# Online Supplementary Documents

**Table S1: List of articles excluded during full-text screening with reasons for exclusion**

| S.No. | Excluded Articles | Reason for Exclusion |
|---|---|---|
| 1. | Antibiotic resistance in Bangladesh: A systematic review | Laboratory surveillance system not highlighted |
| 2. | Cholera incidence among patients with diarrhoea visiting National Public Health Laboratory, Nepal | Full-text article not accessible |
| 3. | Detection of the emergence of mcr-1-mediated colistin-resistant Escherichia coli and Klebsiella pneumoniae through a hospital-based surveillance in an oncology centre in eastern India | Laboratory surveillance system not highlighted |
| 4. | Expanding poliomyelitis and measles surveillance networks to establish surveillance for acute meningitis and encephalitis syndromes--Bangladesh, China, and India, 2006-2008 | Year of publication not as per inclusion criteria |
| 5. | Expansion of syndromic vaccine preventable disease surveillance to include bacterial meningitis and Japanese encephalitis: evaluation of adapting polio and measles laboratory networks in Bangladesh, China and India, 2007-2008 | Year of publication not as per inclusion criteria |
| 6. | Field- and laboratory-based active dengue surveillance in Chennai, Tamil Nadu, India: observations before and during the 2001 dengue epidemic | Year of publication not as per inclusion criteria |
| 7. | Genetic sequencing for surveillance of drug resistance in tuberculosis in highly endemic countries: a multi-country population-based surveillance study | Laboratory surveillance system not highlighted |
| 8. | Genomic surveillance for hypervirulence and multi-drug resistance in invasive Klebsiella pneumoniae from South and Southeast Asia | Laboratory surveillance system not highlighted |

| 9. | Health and Demographic Surveillance Systems Within the Child Health and Mortality Prevention Surveillance Network | Demographic surveillance system. Infectious disease and Laboratory surveillance system not covered. |
|---|---|---|
| 10. | Hospital based surveillance and molecular characterization of rotavirus in children less than 5â€¯years of age with acute gastroenteritis in Nepal | Laboratory surveillance system not highlighted |
| 11. | A hospital based surveillance of metallo-beta-lactamase producing gram negative bacteria in Nepal by imipenem-EDTA disk method | Laboratory surveillance system not highlighted |
| 12. | Hospital-based surveillance for Japanese encephalitis at four sites in Bangladesh, 2003-2005 | Laboratory surveillance system not highlighted |
| 13. | Hospital-based zoonotic disease surveillance in Bangladesh: design, field data and difficulties | Laboratory surveillance system not highlighted |
| 14. | IASM: A System for the Intelligent Active Surveillance of Malaria | Country setting not as per inclusion criteria |
| 15. | Implementation of surgical site infection surveillance in low- and middle-income countries: A position statement for the International Society for Infectious Diseases | Laboratory surveillance system not highlighted |
| 16. | Implementation of the world health organizationâ€™s global antimicrobial resistance Surveillance System (GLASS) for the surveillance of sputum specimens collected from patients at Siriraj Hospital | Full-text article not accessible |
| 17. | Laboratory diagnosis of novel corona virus (2019-nCoV)-present and the future | Laboratory surveillance system not highlighted |
| 18. | Mortality from external causes in Africa and Asia: evidence from INDEPTH Health and Demographic Surveillance System Sites | Laboratory surveillance system not highlighted |
| 19. | Mortality Surveillance Methods to Identify and Characterize Deaths in Child Health and Mortality Prevention Surveillance Network Sites | Laboratory surveillance system not highlighted |
| 20. | Multicenter, hospital-based surveillance of rotavirus disease and strains among indian children aged <5 years | Year of publication not as per inclusion criteria |
| 21. | Multisite virological influenza surveillance in India: 2004-2008 | Year of publication not as per inclusion criteria |
| 22. | Pathology and Telepathology Methods in the Child Health and Mortality Prevention Surveillance Network | Laboratory surveillance system not highlighted |

| 23. | Poliovirus Laboratory Based Surveillance: An Overview | Full-text article not accessible |
|-----|-------------------------------------------------------|----------------------------------|
| 24. | Pregnancy-related mortality in Africa and Asia: evidence from INDEPTH Health and Demographic Surveillance System sites | Laboratory surveillance system not highlighted |
| 25. | Public Health Laboratory Surveillance and Diagnosis of Japanese Encephalitis: Time to Revisit | Laboratory surveillance system not highlighted |
| 26. | Specialist laboratory networks as preparedness and response tool - the Emerging Viral Diseases-Expert Laboratory Network and the Chikungunya outbreak, Thailand, 2019 | The laboratory network not part of WHO SEARO region. |
| 27. | Standardization of Minimally Invasive Tissue Sampling Specimen Collection and Pathology Training for the Child Health and Mortality Prevention Surveillance Network | Laboratory surveillance system not highlighted |

**Table S2: List of Surveillance System for which websites/ grey literature was not accessible.**

| S.No. | Name of the Surveillance system identified within the articles |
|---|---|
| 1 | National Rotavirus Surveillance Network(NRSN)- India |
| 2 | Health and Demographic Surveillance sites(HDSS) |
| 3 | Invasive Bacterial Infection Surveillance'(IBIS) |
| 4 | Alliance for Surveillance of Invasive Pneumococci' (ASIP), |
| 5 | Pan Asia Epidemiologic Surveillance Network |
| 6 | Hospital Based Sentinel Surveillance for Bacterial Meningitis (HBSSBM) |
| 7 | Hospital-based sentinel surveillance for Streptococcus pneumoniae and other invasive bacterial diseases in India (HBSSPIBD)-India |
| 8 | WHO Invasive Bacteria -Vaccine Preventable Disease Surveillance Network |
| 9 | Hybrid AMR Surveillance system |
| 10 | AIV surveillance system |
| 11 | Severe Pneumonia (SevPn) surveillance system |
| 12 | National Meliodosis Surveillance Program |

| 13 | Bangladesh, Bhutan, India, Nepal, Sri Lanka Malaria Drug Resistance Network (BBINS) |
|----|-----------------------------------------------------------------------------------|

