AMR surveillance in Kerala: initiative, approach and networks

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Increasing prevalence and dissemination of NDM–1 metallo-β-lactamase in India: data from the SMART study (2009)

Christine Lascols, Meredith Hackel, Steven H. Marshall, Andrea M. Hujer, Sam Bouchillon, Robert Badal, Daryl Hoban, Robert A. Bonomo

GAP-AMR
• 2015

NAP-AMR
• 2017

KARSAP
• 2018
Strategic priorities – KARSAP

1. Improve awareness and understanding of AMR-communication, education, training
2. Strengthen knowledge and evidence base through surveillance and research
3. Reduce infection through effective sanitation, hygiene and infection prevention methods
4. Optimize and regulate the use of antimicrobials in human and animal health

Research priorities
Surveillance

AMR surveillance

HCAI Surveillance
AMR surveillance

- For assessing the burden of AMR & for providing the information for action in support of local, national & global strategies
- Tracks changes in microbial populations
- Permits the early detection of resistant strains of public health importance
- Supports the prompt notification & investigation of outbreaks
- Surveillance findings are needed to guide policy recommendations & to assess the impact of resistance containment interventions
Antibiogram

• Presentation of cumulative AST data from a single institution on an annual basis.
• Monitor resistance trends
• Reveal emergence of potential novel resistance mechanisms.
• Aid clinicians in empiric treatment of infections
• CLSI guidelines [M 39-A 4]- for preparation of cumulative antibiograms.
Activities

• Strengthening & standardization of Microbiology labs.

• Establishing a nodal centre for HCAI surveillance and training at MCH TVM.

• Whole genome sequencing of colistin resistant isolates in kerala-RGCB
AMR surveillance – Kerala

1. GMC Trivandrum
2. GMC Kozhikode
3. GMC Thrissur
4. GMC Kottayam
5. GMC Alappuzha
6. GMC Ernakulam
7. GMC Manjeri
8. GMC Kollam
9. GH Ernakulam
10. State PH Lab, Trivandrum
AMR surveillance

- Based on National Policy for Control of AMR, 2011 & National Action Plan on AMR (NAP-AMR) 2017-21

Identification of infections of public health importance for surveillance

1. Blood stream infections (BSIs)
2. Skin and soft tissue infections (SSTI)
3. Respiratory tract infections (RTIs)
4. Urinary tract infections (UTI)
6 pathogens for AMR surveillance

1. Acinetobacter spp
2. E. coli
3. Klebsiella spp
4. Pseudomonas aeruginosa
5. Staphylococcus aureus
6. Enterococcus spp
Hospital acquired infection

Surveillance of antimicrobial resistance/Antibiotic consumption

Cumulative antibiogram (Hospital/Community)

Antibiotic policy

Standard treatment guidelines

Antimicrobial stewardship
## Priority Pathogen Isolates, 2018

<table>
<thead>
<tr>
<th>Priority pathogens</th>
<th>Number of blood isolates</th>
<th>Number of urine isolates</th>
<th>Number of aspirated pus isolates</th>
<th>Number of other body fluid* isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S. aureus</em></td>
<td>67</td>
<td>12</td>
<td>338</td>
<td>3</td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td>75</td>
<td>1281</td>
<td>307</td>
<td>13</td>
</tr>
<tr>
<td><em>Klebsiella species</em></td>
<td>108</td>
<td>474</td>
<td>281</td>
<td>23</td>
</tr>
<tr>
<td><em>Enterococcus species</em></td>
<td>36</td>
<td>64</td>
<td>54</td>
<td>7</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>58</td>
<td>95</td>
<td>105</td>
<td>12</td>
</tr>
<tr>
<td><em>Acinetobacter species</em></td>
<td>110</td>
<td>36</td>
<td>51</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><em>Salmonella – Typhi &amp; Paratyphi</em></th>
<th># Blood isolates</th>
<th># Stool Isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

