VULNERABILITY
OF POPULATION EXPOSED TO
ARSENIC CONTAMINATION IN
THE MID GANGA PLAIN OF
BIHAR, INDIA

Nupur Bose, Ashok K. Ghosh, N.P.Roy, Ajay
Upadhyay, Amardeep Singh & Sushant K. Singh

Department of Environment and Water Management,
A.N. College [Magadh University]
Patna, India
Our studies indicate that newer alluvial deposits of the Bihar Plains are the areas of widespread and intense arsenic contaminated ground water sources.

Detection of arseniferous aquifers in Bihar, India, in the last 4 years exemplify how ground water quality has been compromised on account of its unplanned and excessive utilization in domestic and agricultural sectors.

It is leading to one of the most daunting health challenges to the Indian society, as it is affecting some of the densely populated impoverished rural areas.
Bihar – Districts studied for Arsenic contaminations

BALLIA, U.P.

WEST BENGAL
AIM OF THIS STUDY

To facilitate the recently introduced mitigation strategies by-

b. Determining the quantum of population at risk in villages with arsenic contaminated aquifers.

c. Classifying the villages on the basis of an index of vulnerability to arsenic poisoning.

d. Obtaining feedbacks regarding the sustainability of recently initiated mitigation strategies.
Methodology

- Water samples from about 27,061 hand pumps were tested, first by Field Test Kits and then subject to confirmatory UV/AAS tests.
- Index of Vulnerability from 1-10 was derived on the basis of total population [Census data] and percentage of contaminated pumps in study area.
- Questionnaires distributed in areas of arsenic hotspots for information on the duration of consumption of contaminated water, depth of hand pumps, nutrition and health problems.
## POPULATION AT RISK IN THE STUDY AREA

<table>
<thead>
<tr>
<th>DISTRICTS</th>
<th>NO. OF CONTAMINATED SOURCES IN AFFECTED VILLAGES</th>
<th>POPULATION VULNERABLE TO ARSENIC TOXICITY</th>
<th>% OF POPULATION IN THE STUDY BELT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATNA</td>
<td>600</td>
<td>251,788</td>
<td>32.27</td>
</tr>
<tr>
<td>BHOJPUR</td>
<td>2496</td>
<td>117,609</td>
<td>33.84</td>
</tr>
<tr>
<td>VAISHALI</td>
<td>1612</td>
<td>65,062</td>
<td>28.75</td>
</tr>
<tr>
<td>BHAGALPUR</td>
<td>2510</td>
<td>294,338</td>
<td>45.35</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7218</td>
<td>728,787</td>
<td>43.57</td>
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</tbody>
</table>
VULNERABILITY INDEX - PATNA

- Up to 4 [low risk] – 53 villages
- 4 – 6 [moderate risk] – 17 villages
- 6 – 8 [moderately high risk] – 08 villages
- 8 – 10 [high risk] – 19 villages
VULNERABILITY INDEX - BHOJPUR

- Up to 4 [low risk] – 71 villages
- 4 – 6 [moderate risk] – 22 villages
- 6 – 8 [moderately high risk] – 20 villages
- 8 – 10 [high risk] – 30 villages
- Up to 4 [low risk] – 59 villages
- 4 – 6 [moderate risk] – 09 villages
- 6 – 8 [moderately high risk] – 08 villages
- 8 – 10 [high risk] – 02 villages
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<td>BHAGALPUR</td>
<td>69</td>
<td>17</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>TOTAL NO. OF VILLAGES</td>
<td>252</td>
<td>67</td>
<td>63</td>
<td>81</td>
</tr>
</tbody>
</table>
Symptoms of ARSENICOSIS?
NODULES OVER SKIN

Gayanti Devi

Laxman Munda
THICKENING AND DISCOLORATION OF THE SKIN
Alopecia

Tetary Kumari
SKIN LESIONS

Sirka Munda

Junardi Rai
NODULES, THICKENING AND DISCOLORATION OF THE SKIN

Anita Devi
THICKENING AND DISCOLORATION OF THE SKIN

Anita Devi
Discoloration of skin and Nodules

Ritesh Kumar
Melanosis and Keratosis

Kalawati Kumari

Siajanki Devi
DISCOLORATION of the SKIN

Master Ranjeet

Agin Singh
White Spot on Skin

Kusum Kumari
Nodules and Cracks over Thickened Soles

Diffuse varicose lesions of the soles with cracks and fissures and keratotic horns over palms/soles.
VISIBLE SYMPTOMS

The symptoms we detected in our field study resembles symptoms reported in West Bengal and Bangladesh

Suresh Roy

Kalawati Kumari
CURRENT MITIGATION
ADOPTED

- RAIN WATER HARVESTING
- REVIVAL OF OLD DUGWELLS
- TAPPING WATER FROM DEEPER AQUIFERS
RECOMMENDATIONS

- Adoption of awareness programs
- Community participation
- Regular monitoring of hotspots
- Proper maintenance of open dug wells
- Use of gravity driven low-cost filters
- Health centres for verification & treatment of arsenic poisoning symptoms
ACKNOWLEDGEMENT

WE THANK UNICEF, BIHAR CENTER FOR THEIR SUPPORT FOR THIS PROJECT
THANK YOU