**Table S3: Characteristics of studies included**

| S.No | Author, year | Design of study | Aim and objective of study | Study Location | Characteristics of Surveillance | | | | | | Diseases Captured | Gaps and Challenges identified in the system | Genomic Surveillance component |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Name of surveillance system | Type of surveillance 1.Active 2.Passive 3.Sentinel 4.Special Surveys | Level of surveillance 1.District 2.State 3.National | Mode of surveillance 1.Paper based 2.Electronic | Type of Surveillance system 1.Vertical 2.Integrated | Laboratory component | | | |
| 1. | Gandra et al, 2020 | Review | To discuss health systems, laboratory | South and southeast Asian | AMR Surveillance | Passive surveillance of laboratory data. | NR | Paper-based | NR | Thailand comprises a comprehensive laboratory | Antimicrobial Resistance | Most nations, have inadequate infrastructure and | NR |

| | | | capacity, bacterial disease burden, AMR surveillance progress, status, challenges, opportunities and progress in efforts to tackle AMR in eight South and Southeast Asian | countries. | | | | | | network and capacity.<br><br>All the countries have national reference laboratory selected for AMR surveillance.<br><br>Private sector Laboratories are more compared to public sector. | | laboratory capacity in the public sector<br><br>There are no accredited laboratories meeting international standards in Nepal.<br><br>It is difficult to gather laboratory data electronically, and IT usage is modest. | |
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| | | | countries. | | | | | | | Only Thailand has comprehensive AMR surveillance system and plans of further expanding it. | | | |
| 2. | May et al, 2011 | Review | To demonstrate syndromic surveillance systems are being used in low- | Southeast Asian (India, Thailand) Western pacific | Syndromic Surveillance | Syndrome based surveillance | India: state | India: Both Thailand: Both | Integrated disease surveillance system in India | Laboratory used for diagnostics | India: acute flaccid paralysis, acute dysentery, cholera-like disease, diphtheri | Personnel related challenges in the form of lack of knowledge, training, resulting in delayed reporting. | NR |

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| | | | resource settings | Eastern Mediterranean Regions of Americas African countries | | | | | | | a, encephalitis, fever with bleeding tendency Thailand: focused on constitutional, respiratory, and gastrointestinal syndrome | | |
| 3. | Mercado et al, 2017 | Cross-sectional | study assessed the current sources | 22 target countries in the | National malaria control program | NR | NR | 15 countries mentioned they are in | NR | Data collected from | Malaria | Engaging private sector is a challenge | NR |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | of malaria surveillance data collected by NMCPs and the role of the private sector in malaria treatment in the Asia Pacific region. | Asia Pacific: Afghanistan, **Bangladesh, Bhutan**, **Democratic People's Republic of Korea** (DPR Korea), **India, Indonesia, Malaysia, Myanmar**, **Nepal**, Pakistan, **Sri Lanka, Thailand,** | (NMCP) surveillance system. | | | the process of rolling out electronic data reporting system. 7 countries mentioned they have established electronic reporting system as a primary medium for reporting. 5 countries did not specify | | laboratories | in many countries. |

| No. | Author | Study type | Aim | Country | System | Surveillance | Levels | Both | Type | Network | Diseases | Challenges | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Timor-Lest**e, | | | | their reporting method. | | | | | |
| 4. | Phalkey et al, 2013 | Multicentric retrospective cross-sectional evaluation study. | study aimed to assess the structure and performance of the Integrated Disease Surveillance System. Also assessed challenges in the system. | India | IDSP | Involves both active and passive surveillance. | All the three levels. | Both | Integrated | Through IDSP, a referral network of ten labs was formed in the state, however it is not operating at its best. | Multiple diseases | Challenging support activities including lab, communication tools, transportation, training, and other tools. Sometimes reporting quality is | NR |

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| | | | | | | | | | | | | compromised. Issues with logistics resulting from the storing and transport of huge amounts of printed formats. | |
| 5 | Lim at al, 2020 | Not identified | study aimed to develop and test an application that can support a | People's Democratic Republic, Myanmar, Nepal, Thailand, the and | Antimicrobial resistance surveillance system (AMASS) | NR | NR | Offline Electronic data collection. | NR | Medical facilities with a microbiology lab. With the least amount of | AMR | NR | NR |

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| | | | local hospital to analyse routinely collected electronic data independently and generate AMR surveillance reports rapidly | Vietnam | | | | | | resources and skills needed, the AMASS can assist hospitals with microbiology laboratories in evaluating frequently collected data and producing reports.  This may give individual hospitals the power to improve | | | |

| # | Author | Type | Study description | Country | Surveillance type | | | | | | | | |
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| | | | | | | | | | | local knowledge of AMR, take appropriate action, and make the most of available local data. | | | |
| 6 | Setiawaty et al, 2014 | Primary study: Outbreak investigation report | Study was conducted to discuss the outbreak investigation experiences and | Indonesia | Event based surveillance<br><br>District surveillance officer (DSO) surveillance | Active, passive and sentinel. | Involves all the three levels. | NR | NR | The national influenza centre and laboratory network for influenza were built to hasten the | Avian influenza ::H5N1 | Underuse of the tools and reagents for diagnosis.<br><br>Management of inventories and | Genetic characteristic of virus were taken into consideration during outbreak investigation. |