*Pleural fluid, CSF, synovial fluid, ascites
Carbapenem resistance (India)

- Acinetobacter spp: 70
- E. coli: 12
- Klebsiella spp: 51
- Pseud. aeruginosa: 42
Gram positives

Resistance (India)

MRSA 47
VRE 12
ESBL production

% ESBL producers Kerala 2017  % ESBL producers Kerala 2018
% ESBL producers India

Acinetobacter spp  E. coli  Klebsiella spp  Pseudomonas aeruginosa
Carbapenem resistance

- Carbapenem resistance Kerala 2017
- Carbapenem resistance Kerala 2018
- Carbapenem resistance in India

- Acinetobacter spp
- Ecoli
- Klebsiella spp
- Pseudomonas aeruginosa
Gram positives

- MRSA
- VRE

<table>
<thead>
<tr>
<th>Location</th>
<th>Year</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerala</td>
<td>2017</td>
<td>40%</td>
</tr>
<tr>
<td>Kerala</td>
<td>till 2018</td>
<td>30%</td>
</tr>
<tr>
<td>India</td>
<td></td>
<td>50%</td>
</tr>
</tbody>
</table>
National AMR surveillance network

• Submit 1% of bacterial isolates on quarterly basis to NCDC for quality control testing
• Vancomycin, Carbapenem & Colistin resistant isolates – molecular characterization
• Share HAIs surveillance data - ready to join National HAI surveillance network.
• Share antimicrobial consumption data.
• Preserve the isolates for future need
<table>
<thead>
<tr>
<th>Condition</th>
<th>Likely Causative Organisms</th>
<th>Empiric antibiotics (presumptive antibiotics)</th>
<th>Alternative antibiotics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute uncomplicated Cystitis</td>
<td><em>E. coli</em>, <em>Staphylococcus saprophyticus</em> (in sexually active young women), <em>Klebsiella pneumoniae</em></td>
<td>Nitrofurantoin 100 mg BD for 7 days or <em>Cotrimoxazole</em> 960 mg BD for 3-5 days or Ciprofloxacin 500 mg BD for 3-5 days</td>
<td>Cefuroxime 250 mg BD for 3-5 days</td>
<td>Get urine cultures before antibiotics &amp; modify therapy based on sensitivities.</td>
</tr>
<tr>
<td>Acute uncomplicated Pyelonephritis</td>
<td><em>E. coli</em>, <em>Staphylococcus saprophyticus</em> (in sexually active young women), <em>Klebsiella pneumoniae, Proteus mirabilis</em></td>
<td>Amikacin 1 g OD IM/IV or Gentamicin 7 mg/kg/day OD (Monitor renal function closely and rationalise according to culture report) Complete total duration of 14 days</td>
<td>Piperacillin-Tazobactam 4.5 g IV 6 hourly or Cefoperazone-Sulbactam 3 g IV 12 hourly or Ertapenem 1 g IV OD</td>
<td>Urine culture and susceptibilities need to be collected before starting antimicrobial treatment to guide treatment.</td>
</tr>
<tr>
<td>Clinical Condition</td>
<td>Common Pathogens</td>
<td>Empiric AMA</td>
<td>Alternate AMA</td>
<td>Comments</td>
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<tr>
<td>-------------------------------------------</td>
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<tr>
<td>Acute Cystitis (in absence of cultures)</td>
<td><em>E. coli</em>, <em>Proteus sp</em></td>
<td><em>Nitrofurantoin</em> 100 mg <strong>BD</strong> for 7 days</td>
<td><em>Cefuroxime</em> 250 mg <strong>BD</strong> for 3-5 days</td>
<td><em>Staphylococcus saprophyticus</em> (in sexually active young women) but not common in India. In pregnancy the duration of treatment is longer</td>
</tr>
<tr>
<td></td>
<td><em>Klebsiella sp.</em></td>
<td><em>Cotrimoxazole</em> 500/125 mg <strong>BD</strong> for 3-5 days</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td><em>Ciprofloxacin</em> 500 mg <strong>BD</strong> for 3-5 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute Pyelonephritis (individualized based on data from each center) If blood culture is positive, a carbapenem is preferred)</td>
<td><em>E. coli</em>, <em>Klebsiella sp</em></td>
<td><em>Piperacillin tazobactam</em> 4.5 gm <strong>IV</strong> 6 hourly for 10 days</td>
<td><em>Imipenem</em> 500 mg <strong>IV</strong> 8 hourly for 10 days or</td>
<td>Urine and blood culture should be done before start of treatment.</td>
</tr>
<tr>
<td></td>
<td><em>Proteus sp S. aureus</em></td>
<td><em>Ertapenem</em> 1 g <strong>IV OD</strong> for 7 days</td>
<td>*Inj Amikacin 5 mg/kg <strong>IV</strong> once daily x 10 days</td>
<td>Amikacin 1gm <strong>OD IV or Gentamicin 7 mg/kg</strong> as prescribed doses. Close monitor on renal parameters is needed and watch out for</td>
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</tbody>
</table>
KARS-Net objectives

