Cholera Vaccine - case study from Bangladesh

Vaccinology in Asia Pacific
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Overview on session

• Cholera an ancient disease, still creating havocs of epidemics and outbreaks

• Cholera vaccines developed for prevention of disease

• *The problems faced and solutions*
  Making vaccines available to populations that need it the most-
  - the example of Bangladesh

• The way forward for cholera control
Cholera continues to spread across continents

2009-2011 large epidemics in Haiti, Zimbabwe, Pakistan, Sierre Leone, Sudan, Guinea and in Bangladesh in endemic and new areas - Tongi, Netrakona, Naranganj, Pabna, Satkhira

Cholera rates ~2.6/1000 in Bangladesh
Estimated > 450,000 hospitalized cases
Estimated > 1 million infections per year
Young children, adults, all age groups at risk

Globally 3-5 million cases and over 200,000 death occur each year (WHO, 2010)
**Dhaka Hospital patient numbers 2007-2009**

**Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec**
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![Graph showing patient numbers from 2007 to 2009 with peaks and troughs across the months.](image)

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**Assessment of Patient Numbers in Dhaka Hospitals from 2007 to 2009**

The graph illustrates the patient numbers in Dhaka hospitals from January 2007 to December 2009. The highest patient numbers are observed in the months of September and October, while the lowest numbers are seen in February and March. The data shows a significant variation in patient numbers across the years, indicating seasonal variations or other factors influencing hospital admissions.

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**Legend**

- **2007**
- **2008**
- **2009**

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**Notes**

- The peak months for patient numbers are September and October.
- The lowest patient numbers are observed in February and March.
- Seasonal factors may influence hospital admissions.

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**References**

- Dhaka University Medical College, Dhaka, Bangladesh.

We are living in an era of extreme natural and man made turbulence: flood, earthquake, TORNADO and political conflicts.
The cholera outbreak was caused by contamination of drinking water. Cholera flourishing in the makeshift camps as the rainy season arrives in Haiti.

28 Oct 2010. “A total of 4,147 people are now being treated in hospitals for cholera, while eight new reported fatalities brought the death toll 292” said the head of Haiti's health department Gabriel Thimote.
Cholera based Research leading to solutions from the icddr,b over the last 60 years

Vaccines, Rehydration therapy and ORS, Zinc, antibiotics
Zinc for improving recovery from diarrhea/cholera or for improving vaccine efficacy.
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- Cholera vaccines developed for prevention of disease
- The problems faced and solutions

7 vaccine trials carried out at the icddr,b

Making vaccines available to populations that need it the most - the example of Bangladesh

The way forward for cholera control
Efforts in the development and use of oral cholera vaccine over the last 20 years
Development of cholera vaccines

Inactivated vaccines

Killed whole cell plus recombinant cholera toxin B subunit
Contains: CTB plus cholera vibrios
WHO-recommended licensed in >50 countries world-wide including Bangladesh (Dukoral-SBL Sweden now Crucell)

Variant of Killed whole cell vaccine

MoroVacx
(WC 01- Variant minus CTB) in Vietnam
20 Million doses given to people in cholera high risk settings

ShanChol
licensure in India in April 2009
WHO prequalification September, 2011
Phase III Efficacy data- 70% PE, lasting over 5 years
Live oral Cholera vaccines

Live attenuated single dose cholera vaccines

CVD103 HgR (Orochol, Paxvax)
Phase III studies in Indonesia; new studies being initiated

Peru 15 (CholeraGarde)
Live attenuated, *V. cholerae* O1 El Tor biotype- 2x10^8 cfu
Single dose

Phase I-II studies carried out in Bangladesh: Vaccine still not available for efficacy studies
Overview on session

• The problems faced and solutions
  Making vaccines available to populations that need it the most - the example of Bangladesh
• The way forward for cholera control
Although a cholera vaccine has been shown to be protective in large field trial in adults and children in Bangladesh in 1985, we have not been able to use it yet to decrease epidemic and endemic cholera.

One of the obstacles has been the cost > US $30-35/immunization schedule

However safe and affordable vaccines are now in the horizon costing less than 2 dollar per dose of cholera vaccine

The protective efficacy of vaccines combined with the herd protection achievable can make vaccination successful for large populations in our settings
How can vaccine interventions be translated into public health tools for prevention of diarrheal diseases??