| | | Cannot be categor ized | ways to improve the process in the future. | | system for active case detection . Rumour surveillan ce Sentinel influenza like illness (ILI) surveillan ce Severe Acute Respirato ry Illness (SARI) | | | | | influenza A (H5N1) response. Animal disease detection facility for the region. These laboratory networks may one day be used to diagnose not only influenza but also other new infectious diseases. | | upkeep of laboratory equipment are problems due to a lack of qualified laboratory personnel. Other difficulties experience d by the network included inadequate supplies of equipment and reagents in other | |
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| | | | | | surveillance | | | | | In Indonesia, 44 labs were designated as the H5N1 influenza A diagnostic laboratories. They were spread across 21 of Indonesia's 33 provinces. Eight regional labs in eight provinces, | | laboratories. | |
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| # | Author | Study design | Objective | Country | Setting | Surveillance type | | Data management | | Laboratory | Disease | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 34 subregional labs in thirteen provinces, and two referral laboratories in Jakarta. | | | |
| 7 | Jayaraman et al, 2018 | Surveillance study<br><br>Cross-sectional | To describe the framework of the Hospital Based Sentinel Surveillance for Bacterial Meningiti | India | Hospital based sentinel surveillance for bacterial meningitis | Sentinel | NR | Electronic data transfer using Epi-Info on a monthly basis.<br><br>Hard copies of the CRFs were | NR | Christian Medical College, Vellore serves as the Reference Laboratory for the network and administered external quality assurance | Bacterial meningitis | NR | NR |

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| | | | s (HBSSBM) network in India and findings from the surveillance activity carried out during 2012–2013. | | | | | received at the coordinating center for second data entry, data validation, and analysis | | (EQA) programme for the participating sentinel sites<br><br>External quality evaluation done by reference laboratory. | | | |
| 8 | Bose et al, 2013 | Report<br><br>Case Based Surveill | The paper describes the epidemiology of measles | Pune, India | Measles Surveillance System | This is the first report from an active case based laboratory supported | State and district. No National system for case based laboratory supported | Case reporting use Case investigation form (CIF) | NR | Laboratory supported surveillance system | Measles | NR | NR |

| | | ance study

Not clearly identified | in three MAVP blocks of Pune for the period November 2009 through December 2011. | | | measles surveillance system in India. | measles surveillance system. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Sathku mara et al, 2018 | Report

Not clearly defined | To develop a phylogeo graphic appreciat ion of disease emergen ce, understa nd its | Sri Lanka | National surveillan ce programme | NR | National | NR | NR | Reference laboratory supported surveillanc e | Clinical melioidos is | NR | NR |

| | | | progression to different clinical outcomes, and measure the extent of disease class/genotype correlation | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | Capeding et al, 2013 | prospective, multicenter, active fever surveillance, | To determine the incidence and proportion of acute | Indonesia, Malaysia, Philippines, Thailand and | NR | Active surveillance conducted for this study | District | Electronic | NR | Case confirmation and testing | Dengue, chikungunya, hepatitis A and influenza A viruses, leptospir | NR | NR |

| # | Author | Type | Description | Country | | | | | | | | | |
|---|--------|------|-------------|---------|---|---|---|---|---|---|---|---|---|
| | | cohort study | febrile episodes that were caused by dengue, as well as by chikungunya, hepatitis A and influenza A viruses, leptospirosis, rickettsia, and S.Typhi | Vietnam | | | | | | | osis, rickettsia, and S.Typhi | | |
| 11 | Kaur et al, 2019 | Review | Discusses the develop | India | Hybrid AMR Surveilla | NR | National | Data on the results of the | NR | Collect data from various | AMR | NR | The platform is also |

| | | | ment of i-AMRSS by the Indian Council of Medical Research (ICMR) for the management and analysis of AMR data from different laboratories. | | nce system: Antimicrobial resistance surveillance system (i-AMRSS) | | | Antimicrobial Susceptibility Testing (AMST) are collected electronically through a web portal. In order to have standardised data, the system provides built-in reporting criteria or distinct stakeholders. | | laboratory network | | | designed to facilitate genomic studies by identifying priority resistant pathogens |
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| 12 | Bhunti et al, 2019 | Surveillance study Report

Potential cross-sectional | This report describes the methodology of the SevPn surveillance system and provides preliminary results on each of its objectives from December 2010 through | Thailand | Severe Pneumonia (SevPn) surveillance system | Passive and sentinel | Surveillance and Rapid Response Teams' (SRRT) at national, district, provincial and community level. | Electronic i.e. web based system | NR | Comprises of a laboratory network | Severe Pneumonia | Inadequate laboratory detection abilities.

86% of prospective cases discovered during surveillance audits not submitted to the SevPn system. | NR |
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| | | | Decembe r 2015 | | | | | | | | | |
| 13 | Murhek ar et al, 2019 | Second ary study | Analysed the laborator y surveillan ce data from 51 functiona l VRDLs collected from January 2016 to July 2018 to describe the epidemio logy of | India | NR | sentinel | All levels | Web-based data entry system | NR | consists of the Network for Virus Research and Diagnostic Laboratory (VRDLN). Regional biosafety level 3 laboratorie s and state and medical college biosafety level 2 | Chikungu nya | NR | NR |

| # | Author | Type | Description | Country | | Surveillance | Level | | | Laboratory | Disease | | |
|---|--------|------|-------------|---------|------|--------------|-------|------|------|------------|---------|------|------|
| | | | CHIKV in India. | | | | | | | laboratories are among the labs in the network. All standard and specialised testing are available in local laboratories. | | | |
| 14 | Murhekar et al, 2019 | Report Potential Cross-sectional | analyzed the laboratory surveillance data from 2014 to | India | NR | Sentinel | All levels | Both | NR | Comprises of Virus Research and Diagnostic Laboratory Network (VRDLN). | Dengue | NR | NR |

