



Implementation of Integrated Surveillance System for Detection of Antimicrobial Resistance in Bangladesh

Zakir Hossain Habib¹, Tahmina Shirin²

¹Chief Scientific Officer, Department of Microbiology, Institute of Epidemiology, Disease Control & Research, Dhaka, Bangladesh;

²Director, Institute of Epidemiology, Disease Control & Research, Dhaka, Bangladesh

Surveillance of antimicrobial resistance (AMR) tracks changes in microbial populations, permits the early detection of resistant strains of public health importance, supports the prompt notification and investigation of outbreaks¹. Surveillance findings are needed - to guide clinical therapy decisions, to generate evidence for policy recommendations, to assess the impact of resistance containment interventions.

The National Action Plan for Antimicrobial Resistance Containment (ARC) in Bangladesh 2017-2022 was developed by Disease Control Unit, Communicable Disease Control Program, DGHS, Bangladesh in line with GAP of WHO. Establishment of Surveillance System for AMR is emphasized in NAP. There was no systemic national surveillance conducted on AMR until 2016, except in selected diarrhoeal pathogen monitored and documented by icddr². In 2016 Antimicrobial Resistance Surveillance in Bangladesh project is initiated by Institute of Epidemiology, Disease Control & Research (IEDCR) with the support under the Global Health Security Agenda (GHS) with cooperative agreement with US CDC. Initially the project duration was five years (2016-2020). The objective of the surveillance is to establish a surveillance system to find out the status of Antimicrobial Resistance among common pathogens in Bangladesh.

The site selection, setting up of Surveillance team (locally and Centrally), Development of AMR Surveillance Protocol, development of Standard

Operating Procedures (SOP), recruiting human resource, setting up system for data collection from sentinel sites and send to the central server, procurement of logistics and equipment etc. was done and the surveillance sites started functioning from March 2017. Surveillance sites were selected on the basis of - country geographical representation, ability and willingness of the hospital to enroll cases, availability of standard microbiology laboratory which can perform culture and sensitivity testing. Initially five sites started surveillance activities in 2017 namely Mymensingh Medical College and Hospital, Mymensingh, Uttara Adhunik Medical College and Hospital, Dhaka, Rajshahi Medical College and Hospital, Rajshahi, Rangpur Medical College and Hospital, Rangpur and Bangladesh Institute of Tropical and Infectious Diseases (BITID), Chattagram. In the following years another four sites were included with the support of World Health Organization (WHO), namely Dhaka Medical College and Hospital, Dhaka, Sylhet MAG Osmani Medical College and Hospital, Sylhet, Khulna Medical College and Hospital, Khulna and Cox's Bazar Medical College and Hospital (Chattagram).

Of these nine (9) sentinel sites eight (8) were public institutes and one, Uttara Adhunik Medical College and Hospital is private institute. Capacity building of the sites were done by training both basic & refresher of the surveillance team like laboratory personnel, surveillance physicians and nurses, providing SOPs, logistics and equipment of the laboratories. Every detail of the surveillance procedure was included in the surveillance protocol where ten priority pathogen, six specimens and five cases were described. Patients are selected by the surveillance physicians according to the case definition and the target specimen were collected and sent to the microbiology laboratory to find out the priority pathogens.

Currently there are 10 priority pathogens are within the

Correspondence: Prof. Dr. Zakir Hossain Habib, Professor of Microbiology & Chief Scientific Officer, Department of Microbiology, Institute of Epidemiology, Disease Control & Research, Dhaka, Bangladesh; Email: parashhabib@gmail.com; Cell no.: +8801711109160; ORCID iD: <https://orcid.org/0000-0003-2163-3600> @Authors 2022. CC-BY-NC DOI: <https://doi.org/10.3329/bjmm.v16i1.65788>

surveillance system. These are *Escherichia coli*, *Klebsiella pneumoniae*, *Enterococcus species*, *Vibrio cholera*, *Shigella species*, *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Salmonella species*, *Pseudomonas aeruginosa* and *Acinetobacter species*. Six specimens are enrolled for this surveillance. These are urine, blood, stool, sputum, endotracheal aspirate and wound swab. A total number of five clinical diseases are included for this surveillance. These are urinary tract infection, septicemia, diarrhea, pneumonia and wound infection. Surveillance team at sentinel sites consists of surveillance physicians and nurses as well as microbiology laboratory personnel under the leadership of Head of microbiology department and coordinated by a Project Facilitator (PF) appointed by IEDCR. Centrally AMR surveillance coordination subcommittee at IEDCR under the leadership of Director of IEDCR coordinates the activities and the microbiology laboratory of IEDCR acts as the reference laboratory. AMR surveillance co-ordination subcommittee consists of Epidemiologists, Laboratory personnel, AMR Surveillance Consultant chaired by Director IEDCR. This team is supported by IT expert, data management assistant, medical technologists and AMR surveillance consultant. AMR team meeting held routinely once in a week and as and when required for monitoring the AMR Surveillance activities and planning. Central team (AMR Sub-committee) at IEDCR provide guidance and co-ordinates all the activities of the sentinel sites. They collaborate with GHSA partners and communicate with national and international agencies. They conduct monitoring and evaluation visit to the sites to assess their activities and progress. They arrange trainings and refresher trainings of the sentinel site physicians, nurses, microbiologists and technologists. They give technical support to the sentinel site laboratories and maintain logistic supply chain. They perform data cleaning, analysis, review and feedback.

The reference laboratory creates and supply SOP to the sentinel sites, reference strain for internal quality control, provide training to the laboratory personnel and ensure quality of the laboratory performance by retesting of the bacterial isolates of the sentinel sites and facilitating External Quality Assessment (EQA) of the laboratories by international agencies. Frequent visit to the sentinel site laboratory by the reference laboratory personnel is also done for the monitoring. Reference laboratory itself participates in various international EQA programs. All the identified bacterial isolates from the sites are sent to the reference laboratory repository where it is preserved for retesting and further research.

Head of Microbiology laboratory of the sentinel sites should be supported by college authorities and should be more empowered so that individual sites can work independently. Adequate budget should be allocated by the Government. Private laboratory should be included in the surveillance so that a greater picture of AMR in Bangladesh is visible. In that case laboratory-based surveillance can be carried out to make it feasible. Unlike existing surveillance this can be laboratory based surveillance. Due to the growing threat of multi-drug resistant fungal pathogens the surveillance can be extended to include these pathogens in future. Moreover, to identify the pathogens and the cause of resistance by identifying the resistance gene as well as to track the source further extension into molecular surveillance and genome sequencing should be considered actively.

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Bangladesh Journal of Medical Microbiologist, January 2022;16(1):1-2