National Institute of Urban Affairs | WATER & ENVIRONMENT VERTICAL | RIVER CITIES ALLIANCE | Thesis Competition Re-imagining Urban Rivers | NAMAMI GANGE | ALIGARH MUSLIM UNIVERSITY

Season -4

Sponsored Thesis Project Competition on *"Re-imagining Urban Rivers"*

Assessing the Public Health Implications of Hospital Wastewater Discharge into Urban River Ecosystems: A case study of Aligarh

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HOSPITALS
Hospitals are a source of pathogens, drugs, chemicals, resistant bacteria etc

WASTEWATER
Often not treated, these antibiotics, resistant microbes etc are directly discharged into sewage drains and urban waterbodies.

DRINKING SOURCES
Drinking water may contain those pathogenic organisms that have contaminated the source.

PUBLIC HEALTH IMPLICATIONS
Water borne diseases like Typhoid, Cholera, Acute Gastroenteritis, Hepatitis A and E, Ecoli infections, salmonella and shigella infections etc

WHY THIS STUDY?

Objective 1

- To perform analysis of the hospital wastewater and near hospital potable water sources; delineating the microbial diversity, sensitivity and antibiotic resistance

Objective 2

- To investigate indirectly the ecological consequences, focusing water's physical, chemical quality alterations, BOD, COD and fecal contamination.

Objective 3 & 4

- To propose evidence-based mitigation strategies for reducing hospital wastewater microbiome discharge's ecological & public health implications into river ecosystems
- To evaluate the potential risks to public health as a resultant disease prevalence data.

WHAT DID WE DO?

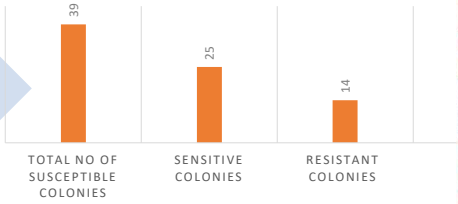
TOTAL – 32 SAMPLES
11- Hospital SEWAGE SAMPLES – Drains
21- Domestic DRINKING WATER SAMPLES – Handpumps 17 + RO filter 4

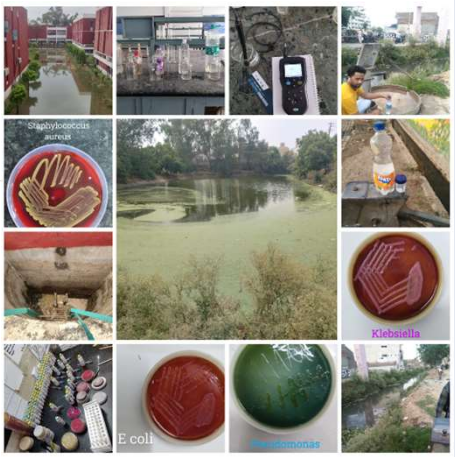
No growth- 1 sample
Single Colony Growth- 12 samples
Multiple Colonies Growth (2 OR more bacterial isolates) - 12 samples
Total – 44 Colonies

15 out of 21 Drinking Water Samples were found to be unfit for drinking.
In most of the samples, dissolved oxygen was of the sub-optimal level. i.e <4-6 mg/L

Out of 11 sewage samples, 8 samples have above the range, BOD. 3/11 exceed the COD limits.
15 out of 21 Drinking Water Samples are found to be unfit for drinking indicated by coliform count.

CARBAPENEM RESISTANCE

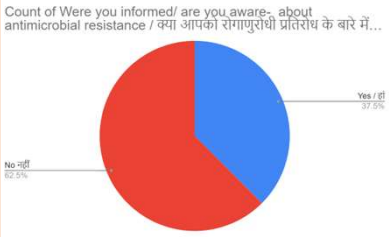


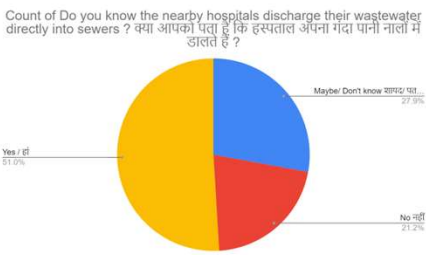


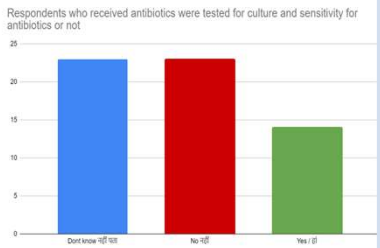
Colonies of Bacteria	No. of colonies Resistant to Carbapenem
Pseudomonas	6
Acinobacter	5
Klebsiella	3
Citrobacter	0
E coli	0
Staph Aureus	NA

WHAT DID WE FIND OUT?

21 out of 105 respondents were unsure or didn't know that hospital wastewater can be a source of many diseases
Almost half (51/105) of the respondents were unaware of the fact that the nearby hospitals don't comply to wastewater treatment protocols and discharge their effluents into nearby waterbodies without or partial treatment.
61 out of 81 respondents who acquired water-borne diseases received antibiotics for treatment out of which over 2/3rd of them didn't know or didn't have culture and sensitivity testing indicating High Risk AMR behaviour contributing hugely to public health impact.







WHAT IS THE AWARENESS IN GENERAL POPULATION ?

WHAT WE CAN DO TO TACKLE THIS?

Architectural Solutions

- EXISTING HOSPITALS UPGRADATION
- GREEN INFRASTRUCTURE INITIATIVES
- STORMWATER DE LOADING

Planning Solutions

- Smart City Integration
  Helpline numbers to report violations
- IEC / Community Involvement
  Public Health Campaigns / BCI
  Training Hospital Staff
- Smart planning – Cluster treatment plants
  Regular Water Testing and Chemical Analysis

Medical Solutions

- Antimicrobial Stewardship Programs / Behaviour Change Interventions
- Early Detection of Water Borne Diseases – Door to door Campaign for Rapid Diagnosis Testing. Specifically in rainy or peak season.
- Grading Point-of-Source & Treatment: Deploy advanced treatment technologies for potentially more impactful sources.