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| | | | 2017 to describe the epidemiology of dengue fever in India | | | | | | | The network has 52 laboratories covering 24 indian states as of 2017. | | | |
| 15 | Setiawaty et al, 2012 | Review | A review on establishing a reliable laboratory network for influenza A diagnosis during | Indonesia | NR | Sentinel | Province, district and national | NR | NR | Eight regional labs in eight provinces, 34 subregional labs in thirteen provinces, and two referral laboratories in Jakarta (NIHRD MoH/NIC and Eijkman | Influenza | Underutilisation of stocks and regents.<br><br>Lack of skilled personnel.<br><br>Insufficient equipment and reagents stocks | NR |

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| | | | the avian flu (H5N1) outbreaks | | | | | | Institute) make up the organisation of the laboratories.<br><br>To ensure quality, the laboratories conduct regular quality inspections.<br><br>Regular training in biosafety and biosecurity is also conducted. | | | |

| 16 | Manurang et al, 2021 | Qualitative study design | This study used well-established guidelines to evaluate the operation of EWARS in Indonesia's West Papua province. | Indonesia | Early Warning and Response System (EWARS) | NR | NR | The source data is reported by surveillance officers using an automated data collection method called SMS reporting.  Health professionals start gathering data at the sub-district level and provide it to the | NR | Comprises of national reference laboratory | NR | Mobile and internet network connectivity  limited human and funding resource  Data reporting is delayed sometimes.  Need for laboratory strengthening. | NR |

| | | | | | | | | surveillance officer via SMS, phone, or hand delivery. The officials then compile all the data from the district and send 1 SMS to the application programming interface (API) of the national Ministry of Health in | | | | |
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| | | | | | | | | the main EWARS computer system. The central EWARS database receives the data via the API, where they are automatically aggregated, examined, and reported on the main EWARS website. | | | | | |
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| 17 | Cavallaro et al, 2016 | Surveillance study  Cannot be defined clearly | The purpose of this paper is to evaluate the feasibility of expanding polio–measles surveillance and laboratory networks to detect bacterial meningitis and JE, using surveillan | India, Bangladesh and China | NR | India- Sentinel  Bangladesh- Survey | National, district | In India and Bangladesh, polio-measles surveillance employees employed the software programme Epi InfoTM (CDC, Atlanta, USA).  Results reporting is more reliable for reporting | NR | Due to differences in laboratory staff and viral and bacterial testing procedures, polio-measles laboratory networks were helpful for developing JE diagnostic capacity but not for confirming | Bacterial meningitis and JE | For laboratory data, data management and reporting are poorer.  No countries fared well when CSF samples were sent to secondary and tertiary laboratories due to inadequacies in tools, training, | NR | NR |

| | | | ce for acute meningitis-encephalitis syndrome in Bangladesh and China and acute encephalitis syndrome in India | | | | | clinical cases but less reliable for reporting laboratory data.<br><br>Laboratory data is manually entered in Bangladesh, whereas it is entered into spreadsheets in India. | | bacterial meningitis. | | and standards for quality assurance and control. | |
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| 18 | Sirivongrangson et al, 2018 | Surveillance study<br><br>Potential Cross-sectional | This manuscript describes the first year of EGASP surveillance in Thailand during November 2015 – October 2016 and are important for early detection of NG resistant strains | Thailand | Enhanced Gonococcal Antimicrobial Surveillance Programme (EGASP) | Sentinel | NR | both | NR | Comprises of 2 reference laboratories for syndromic data and case confirmation | Antimicrobial-resistant Neisseria gonorrhoeae | NR | NR |
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| | | | and informing treatment options | | | | | | | | | | |
| 19 | Rajkumar et al, 2020 | cross-sectional multi-site hospital- based surveil- lance study | To describe the framework and protocol of the ongoing multi-site HBSSPIBD study | India | hospital-based sentinel surveillance for S. pneumoniae and other invasive bacterial diseases (HBSSPIBD) | sentinel | all | The study used paper-based Case Report Forms (CRFs) to gather its data. The lab personnel received training on CRF forms and reporting in the | NR | . Induction training on laboratory practises for sample collection, transportation, processing in the laboratory, testing and documentation, as well as laboratory-based case recruitmen | S. pneumoniae | NR | NR |

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| | | | | | | | | ICMR-NIE online data entry and management system. | | t, was provided to laboratory investigators and project laboratory employees at the National Reference Laboratory (NRL). | | | |
| 20 | Herini et al, 2017 | Cross-sectional study | A prospective surveillance study of infants aged <1 year with | Indonesia | Congenital rubella surveillance system | NR | NR | NR | NR | For case conformation | Congenital Rubella Syndrome | NR | NR |

| | | | suspected CRS. | | | | | | | | | | |
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| 21 | Sirijatuphat et al, 2018 | Cross-sectional may be? | Reported the results of implementing GLASS for surveillance of blood culture specimens in patients who had their blood culture samples collected | Thailand | Global antimicrobial resistance surveillance system (GLASS) | NR | NR | Web based application was used for collecting patient data for this study | NR | GLASS was found Superior to laboratory based surveillance system | AMR | GLASS was found to be more time consuming and required more resources. | NR |

| | | | for clinical purposes | | | | | | | | | | |
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| 22 | Moreno et al,2019 | prospective, active surveillance,hospital-based epidemiological study.

