Burden of disease in neonatal units in Nigeria and Kenya

Helen Nabwera, Dingmei Wang, Olukemi Tongo, Alison Talbert, Walter Otieno, Chinyere Ezeaka, Zainab Imam, Dominic Umoru, Isa Abdulkadir, Stephen Allen

19th September 2019
Causes of under 5 mortality

- Deaths among children aged 1–59 months (54%)
  - Pneumonia, 13%
  - Other, 12%
  - Congenital, 4%
  - Intrapartum-related events, 1%
  - Preterm birth complications, 2%
  - Meningitis, 2%
  - AIDS, 1%
  - Malaria, 5%
  - Injury, 6%
  - Measles, 1%
  - Diarrhoea, 8%

- Neonatal deaths (46%)
  - Preterm birth complications, 16%
  - Intrapartum-related events, 11%
  - Sepsis or meningitis, 7%
  - Other, 3%
  - Congenital, 5%
  - Tetanus, 1%
  - Diarrhoea, 0.3%
Aim

• To describe burden of disease among sick newborns in tertiary and secondary level neonatal units in Nigeria and Kenya.
Objectives

• To develop a shared anonymised database of key clinical variables across the Network.

• To characterise the population and burden of disease in all 7 neonatal unit admissions.
  - Identify research priorities
  - Basis for quality improvement

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Location of Neonatal Units

NMR 33

NMR 21

Moindi et al, 2016; Adedokun et al, 2019
Regional workshops

Ibadan, Nigeria

Kisumu, Kenya

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Study design

• Multi-centre cross-sectional study.

• 7 neonatal units in sub-Saharan Africa (2 secondary level, 5 tertiary level hospitals).

• Period of 6 months.
Study population

- All admissions to the neonatal units over a 6 months period.
- August 2018 - May 2019: timing ethics approval varied across the Network units.
- Inclusion criteria:
  - < 48 hours of admission.
Data collection

• Manual data collection:

  ❑ Case report form

  ❑ Diagnostic criteria for common neonatal conditions:
    o Neonatal sepsis
    o Birth asphyxia
    o Respiratory conditions
    o Abdominal conditions
Data management and analysis

• Research Electronic Data Capture (REDCap) database.

• Data manually entered into database by data clerks at respective units.

• Data Manager LSTM reviewed data for errors and liaised with units on queries.

• Stata version 15.0.

• Logistic regression to determine predictors of mortality.
Maternal details

Demographics
• Mean maternal age, 29 years (SD 6.2)
• Majority married, 2568 (93%)
• Unemployed/housewife, 1018 (37%)
• Completed tertiary level education, 997 (37%)

Health
• Attended <4 antenatal clinics, 915 (34%)
• HIV positive, 136 (5%)
• Hep B positive, 37 (3%)
• Syphilis, 3 (<1%)
• Pregnancy induced hypertension, 408 (15%)
• Antepartum haemorrhage, 171 (6%)
• Gestational diabetes, 38 (2%)
Birth details

• Most births were facility-based 2613 (91%).
• Vaginal unassisted deliveries, 1596 (56%).
• Median gestation, 37 weeks (IQR 33, 39).
• Mean birth weight was 2.4 kg (SD 0.9).
• Low birth weight infants (<2.5kg), 1292 (50%).
# Morbidity and mortality according to birth weight and gestation

