BASELINE INFORMATION FOR THE IMPLEMENTATION OF INDOOR RESIDUAL SPRAYING: THE NIGERIA EXPERIENCE

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OUTLINE

• Background
• Objectives of the baseline data collection
• Methodology
• Outcome and Implication
• Key points
Background

• Indoor Residual Spraying (IRS) is a highly effective method of malaria control

• IRS remains underutilized in many parts of Africa including Nigeria. (why?)

• In the quest to reduce the malaria burden, Nigeria adopted Integrated Vector Management (IVM) in 2006

• IRS is a key component of IVM and its Effective Implementation requires evidence-based information
Vector behaviour
- Endophilic/Exophilic
- Endophagic/Exophagic

Susceptibility status of local malaria vector to IRS Insecticide
- Susceptibility
- Resistance
- Choice of Insecticide

Housing and surfaces
- Housing types
- Sprayable surfaces (mud, plastic, concrete, bamboo etc.)

Human behaviour and practices

Sustainability
Objective of the baseline data collection

- Provide information on the local malaria vectors in specific sites
  - Vector resting behaviour
  - Vector susceptibility status to public health insecticides

- Assess the bio and residual efficacy of IRS insecticides

- Determine the feasibility of IRS in specific setting
Methodology

Gombe (N-E)
Plateau (N-C)
Lagos (S-W)

Presentation to focus on the Lagos sites
Evidence based information for IRS implementation

KAP study

Pilot IRS & Evaluation

Entomological studies

Insecticide susceptibility tests
The success of a community-based interventions depend on belief, perception, acceptance of intervention

Data capture tools include:
- Semi-structured questionnaire
- Key informant interview
- Focus group discussions

<table>
<thead>
<tr>
<th>Site</th>
<th>Type of structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ikorodu</td>
<td>Modern houses (&gt; 80%) concrete blocks with corrugated iron sheet &amp; ceilings</td>
</tr>
<tr>
<td>Badagry</td>
<td>Modern houses (&gt; 80%) concrete blocks with corrugated iron sheet &amp; ceilings</td>
</tr>
<tr>
<td>Ojo</td>
<td>Modern houses (&gt; 90%) concrete blocks with corrugated iron sheet &amp; ceilings</td>
</tr>
</tbody>
</table>

Findings

Implication

✓ Housing type and structure adequate for IRS
✓ Belief and practices unlikely to affect spray surfaces (> 90%)
✓ High level of awareness and willingness to participate in a proposed pilot IRS
Entomological Studies

Malaria Vector species

Malaria Vector behaviour

Insecticide susceptibility/resistance
<table>
<thead>
<tr>
<th>Site</th>
<th>Type of structure</th>
<th>Major malaria Vector species</th>
<th>Resting &amp; feeding behaviour</th>
<th>Average daily IRD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ikorodu</strong></td>
<td>Modern houses (&gt; 80% ) concrete blocks with corrugated iron sheet &amp; ceilings</td>
<td><em>An. gambiae s.s</em> &gt;95%</td>
<td>Endophilic Endophagic</td>
<td>25</td>
</tr>
<tr>
<td><strong>Badagry</strong></td>
<td>Modern houses (&gt; 80% ) concrete blocks with corrugated iron sheet &amp; ceilings</td>
<td><em>An. gambiae s.s</em> (73%)</td>
<td>Endophilic Endophagic</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>An. arabiensis</em> (21%)</td>
<td>Partly endophilic Mainly exophagic</td>
<td>5</td>
</tr>
<tr>
<td><strong>Ojo</strong></td>
<td>Modern houses (&gt; 90% ) concrete blocks with corrugated iron sheet &amp; ceilings</td>
<td><em>An. gambiae s.s</em> (56%)</td>
<td>Endophilic Endophagic</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>An. arabiensis</em> (31%)</td>
<td>Partly endophilic Exophagic</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>An. nili</em> (12%)</td>
<td>Endophilic Endophagic</td>
<td>2</td>
</tr>
</tbody>
</table>
## Insecticide susceptibility Status