Not clearly identified | This study aims to determine the frequency of influenza related hospitalisations in different countries, by circulating strains and age groups, to study | St. Pet Moscow Kazakhstan Czech Rep. Canada Romania Turkey Valencia Tunisia Suzhou /Shanghai India Mexico | Global Influenza Hospital Surveillance Network (GIHSN) | active | NR | NR | NR | Case conformation | Influenza | NR | NR |

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| | | | risk factors for influenza - associated hospitalis ations and estimate Influenza Vaccine Effective ness (IVE) by site, age group and strain | SouthAf rica | | | | | | | |

| 23 | Kant et al, 2010 | Review | Use of information and communication technology in disease surveillance | India | IDSP | NR | All levels | Both, through forms and Web portal | Integrated | Laboratory based surveillance in which the laboratory is supposed to report confirmation of cases using L forms | Infectious diseases | NR | NR |
|----|------|--------|-----|-------|------|----|-----------|------|-----------|-----|------------|----|----|
| 24 | Naser et al, 2015 | Cluster and case based Surveillance study | This paper explores the utility of cluster- and case-based | Bangladesh | NR | Active and passive | District | NR | NR | Case detection and confirmation | Nipah | NR | NR |

| | | Crossec tional | surveillan ce establish ed in governm ent hospitals in Banglade sh to detect Nipah virus, a stage III zoonotic pathogen . | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | Saha et al, 2017 | Cross section al surveill | Aimed to evaluate the logistics, cost and | Banglad esh | Invasive Bacterial- Vaccine Preventa ble | Active and sentinel | NR | NR | Integrated | Case conformati on and | Invasive Bacterial- Vaccine Preventa ble | NR | NR |

| | | ance study?? | sustainability of leveraging the ongoing WHO-coordinated IB-VPD platform for enteric feversurveillancebybroadeningtheinclusioncriteriaoftheoriginalsurveillance | | Diseases (IB-VPD) Surveillance System. | | | | | surveillance | Diseases-Enteric fever | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| 26 | Manoharan et al, 2016 | prospective hospital-based and retrospective laboratory-based surveillance study

Not clearly defined | To provide nationally representative data for the pattern of disease due to S pneumoniae, current trends in the serotype of invasive pneumococci, and invasive | India | NR | Sentinel | NR | NR | NR | Case confirmation and surveillance | Invasive pneumococcal disease | NR | NR |

| | | | pneumococci antimicrobial resistance patterns, in India | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | Ashley et al, 2018 | Review | To summarize the supranational surveillance networks for drug-resistant infections operating in LMICs | LMICs | Global Antimicrobial Resistance Surveillance System (GLASS) | Active, passive and Sentinel | NR | NR | NR | Comprises of laboratory network for surveillance | AMR | Small coverage<br><br>Insufficiently representative data<br><br>Implementing diagnostic pauses in clinical practise | NR |

| | | | since 2000 and dis-cuss their impacts and challenges, and any implications for the implementation of GLASS. | | | | | | | | | might be challenging.

Inactivity on the part of partners

Delays in reporting

Understaffing and underfunding are not prioritised. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | Saha et al, 2016 | Population Based surveillance study | Aims to determine the aetiology of neonatal infections in 5 populatio | Banglad esh, India and Pakista n | Aetiology of Neonatal infection in South | NR | NR | Electronic: ANISA data capture forms (DCFs)- laboratory | NR | Using an electronic laboratory data capture system for diagnostics | Neonatal infection s | Specimen collection and transport to designated study | NR |

| | | Not clearly identified | n-based sites in Bangladesh, India and Pakistan.<br><br>In this article, we describe the laboratory methods of ANISA, including the rationale for molecular platform selection and the associated challenges of | | East Asia (ANISA) | | | data system | | To record the pertinent information about each step of the specimen processing procedure, ANISA data capture forms (DCFs) were developed.<br><br>These DCFs can take the role of conventional laboratory notebooks; built-in checks in the data entry system reduce the | | laboratories and timely processing in rural settings<br><br>Minimal or non-existent laboratory facilities at the field sites; | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | impleme nting this testing in difficult field settings. We also discuss measures taken to improve the detection of a wide range of bacteria and viruses through molecula r testing of blood and respirato ry specimen s along with the complem entary tradition | | | | | | | likelihood of transcribin g errors.<br><br>The lab staff conducting the tests enters all laboratory data on DCFs into the ANISA databases at the individual sites in real time.<br><br>Weekly data transfers from all stations in Dhaka, Banglades h, to the | | | |
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| | | | al culture methods employed | | | | | | | main data server. | | | |
| 29 | Tissera et al, 2016 | Cross sectional surveillance study | we describe the study sites, research design and the findings of the first two years of laboratory-enhanced sentinel surveillan | Sri Lanka | laboratory-enhanced sentinel surveillance system | Active, passive and sentinel | National and district | Case reporting forms used to collect data | NR | The project chose the Genetech Research Institute (GRI) Colombo as a supporting reference laboratory, and during the project's first year, GRI | Dengue | NR | NR |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ce system | | | | | | | Colombo served as an interim testing laboratory. | | | |
| 30 | Bala et al, 2013 | Retrospective study- Secondary study | This study was conducted to analyse the AMR profile of N gonorrhoeae in selected SEAR countries, based on retrospec | 6 SEAR countries (namely Bhutan, Indonesia, India, Myanmar, Sri Lanka and Thailand) | NR | NR | NR | NR | NR | In 1997, WHO GASP was founded in the South-East Asia Region (SEAR). The Safdarjung Hospital's Regional STD Teaching, Training and Research | AMR | NR | NR |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | tive AMR data communicated by the focal point laboratories participating in the WHO GASP during the period 2009 to 2012. | | | | | | | Center in New Delhi, India, was acknowledged as the regional reference laboratories (RRL) | | | |
| 31 | Saluja et al, 2016 | Observational study | to carry out a hospital-based surveillan | India | Hospital based surveillance | NR | NR | Case reporting form from | NR | Case detection | Gastroenteritis | NR | All stool samples that had rotavirus VP6 |