- Safe water
- Better hygiene and sanitation
- Health Education
- VACCINATION
The concept and importance of vaccines has already been accepted in many developing countries including Bangladesh.

Vaccines in the Expanded Program for Immunization (EPI) have brought down incidence of many childhood infectious diseases since its implementation began.

Decrease of Polio, Measles, Tetanus, Diphtheria, Pertussis.

The Hepatitis B and the Hib vaccine has been added to the EPI delivery system in many countries. We are now adding rubella vaccine to the list.
Cholera vaccination in a high diarrhea endemic and epidemic prone population in Bangladesh

"Introduction of cholera vaccine in Bangladesh"

the health impact, operational and sustainability issues related to the introduction of a cholera vaccination program

The ICVB project- Introduction of cholera vaccine in Bangladesh
Site of the ICVB project in urban area in Mirpur

- Mirpur, approx. 39km², located in north-west of Dhaka City
- About 3.5 million people (projected based on BBS 2001) live in the area
- Of the sixteen wards of Mirpur, six wards (2, 4, 5, 6, 14 and 16) were selected for the ICVB project
- These were the high cholera incidence areas with hospitalization rates for cholera ranging from 2-6/1000
Design of the ICVB project in Mirpur

Cluster randomized trial where 90 clusters were divided into three arms, 30 clusters in each arm.

Six wards were divided into 90 clusters of 2500 population each. A total of 240,000 people.

Each cluster separated from the adjoining cluster by a 30 meter buffer zone to minimize contamination.

Study arms

1. Vaccine arm
2. Vaccine plus behavior change components (hand washing and point of use water treatment)
3. Control or non-intervention arm
Behavior Change Communication Interventions:

- Hand washing with soapy water
- Point of use water treatment with chlorine
### Vaccine coverage in the Mirpur study site

<table>
<thead>
<tr>
<th>Study area</th>
<th>Study population</th>
<th>Dose 1</th>
<th>Coverage</th>
<th>Dose 2</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 clusters</td>
<td>173,041</td>
<td>141,839</td>
<td>82%</td>
<td>123,666</td>
<td>72%</td>
</tr>
</tbody>
</table>

An encouraging 87% coverage for the second Shanchol vaccine dose
We had 60,000 doses of vaccine remaining after the completion of the ICVB study in Mirpur: New study designed and approved for vaccination in a rural setting.

Vaccination in rural Bangladesh in Keranigang upazila in Bangladesh

The ROCV study- 92% coverage for two dose uptake.
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- Making vaccines available to populations that need it the most - the example of Bangladesh

- The way forward for cholera control globally
Over 280 participants aged one year and above and over 330,000 doses delivered to all age groups in Bangladesh

We have set the example that cholera vaccine can to be introduced in Bangladesh using the EPI facilities available

For success of nationwide program, technology transfer for sustainability of program is now needed
The way forward for integrating cholera vaccine in health care systems in epidemics and outbreaks

Since 2011 onwards, Shanchol has been used to vaccinate large numbers of people in outbreak, epidemic, endemic settings:

- urban and rural Haiti- 100,000
- Mae La in Thailand-44,000
- Boffa and Forecariah in Guinea-209,000
- Orissa in India-51,000
- South Sudan- Jamam, Gendrassa, YusulBalil,Doro-73,000

Close to 900,000 people have been vaccinated with Shanchol since 2011! including 20 million in Vietnam with Morovacx
What are the road blocks for introduction of cholera vaccine in countries

- Stockpile- WHO now has a stockpile for 2 million doses per year for 2 years
- This is meant for use for outbreak and epidemic situations and not for control of endemic cholera
- The stockpile needs to be increased considerably and success of the GAVI meeting next week will be important in steering us forward
- Vaccine availability and funding are both issues
- Countries will need to recognize cholera burden and carry out surveillance and recognize need and demand for vaccine
- The next few years are critical to keep WHO and GAVI engaged so that cholera vaccine becomes available for control of both endemic and epidemic cholera
Acknowledgement

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