<table>
<thead>
<tr>
<th>Site</th>
<th>Insecticide tested</th>
<th>Number of Anopheles exposed</th>
<th>24 hrs post Exposure mortality</th>
<th>Susceptibility /resistance status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ikorodu</td>
<td>Deltamethrin</td>
<td>100</td>
<td>100</td>
<td>Susceptible</td>
</tr>
<tr>
<td></td>
<td>Lambdacyhalothrin</td>
<td>100</td>
<td>100</td>
<td>Susceptible</td>
</tr>
<tr>
<td></td>
<td>DDT</td>
<td>100</td>
<td>75</td>
<td>Resistance</td>
</tr>
<tr>
<td></td>
<td>Bifenthrin</td>
<td>100</td>
<td>98</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Badagry</td>
<td>Deltamethrin</td>
<td>100</td>
<td>100</td>
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<td>100</td>
<td>100</td>
<td>Susceptible</td>
</tr>
<tr>
<td></td>
<td>DDT</td>
<td>100</td>
<td>70</td>
<td>Resistance</td>
</tr>
<tr>
<td></td>
<td>Bifenthrin</td>
<td>100</td>
<td>95</td>
<td>Resistance suspected</td>
</tr>
<tr>
<td>Ojo</td>
<td>Deltamethrin</td>
<td>100</td>
<td>98</td>
<td>Susceptible</td>
</tr>
<tr>
<td></td>
<td>Lambdacyhalothrin</td>
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<td>99</td>
<td>Susceptible</td>
</tr>
<tr>
<td></td>
<td>DDT</td>
<td>100</td>
<td>65</td>
<td>Resistance</td>
</tr>
<tr>
<td></td>
<td>Bifenthrin</td>
<td>100</td>
<td>93</td>
<td>Resistance suspected</td>
</tr>
</tbody>
</table>
Pilot IRS: 100 structure per village (about 80%)

<table>
<thead>
<tr>
<th>Site</th>
<th>Insecticide Sprayed</th>
<th>Number of Structures Enumerated</th>
<th>Period of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ikorodu</td>
<td>bifenthrin (Bistar 10 WP)</td>
<td>100</td>
<td>June to October (6months)</td>
</tr>
<tr>
<td>Badagry</td>
<td>Lambdacyhalothrin (ICON 10 CS)</td>
<td>100</td>
<td>June to October (6months)</td>
</tr>
<tr>
<td>Ojo</td>
<td>Deltamethrin (K-Othrine WG 250)</td>
<td>100</td>
<td>June to October (6months)</td>
</tr>
</tbody>
</table>
Assessment:

- Quality of spray *(Spot check)*
- Insecticide Bio-efficacy *(WHO Bioassay cone test)*
- Residual effect *(over 6 months)*
Figure 1: Average mosquito indoor resting density prior to and during a six month of IRS evaluation in houses sprayed with ICON 10CS, K-Othrine WG 250 and Bistar10 WP
Figure 2: Residual efficacy of ICON 10CS, K-Othrine WG 250 and Bistar10 WP on wall surfaces during a six month evaluation in sprayed houses using the Kisumu reference strain of *Anopheles gambiae s.s.*
Key Points

Significance of research

- The investigation highlighted the need for adequate baseline information prior to IRS intervention
- Susceptibility of the local mosquito to bifenthrin in WHO test did not guarantee the efficacy of Bistar 10 WP
- IRS with K-Othrine and Icon 10 CS was well accepted, but the use of Bistar 10 WP was rejected by the community

Current research trend

- Establishment of sentinel sites for resistance monitoring and Vector surveillance (etc)
- Assessment of the cost effectiveness of combination of IRS with LLINs

Private sector involvement

- Study initiated by the public sector (NMCP), supported by RBM partners
- IRS implementation: a joint venture
THANK YOU