>67</td>
</tr>
</tbody>
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Percentage of zero-dose children

Vaccination is an important intervention but investments in WASH, diagnostics, treatment and surveillance systems are urgently required
Ongoing evidence is needed to address emerging knowledge gaps

How do we optimize vaccine impact?
RCT in urban slums of Dhaka, Bangladesh, in 2018 showed an incidence rate of 96 per 100,000 in the vaccinated clusters.

What is the strategy to protect older age groups?
Study in Nepal showed that adjusted incidence of typhoid is higher in older age groups of 5 to 25 years compared to other high burden countries.

How can we best fight antimicrobial resistance?
Pakistan recently reported a case of carbapenem-resistant typhoid in a young patient.

How and when to use TCV in outbreak settings?
By 2030, the number of natural disaster events is projected to reach 560 per year, or 1.5 per day. Countries with high disease burden are also at high risk of climate change.

Effective prevention and control will require investments beyond vaccine introduction

- Improvement of WASH services including municipal sanitation services and chlorinated drinking water
- Development and use of low-infrastructure diagnostic tests
- Modification of prescribing practices to minimize spread of drug resistance
- Expansion of surveillance systems to address various aspects, including vaccine impact, strain replacement, and clinical and economic implications of increasing drug resistance
- Determination of durability of TCV protection and the need for booster doses
Thank You!

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