ABCdr - A retrospective evaluation of LLIN durability after 2-4 years in Tanzania

Lena M. Lorenz1*, Sarah J. Moore2,3, Dennis J. Massue2,4, Zawadi Mageni1,3, Renata Mandike5, John Bradley1, William N. Kisinya4, Jason D. Moore1,3, Hans J. Overgaard6

1London School of Hygiene & Tropical Medicine, London 2Swiss Tropical and Public Health Institute, Basel 3Takara Haile Institute, Bagamoyo 4National Institute for Medical Research, Muheza 5National Malaria Control Programme, Dar es Salaam 6Norwegian University of Life Sciences, Ås
lena.m.lorenz@gmail.com

Introduction

Long-Lasting Insecticidal Nets (LLINs) are the mainstay of malaria control. However, despite many National Malaria Control Programs adopting universal LLIN coverage, the effective life of nets under user conditions – LLIN durability – is largely unknown. Olyset® nets were provided for free to children under 5 in 2009/2010 and to the general population in 2010/2011 in Tanzania.

Methods

Four aspects of LLIN durability were investigated in nets from 3,420 households in 8 districts in Tanzania.

- Attrition: net loss through discarding or re-using
- Bioefficacy: knock-down or mortality of Anopheles mosquitoes
- Chemical content: g/kg pyrethroid in net fibres
- Degradation: number, size and location of holes

All nets were collected from households, and a questionnaire was administered. BCD components were measured in a sub-sample of 200 identified campaign nets.

Results

A Component - Attrition

Fig. 3 Percentage net loss (± 95% CI) of Olyset® campaign nets by month since distribution and district. Attrition was calculated from number of light – blue Olyset nets collected and reported number of campaign nets received.

D Component – physical Degradation (200 nets sampled)

Table 1 Number and percentage of 2, 3 and 4 year old Olyset® nets failing a sub-set of WHO durability criteria. Mosquito mortality is only shown for WHO cone bioassays, a less accurate bioefficacy indicator for permeant-based LLINs than WHO tunnel tests.

<table>
<thead>
<tr>
<th>Component</th>
<th>No Holes</th>
<th>With Holes</th>
<th>Servicable</th>
<th>Unservicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attrition</td>
<td>12% (24)</td>
<td>88% (176)</td>
<td>24% (51)</td>
<td>26% (47)</td>
</tr>
<tr>
<td>Degradation</td>
<td>39% (78)</td>
<td>39% (78)</td>
<td>12% (24)</td>
<td>88% (176)</td>
</tr>
</tbody>
</table>

B + C Components – Bioefficacy

Table 1 Number and percentage of 2, 3 and 4 year old Olyset® nets failing a sub-set of WHO durability criteria. Mosquito mortality is only shown for WHO cone bioassays, a less accurate bioefficacy indicator for permeant-based LLINs than WHO tunnel tests.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>4 years (n=24)</th>
<th>3 years (n=122)</th>
<th>2 years (n=46)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;80% Anopheles 24hr mortality (WHO cone tests)</td>
<td>20 (83.3%)</td>
<td>98 (80.3%)</td>
<td>31 (64.6%)</td>
<td>149 (75.3%)</td>
</tr>
<tr>
<td>&lt;15.0 g/kg permethrin content (HPLC)</td>
<td>9 (37.5%)</td>
<td>28 (23.3%)</td>
<td>5 (10.4%)</td>
<td>42 (21.9%)</td>
</tr>
<tr>
<td>“Too torn” 1</td>
<td>13 (54.2%)</td>
<td>42 (34.4%)</td>
<td>21 (43.8%)</td>
<td>76 (39.2%)</td>
</tr>
</tbody>
</table>

1using hole counts, pHi >643 & hole surface area >790cm²

Preliminary Findings

- Age range of Olyset® nets tested: 2 – 4 years
- Most nets in houses in Tanzania are still Olyset® campaign nets
- Loss of Olyset® campaign nets ranges from 29 – 41% depending on time since distribution
- 39% of nets still present “too torn” to be useful against malaria
- 75% of nets did not pass the WHO cone 24 hour mortality test – WHO tunnel test results pending
- 22% of nets contained less permethrin within fibres than recommended by WHO for new nets

References


WHO (2013). Guidelines for laboratory and field testing of long-lasting insecticidal nets. WHO/DTPA/2013.1


Submitted to BMAC Public Health