• Foster standardization, strengthening and expansion of AMR surveillance in Kerala
• Analyse and report KARS-Net data to State Government and NCDC on regular basis
• Contribute towards the estimation of extent, burden and monitoring of AMR in Kerala
• Detect emerging resistance and its spread in Kerala
KARS-Net prerequisites

A. Essential

• Regular documentation of internal quality control (IQC) for antimicrobial susceptibility testing using standard strains and media

• Continuing participation in Microbiology EQAS for at least last 2 years, with minimum 75% score in identification/susceptibility testing

• Willingness to participate and share AMR data with KARS-Net
KARS-Net prerequisites

B. Desirable

• Accreditation of laboratory or institute by National Accreditation Board for Testing and Calibration Laboratories (NABL) or National Accreditation Board for Hospitals & Healthcare Providers (NABH)

• Regular generation of institutional antibiograms

• Using WHONET or other laboratory software to capture AMR data electronically
Future activities

• 10 more institutions shall be inducted into KARS-NET from the list of institutions & labs in Kerala, based on their capacity for AMR testing & Surveillance- assessed using-

• The initial focus of surveillance in KARS-NET shall be bacterial drug resistance

• Key staff from participating institutions shall be trained for
  a) Standardized AST
  b) Data management- WHONET training
  c) Development of antibiograms
  d) Preparation of SOPs for all procedures
The Pareto Principle – why you shouldn’t focus on everything

The Pareto Principle

by Vilfredo Pareto

The Secret to Success by Achieving More with Less

The 80/20 Principle

The Secret to Achieving More with Less

Richard Koch
HAI SURVEILLANCE

• Investing in infection control is the need of the hour. 1 dollar spent on IPC translates to 246 dollars saved in patient care*

• HAI surveillance data – VAP, CAUTI, CLABSI, SSI – link nurses from ICUs

• DME – conducted 1 week workshop & training for nurses of all MCHs in IPC & HAI rate calculation – link nurses

* Study by Sanjeev Singh, et al from AIMS
VAP Metrics MDICU 2018

- NHSN
- INICC
- MCH TVPM

Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec
---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----
1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1

- 1.1
- 35.2
- 30.4
- 25.6
- 22.7
- 21.2
- 40.5
- 16.5
- 16.5
- 16.5
- 16.5
- 16.6
- 15.2
- 16.5
- 12.3
- 15.6
- 15.6
- 14.2

MCH TVPM
Don’t judge each day by the harvest you reap but by the seeds you plant.

ROBERT LOUIS STEVENSON
NOVELIST/POET (DECEASED 1894)
SMALL GROUP LEARNING
“ALONE WE CAN DO SO LITTLE; TOGETHER WE CAN DO SO MUCH.”
- Helen Keller

Thank you