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| | | Prospective Hospital Based Surveillance  Cross-sectional | ce of rotavirus gastroenteritis in children≤ 59 months of age and develop estimates of disease burden in the population under surveillance | | | | | hospital log books | | | | | antigen results that were positive underwent strain characterisation by ELISA. At the Central Laboratory, reverse-transcription polymerase chain reaction was used for genotyping (RT-PCR) |

| 32 | Shakya et al, 2012 | Not clearly identified | To analyse the biochemical characteristics, antimicrobial susceptibility trend, genetic relatedness and the ctxB type of V. cholerae strains isolated during 2007–2010 at | Nepal | national antimicrobial resistance surveillance network | NR | All the levels | NR | NR | The 10 network laboratories that conduct the ongoing national antimicrobial resistance (AMR) surveillance include the National Public Health Laboratory of Nepal (NPHL) | AMR | NR | Genotypically identified Vibrio cholerae were found in ten different hospital laboratories in Nepal between 2007 and 2010 from patients who had diarrhoea. |

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| | | | different parts of Nepal | | | | | | | | | | |
| 33 | Kumar et al, 2016 | Report  Potential cross-sectional | This preliminary report describes rotavirus burden in children admitted with acute gastroenteritis between September 2012 and  December 2014 by age, region, seasons and also | India | Indian National Rotavirus Surveillance Network | NR | National and district | At each of the regional and referral laboratories, data were input into the CRF using the online data collecting portal that is hosted on the NIE web server. | NR | Comprises of referral laboratories | Acute gastroenteritis | NR | Rotavirus positive samples were used to perform reverse transcription polymerase chain reaction (RT-PCR) rotavirus genotyping for VP7 (G-typing) and VP4 (Ptyping). |

| | | | the diarrheal disease severity pattern | | | | | | | | | | |
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| 34 | Turner et al, 2013 | Hospital case based surveillance study<br><br>Potential cross-sectional | The aim of this laboratory-enhanced, hospital-based surveillance was to characterise the epidemiology of respiratory virus infection | Thailand-Myanmar border | NR | NR | NR | Case record forms | NR | Case detection and surveillance | Respiratory virus infections | Lack of proper data representativeness. | NR |

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| 35 | | | s among refugees living on the Thailand-Myanmar border. | | | | | | | | | | |
| 35 | Murhekar et al, 2018 | Hospital based sentinnel Surveillance report Report | This is the first report of long-term CRS surveillance data in India | India | laboratory-supported surveillance for CRS(Congenital Rubella Syndrome) | Sentinel | NR | NR | NR | Lab Diagnosis | Congenital Rubella Syndrome | NR | Oropharyngeal swabs should be taken from all infants who are 6 months old at the time of enrollment and transferred to the National Institute of |

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| | | | | | | | | | | | | | Virology in Pune for RT-PCR testing and genotyping in accordance with WHO standards. |
| 36 | Corea et al, 2016 | Laboratory Based Case finding program\n\nNot clearly defined | To describe the results of that laboratorybased case-finding program: the geographic | Srilanka | National Meliodosis Surveillance Program | NR | national | electronic | NR | Coordinated by the Western Australian Public Health Laboratory, lab diagnosis\n\nClinical laboratory molecular technology was first | Invasive Melioidosis | NR | MLST Genotyping done and Coordinated by Western Australian Public Health Laboratory |

| | | | distribution of invasive melioidosis in Sri Lanka, the principal epidemiologic risk groups, | | | | | | | brought to Sri Lanka with a deployable molecular laboratory as part of the World Health Organization's laboratory capability-building programme, and since then, a nationwide melioidosis monitoring programm | | | |
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| | | | | | | | | | | e has been developed. | | | |
| 37 | Aparna Shah, 2017 | Review | To suggest actions for policy makers to adopt as part of their national action plans to establish robust nationwide laboratory based surveillance | Sourh East Asia Countries | NR | NR | AMR surveillance is limited to national or regional laboratories, leaving the district laboratories out of any surveilla | NR | NR | In 2015, a WHO examination of the regional situation revealed that, of the region's 11 member nations, six have national policies or strategies on AMR, seven have national coordinating mechanisms, and nine have regulatory agencies | AMR | Poor infrastructure for lab based surveillance. | NR |

| | | | mechanis ms for AMR. | | | | nce net work." | | | to monitor AMR. 4 The state of laboratory- based surveillanc e is impacted by each of these variables. Six of the national reference laboratorie s for antibiotic sensitivity testing take part in external quality assessmen t programm es. and seven said that their entire network of | | | |
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| | | | | | | | | | tertiary hospitals is supported by a strong laboratory infrastructure. Six nations take part in external quality assessment programmes, while nine nations have national reference laboratories for determining antibiotic sensitivity. There is no information available about how many laboratorie | | | |
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| | | | | | | | | | s adhere to international standards.<br><br>There is a dearth of trustworthy and comparable data since standards from organisations like the Clinical and Laboratory Standards Institute and the European Committee on Antimicrobial Susceptibility Testing are not frequently | | | |
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| | | | | | | | | | employed. Standards for surveillance are not universally accepted in all nations. National data are frequently restricted to proportions of resistant bacteria, even though reporting the percentage of resistant bacteria causing specific diseases or affecting identified | | | |
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| | | | | | | | | | groups is preferred. Despite the software's free availability and ease of use, WHONET is not frequently used to track patterns of resistance. According to data acquired by the WHO regional office, the infrastructure and general state of the nation's health laboratorie | | | |
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| | | | | | | | | | | s have an impact on how well surveillance is conducted. | | | |
| 38 | Garg et al, 2018 | Review | The aim of this paper was to assess | India, Nepal, Banglad esh, Myanm | NR | NR | NR | NR | NR | By leveraging the capabilities of a few | Polio, AFP | Inconsisten t and incomplete data from all | Two facilities in India (Hyderaba d and |