<table>
<thead>
<tr>
<th>Birth weight/admission weight (g)</th>
<th>Total (%)</th>
<th>Birth asphyxia N₁=593</th>
<th>Sepsis (1 or more episodes) N₂=1205</th>
<th>Abdominal signs N₃=85</th>
<th>Respiratory problems N₄=847</th>
<th>Mortality N (%) N₅=478</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1000</td>
<td>113 (4)</td>
<td>15 (3)</td>
<td>45 (4)</td>
<td>7 (8)</td>
<td>67 (8)</td>
<td>86 (18)</td>
</tr>
<tr>
<td>1000-&lt;1500</td>
<td>384 (13)</td>
<td>29 (5)</td>
<td>173 (15)</td>
<td>17 (20)</td>
<td>197 (23)</td>
<td>143 (30)</td>
</tr>
<tr>
<td>1500-&lt;2500</td>
<td>795 (28)</td>
<td>101 (17)</td>
<td>275 (23)</td>
<td>22 (26)</td>
<td>246 (29)</td>
<td>75 (16)</td>
</tr>
<tr>
<td>2500-4000</td>
<td>1201 (42)</td>
<td>356 (60)</td>
<td>526 (44)</td>
<td>23 (27)</td>
<td>302 (36)</td>
<td>113 (24)</td>
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<tr>
<td>4000-&lt;5500</td>
<td>76 (3)</td>
<td>20 (3)</td>
<td>27 (2)</td>
<td>0</td>
<td>17 (2)</td>
<td>6 (1)</td>
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<tr>
<td>Missing data</td>
<td>299 (10)</td>
<td>72 (12)</td>
<td>140 (12)</td>
<td>16 (19)</td>
<td>18 (2)</td>
<td>55 (11)</td>
</tr>
<tr>
<td>Total</td>
<td>2868</td>
<td>593 (21)</td>
<td>1205 (42)</td>
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</thead>
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<tr>
<td>&lt;28</td>
<td>122 (4)</td>
<td>15 (3)</td>
<td>49 (4)</td>
<td>2 (2)</td>
<td>62 (7)</td>
<td>86 (18)</td>
</tr>
<tr>
<td>28-&lt;32</td>
<td>379 (13)</td>
<td>31 (5)</td>
<td>170 (14)</td>
<td>24 (28)</td>
<td>200 (24)</td>
<td>118 (24)</td>
</tr>
<tr>
<td>32-&lt;37</td>
<td>764 (27)</td>
<td>94 (16)</td>
<td>288 (24)</td>
<td>22 (27)</td>
<td>251 (30)</td>
<td>107 (22)</td>
</tr>
<tr>
<td>37-&lt;42</td>
<td>1435 (50)</td>
<td>393 (66)</td>
<td>615 (51)</td>
<td>35 (41)</td>
<td>282 (33)</td>
<td>138 (29)</td>
</tr>
<tr>
<td>42-&lt;45</td>
<td>94 (3)</td>
<td>40 (7)</td>
<td>39 (3)</td>
<td>1 (1)</td>
<td>34 (4)</td>
<td>12 (3)</td>
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<td>74 (3)</td>
<td>20 (3)</td>
<td>44 (4)</td>
<td>1 (1)</td>
<td>18 (2)</td>
<td>17 (4)</td>
</tr>
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</table>
## Predictors of neonatal mortality

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Adjusted OR</th>
<th>P</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed or housewife</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petty trader/ labourer</td>
<td>1.04</td>
<td>0.855</td>
<td>0.69, 1.57</td>
</tr>
<tr>
<td>Junior schools teachers/drivers</td>
<td>0.74</td>
<td>0.278</td>
<td>0.43, 1.27</td>
</tr>
<tr>
<td>Intermediate public servant/senior school teachers</td>
<td>0.38</td>
<td>0.035</td>
<td>0.16, 0.94</td>
</tr>
<tr>
<td>Senior public servant/ professionals/ large scale traders</td>
<td>0.36</td>
<td>0.041</td>
<td>0.13, 0.96</td>
</tr>
<tr>
<td>Antenatal clinic visits</td>
<td>0.92</td>
<td>0.026</td>
<td>0.87, 0.99</td>
</tr>
<tr>
<td>Birth weight &lt;1.5 kg</td>
<td>4.42</td>
<td>&lt;0.001</td>
<td>2.71, 7.20</td>
</tr>
<tr>
<td>Length on admission</td>
<td>0.91</td>
<td>&lt;0.001</td>
<td>0.86, 0.95</td>
</tr>
<tr>
<td>Congenital anomalies</td>
<td>2.49</td>
<td>0.011</td>
<td>1.23, 5.01</td>
</tr>
<tr>
<td>Asphyxia morbidity</td>
<td>3.45</td>
<td>&lt;0.001</td>
<td>2.26, 5.27</td>
</tr>
<tr>
<td>Respiratory conditions morbidity</td>
<td>1.58</td>
<td>0.015</td>
<td>1.09, 2.30</td>
</tr>
<tr>
<td>Abdominal condition morbidity</td>
<td>3.41</td>
<td>0.001</td>
<td>1.62, 7.19</td>
</tr>
</tbody>
</table>

Abbreviation: OR, odds ratio; 95%CI, confidence intervals; AUC, area under the curve.
Conclusion

• There is a high burden of neonatal (and maternal) illness.

• Nearly half of very low birth weight infants (<1500g) died before discharge.

• The very low frequency of abdominal signs suggests feeds could be introduced earlier which may improve outcomes.
Limitations

• Predominantly tertiary level units:
  ❑ may not be accessible to disadvantaged members of the community,
  ❑ may have identified the sickest neonates who would have been referred
    for tertiary level care and therefore not generalisable to lower levels of
    care for hospitalised neonates in these contexts.

• Not able to establish definitive cause-effect relationships.
Next steps

• Facilitated design of context-relevant nutrition intervention feasibility studies.

• Opportunities for quality improvement in clinical care.

• Continue to build research capacity in child health research.

• Expanding Neonatal Nutrition Network to other sub-Saharan African countries.

• Collaboration with maternal health.

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Dr Grace Nalwa
Dr Martha Mwangome
Dr Alison Talbert

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