PILOT STUDY ON THE EFFECT OF AN INTERVENTION USING SODIUM DICHLOROISOCYANURATE TABLETS (AQUATABS) FOR DRINKING WATER TREATMENT IN DHAKA, BANGLADESH

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OBJECTIVES

- To examine the practicability of motivating mothers to utilize Aquatabs disinfecting tablets for a significant period of time
- To examine the social, cultural and aesthetic acceptability of the Aquatabs chlorinated water
- To evaluate the success of chlorinated water in reducing water borne diseases (diarrhea etc.), specially among children under 5 years of age
- Investigate the feasibility of bringing about behavioral changes regarding use of drinking water
AQUATABS FOR DRINKING WATER TREATMENT

Internationally recognized brand
of a water purification tablet

Chemically: Sodium Dichloroisocyanurate (NaDCC)

NaDCC dissociates in water
to release free available chlorine (HOCl)

\[
\text{NaDCC} + \text{H}_2\text{O} \leftrightarrow \text{HOCl} + \text{Na}^+ + \text{H}_2\text{Cy}
\]

Hypochlorous acid is universally recognized
as a safe and effective water disinfectant
INTERNATIONAL USERS

- World Health Organization
- UNICEF
- Red Cross
- International Dispensary Association
- Oxfam
- World Vision
REASONS FOR SELECTING THE AREA

- Densely populated area
- People do not practice any water purification at household or community level
- Close connection between drinking water and sewerage system
- Lack of knowledge among people about safety of drinking water due to illiteracy
- Wide occurrence of diarrhea among children under the age of 5

*Pre-trial testing of water supply: faecal coliform count > $10^3$ MPN/100 ml*
LALBAGH STUDY AREA

- Area: 5.74 sq km
- Population: 365,323
- Households: 71,000
PARTICIPATION IN THE PILOT TRIAL

Period of 1 month:

*Three 10-day periods*

318 people in 50 households

70 children under 5 years of age
DATA COLLECTION

- Each household was visited once at a 10-day period to observe dosage used and to collect water samples.
- Laboratory tests were done for free residual chlorine level and presence of fecal coliforms.
- Comments were added for under chlorination, over chlorination, and correct chlorination.
- All lab results at each 10-day period were compared.
- The percentage of households which appreciated the use of Aquatabs for drinking water for their daily consumption was noted.
- Diarrheal conditions in children were noted.
TESTING

- **Fecal coliform detection:**
  
  *Multiple tube fermentation technique*

  *MPN method*

- **Free residual chlorine detection:**
  
  *Titrimetric method*
DATA ANALYSIS

- Done for each 10-day period visit
- Bacterial levels in each household water for each 10-day period visit
- Reasons for non-compliance or family drop-out from the study
- Relationship between successful addition of Aquatabs and incidence of diarrhea

- Household’s opinion of Aquatabs
  noticed/disliked/liked the taste?
  noticed any effects on health?
  would they be willing to continue to add the tablets in the future?
COMPARISON OF FECAL COLIFORMS IN HOUSEHOLD WATER

![Graph showing comparison of fecal coliforms in household water over three periods.](image)

- **1st 10 days period**
- **2nd 10 days period**
- **3rd 10 days period**
COMPARISON OF FREE RESIDUAL CHLORINE IN HOUSEHOLD WATER

Chlorine in the range 0.2 – 2.8 mg/l for all households at all periods
COMPARISON OF CHLORINATION EFFICIENCY IN ALL HOUSEHOLDS

1st 10 day trial
- 4% correctly chlorinated
- 96% under chlorinated

2nd 10 day trial
- 16% correctly chlorinated
- 84% under chlorinated

3rd 10 day trial
- 10% correctly chlorinated
- 6% under chlorinated
- 84% dropped out
SUCCESSFUL REDUCTION OF DIARRHEA IN CHILDREN THROUGH AQUATABS CHLORINATION

<table>
<thead>
<tr>
<th>Number of children under 5 years old</th>
<th>Diarrhea prior to using Aquatabs</th>
<th>DURING TRIAL</th>
<th>Percentage, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative diarrhea Group</td>
<td>Minor diarrhea Group</td>
<td>Severe diarrhea Group *</td>
</tr>
<tr>
<td>14</td>
<td>Severe *</td>
<td>YES</td>
<td>20.0</td>
</tr>
<tr>
<td>46</td>
<td>Severe</td>
<td>YES</td>
<td>65.7</td>
</tr>
<tr>
<td>10</td>
<td>Severe</td>
<td>YES</td>
<td>14.3</td>
</tr>
<tr>
<td>Total: 70</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

* > 3 incidences of light diarrhea or any serious diarrheal conditions per month
CONCLUSIONS

- 70% of mothers were not aware that health improvements were related to water supply and sanitation.
CONCLUSIONS

- There was a strong association between the absence of fecal coliforms and “correctly chlorinated” water samples (0.5mg/l - 5mg/l residual free chlorine)

- The diarrhea in children under 5 years of age was reduced from a pre-trial level of 100% in the “Severe Diarrhea Group” to 14.3% during the trial period

- 65.7% of children were reported to be free from diarrhea during the trial period

- There was a strong association between “underchlorinated” water (<0.5mg/l residual free chlorine) and reported diarrhea incidences
CONCLUSIONS

- 78% of mothers favoured the use of Aquatabs because

  They were easy and safe to use,
  store and handle
  They had no objectionable smell or taste
  They dissolved quickly

- It was easy to receive and give advice about their use at household level
CONCLUSIONS

- Mothers subjectively appreciated a better and improved general physical state of their children towards the end of the trial period.

- 65% of mothers expressed a future willingness to pay for Aquatabs, although the fathers were usually not willing to pay.

- The general preference was for the Government or NGO to provide support.
Thank You