| | | | the supplementary role of ES in the ongoing AFP surveillance and highlight the current challenges in expansion of ES in the WHO South-East | ar, Thailand | | | | | | chosen polio laboratories from the Global Polio Laboratory Network's 16 existing facilities in the area, laboratory support for ES was established. | | administrative levels, | Patna) and one in Nepal also do sewage concentration solely, and the laboratories support viral isolation, intratypic discrimination, and genomic sequencing of poliovirus isolates from sewage sludge. |
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| 39 | Njelesani et al, 2014 | Qualitative and Quantitative assessment study<br><br>Mixed method study | To use available evidence to describe the optimal capacities needed at each of laboratory if they were to achieve the goal.<br><br>To develop a set of assessment and monitoring collection tools that would enable us to assess what | Sri Lanka | NR | NR | NR | NR | NR | The laboratory has a respectable workforce, access to research funding, and regional and national partnerships. | Lymphatic Filariasis | Financial issues for NTD research.<br><br>Absence of safety mechanisms and paperwork for quality assurance. | NR |
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| | | | capacity gaps needed addressing if laboratories were to achieve optimal capacity and | | | | | | | | | | |
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| | | | To develop a capacity strengthening action plan to address the gaps and indicators that would enable us | | | | | | | | | | |

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| | | | to monitor progress as capacity gaps were addressed | | | | | | | | | |
| 40 | Vijay et al, 2021 | Cross-sectional study | to assess the prepared ness of veterinary laborator ies in India to participat e in an integrate d | India | NA | NA | NA | NA | NA | establishe d animal laboratorie s for AMR surveillanc e, although these laboratorie s are not currently integrated with the human. | AMR | NR | NR |

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| | | | antimicrobial resistance surveillance network | | | | | | The veterinary and environmental sectors have limited capability for antibiotic susceptibility testing, human sources | | | |

**Table S4: List of Surveillance system found in the studies**

| S.No. | Name of Surveillance system | Country | Type of surveillance 1.Active 2.Passive 3.Sentinel 4.Special Surveys | Level of surveillance 1.District 2.State 3.national | Mode of surveillance 1.Paper based 2.Electronic | Laboratory component | Diseases Captured |
|---|---|---|---|---|---|---|---|
| 1 | Global Antimicrobial Surveillance System (GLASS) | All southeast Asian countries are participants along with other countries from different region. | sentinel | Local to country-level data collection | According to the national AMR surveillance system protocol, participating surveillance sites regularly submit data to the NCC using data management software or paper forms. NFPs are required to submit aggregated AMR data for the prior year as | NRLs provide information on isolates from over 700 sentinel laboratories spread across the member nations.<br><br>When isolates have atypical kinds of AMR, the network laboratories issue an alarm (referred to as "event-driven surveillance" here). | AMR |

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| | | | | well as details about the status of their surveillance system to the GLASS-IT platform.<br><br>Once a year, GLASS requests data from countries. | The quality of test reagents and test performance are ensured by a number of standard assessment processes in each of the participating sentinel laboratories. Each NRL acts as an external quality control programme to guarantee the performance standards of sentinel laboratories around the country. | |
| 2 | Child Health and Mortality Surveillance Network(CHAMPS) | Bangladesh, Ethiopia, Kenya, Mali, Mozambique, Sierra Leone, and South Africa | Local to national | NR | NR | Pathology and High Consequence Pathogens Division The major pathology lab for CHAMPS is DHCPP's Infectious Disease Pathology Branch, which examines specimens by histology for signs of infectious or other disorders and conducts tissue-based diagnostic tests. | causes of stillbirth and death in children under five |
| 3 | National Rotavirus Surveillance Network(NRSN) | India | Website not found | | | | |
| 4 | Health and Demographic | Grey Literature | | | | | |

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|---|---|---|---|---|---|---|---|
| | Surveillance sites(HDSS) | not found | | | | | |
| 5 | National Antibiotic Surveillance Network | Nepal | NR | Local to national level | NR | The National Public Health Laboratory (NPHL) has evolved with the current network of 20 laboratories encompassing all five regions of the nation, and it has added eight pathogens of relevance. | AMR |
| 6 | Global Influenza Hospital Surveillance Network (GIHSN) | India Nepal and other 16 countries | Active and special survey* | Local to national | NR | Samples sent to reference laboratories | Influenza |
| 7 | Invasive Bacterial Infection Surveillance'(IBIS) | No grey literature found | | | | | |
| 8 | Alliance for Surveillance of Invasive Pneumococci' (ASIP), | No grey literature found | | | | | |
| 9 | Asian Network for Surveillance for Resistant | 14 Asian Countries- India, Indonesia, Malaysia, Korea, | Multiple study surveillance study | Local to country | NR | NR | AMR |

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| | Pathogens' | Thailand, and Srilanka (searo) | | | | | |
| 10 | Pan Asia Epidemiologic Surveillance Network | No Grey literature found | | | | | |
| 11 | Antimicrobial resistance Surveillance System (AMASS) | NR | NR | NR | Electronic | Microbiology data from hospitals are transferred to the system | AMR |
| 12 | Hospital Based Sentinel Surveillance for Bacterial Meningitis (HBSSBM) | No Grey literature found | | | | | |
| 13 | Enhanced Gonococcal Antimicrobial Surveillance Programme (EGASP) | WHO- GLASS member states | Sentinel | Country-level | A standardized abstraction form will be used to record information about the fields (as developed by the EGASP country). The EGASP samples and these results will subsequently be sent | EGASP reference laboratories assist EGASP sentinel clinics by performing culture and antibiotic susceptibility tests in accordance with the EGASP methodology and laboratory SOPs. | Gonococcal Antimicrobial Resistance |

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| | | | | to the reference laboratory (s).<br><br>The EGASP coordinator must receive all patient and laboratory data no later than two months following the end of the month in which the corresponding isolates were obtained.<br><br>Utilizing information technology solutions that have already been adopted and put into place at the national level, data can be digitalized.<br><br>(Paper as well as electronic) | | | |
| 14 | Hospital-based sentinel surveillance for Streptococcus pneumoniae and other invasive bacterial diseases in India (HBSSPIBD) | India | No grey literature found | | | | |

| 15 | WHO's Gonococcal Antimicrobial Surveillance Programme (GASP) | India, Indonesia, Malaysia, Sri Lanka, Thailand and other countries | NR | Regional to country | NR | Regional coordinating centres oversee the GASP global network of laboratories. VMMC and Safdarjang Hospital are the WHO GASP South-East Asia Regional Reference Laboratory locations in New Delhi, India. | Gonococcal antimicrobial resistance |
|---|---|---|---|---|---|---|---|
| 16 | WHO Invasive Bacteria -Vaccine Preventable Disease Surveillance Network | No grey literature found | | | | | |
| 17 | WHO Global Influenza Surveillance and Response System (WHO GISRS | 123 WHO Member States: | Active global system | Regional to country level | Report weekly to flunet | Comprises of 4 Essential Regulatory laboratories (ERL) and 13 WHO H5 Reference Laboratory | Influenza |
| 18 | Hybrid AMR Surveillance system | No grey Literature found | | | | | |
| 19 | AIV surveillance system | No Grey Literature found | | | | | |
| 20 | Severe Pneumonia (SevPn) surveillance system | No grey literature found | | | | | |
| 21 | National Meliodosis | Srilanka | No Grey Literature | | | | |

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| | Surveillance Program | | found | | | |
| 22 | Indian network for surveillance of AMR. | India | NR | Regional to national level | real time online AMR data entry system | The network consists of 16 regional centres (RC). As part of a nationwide network known as Regional Centers (RCs), sixteen regional labs from tertiary care hospitals are supplying data on a set number of isolates for each pathogenic group. | Gram negative non-fermenters, enteric fever pathogens, diarrhea-causing bacteria, staphylococci and enterococci, as well as yeasts (Candida and Cryptococcus spp.) and mycelial fungus (not included in the list of WHO priority |

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| | | | | | | pathogens) (Aspergillus spp. and Zygomycetes spp.). |
| 23 | Bangladesh, Bhutan, India, Nepal, Sri Lanka Malaria Drug Resistance Network (BBINS) | Bangladesh, Bhutan, India, Nepal, Sri Lanka | No Grey Literature found | | | | |

**Table S5: Modifications during COVID-19**

| S.No | Author, year | Design of study | Aim and objective of study | Study Location | Characteristics of Surveillance system | | | | | | Diseases Captured | Gaps and Challenges identified in the system | Modification in the existing system |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Name of surveillance system | Characteristics of surveillance system: 1. Type of surveillance 1.Active 2.Passive 3.Sentinel 4.Special Surveys | Level of surveillance 1.District 2.State 3.national | Mode of surveillance 1.Paper based 2.Electronic | Type of Surveillance system 1.Vertical 2.Integrated | Laboratory component | | | |
| 1. | Potdar et al, 2020 | descriptive epidemiology of COVID-19 cases by time, | | India | COVID-19 Surveillance | Sentinel surveillance for severe acute respiratory infection (SARI) | All the three | Electronic | NR | Indian Council of Medical Research (ICMR) has been leading India's laboratory surveillance | COVID-19 | missing data was high | The testing centres complemented the IDSP and the State Public |

| | | place and person | | | | | | | | testing for COVID-19. In the initial phase, testing for SARS-CoV-2 was conducted through 78 selected national reference laboratories. The ICMR led the expansion of testing capacity by using its existing laboratory network, developing standard protocols and launching an online portal for reporting | | | Health Departments in an effective way to augment the testing capacities for COVID-19 |
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| | | | | | | | | | | The infrastructure for testing included ICMR institutes and partners through the Virus Research and Diagnostics Laboratories (VRDL) Network | | | |
| 2. | Kumar et al, 2020 | Review | his review summarizes various molecular diagnostics methods, technical guidelines, and advanced testing | India | NR | NR | All the three levels | Both | NR | ICMR has scaled up COVID-19 testing laboratories in partnership with DST,DBT, ICAR, CSIR, DRDO, MHRD, medical | COVID-19 | NR | ICMR expanded testing laboratories |

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| | | | strategies adopted in India for laboratory diagnosis of COVID-19 | | | | | | colleges, and private laboratories. As of May 30, 2020, there has been a total of 669 COVID-19 testing labs in India, including 466government laboratories and 203 private laboratories. Of these,480 labs are using RT-PCR-based tests, 134 labs are using TruNat tests, and 55 labs are using CBNAAT-based | | | |

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