Development in children on HAART

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The problem

• In South-Africa, 5.6% of the children, aged 2 to 14 years, have been infected with HIV (Shishana O, Simbayi I. Nelson Mandela/ HSRC study of HIV/AIDS).

• This amounts to approximately 250,000 children. (2001 figures, UNAIDS, 2004)
The problem

- Although prevention of MTC therapy is available, not all mothers are prepared to undergo VTC.
- Bottle feeding is not always a viable option and a 15% transmission rate is estimated (Cohen, 2003)
What is known

Before advent of HAART:

- Prevalence rates of neurological impairment were estimated at between 16-19% (Blanche et al, 1990).
- PE 13 -23% (Lobato et al, 1995).
- Belman et al suggested that over 90% of HIV-infected children will experience neurological symptoms. (1988).
- Social factors such as poverty and maternal depression and stress negatively impact on motor and cognitive development.
What is known

- **Children with HIV demonstrate considerable motor and mental delay.**
  - Uganda (Dotar, 1999), 61 infants with HIV showed lower mental and motor development on the mental and motor scales of the Bayley, followed up over a 24 month period than controls.
  - A study of Boivan et al on Zairian infants from birth to 18 months reported motor deficits on the Denver Developmental Screening test for 514 HIV-infected children in comparison with 520 uninfected children.
  - Also, the results from a follow-up on Rwandan children between 6 and 24 months of age, revealed higher rates of developmental delay, mostly due to gross motor retardation, in 218 HIV-infected children compared with those of 218 controls (uninfected children born to either seropositive or seronegative mothers).
What is known

• School performance
  - 44% of 90 school-age children with HIV were functioning below average to average range of intelligence and 56% had significant language impairments. (Papola et al, 1994).
  - WISC scores and academic achievement below average in older HIV infected individuals (Bachanas, 1998)
The questions

- What is the prevalence of:
  - Motor delay
  - Mental delay
  - Language delay
  - Nutritional problems in children with HIV receiving ART, compared to control children?

“Despite the fact that the number of HIV infected children in South Africa continues to grow, no research on the prevalence of neurological complications in HIV infected children in South Africa could be found” (Eales C.J., Potterton J.L., 2001).
The questions

• Do the motor, mental and language quotients (i.e. performance age/chronological age) improve over time with ART? Conflicting evidence (Brown & Lourie, 2000; Smith’s thesis)

• If the children are delayed, is it a global delay or are certain aspects of motor, cognitive and language specifically vulnerable? (E.g. expressive language may be more affected than receptive – Wolters et al, 1995)
The questions

• What are the best instruments to use for monitoring development? Are certain items in the instruments failed by controls and HIV children?

• What items are sensitive and specific for picking up HIV delay and might be incorporated into a screening instrument?
Mental, motor and language development

• **Motor and mental development**
  - Bayley Motor and Mental Scales (Matyida and Jelsma, Ferguson and Jelsma)
  - Alberta Infant Motor Scales (AIMS) (Peters, Feyes, Jelsma)

• **Language development**
  - Rosetti Infant-Toddler language scale. (Europa, Singh, Jelsma)

• **Nutrition** - Schloss
Our studies

• Quantitative, descriptive, cross-sectional study designs were used to investigate the development of HIV infected children attending the HIV/AIDS clinic and receiving HAART at RXCH and GSH Paediatric Ward.

• Samples of convenience were used.
## Results - Gender

<table>
<thead>
<tr>
<th></th>
<th>Bayley</th>
<th>AIMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Well Baby Clinic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>74</td>
</tr>
<tr>
<td><strong>HAART Clinic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Male</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>39</td>
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</table>
Results - Age

<table>
<thead>
<tr>
<th></th>
<th>N Bayley</th>
<th>Mean age Bayley</th>
<th>SD</th>
<th>N AIMS</th>
<th>Mean Age AIMS</th>
<th>SD</th>
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<tbody>
<tr>
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<td>25.0</td>
<td>8.4</td>
<td>5.3</td>
<td>74</td>
<td>7.13</td>
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t Tests p. Value = .00
# Results - Bayley and AIMS

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<th>Mean Bayley</th>
<th>Std. Dev.</th>
<th>t-Test</th>
<th>N AIMS</th>
<th>Mean AIMS</th>
<th>Std. Dev.</th>
<th>t-Test</th>
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<tbody>
<tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td>13.3</td>
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<td>39</td>
<td>66.3</td>
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<tr>
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<td>93.3</td>
<td>18.2</td>
<td>p.&lt;.01</td>
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<td>91.1</td>
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<td>p.&lt;.01</td>
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</tbody>
</table>
Results - Grades of performance - Bayley

Motor performance

- Accelerated performance
  - GSH: 0
  - Khaye: 4
- Within normal limits
  - GSH: 1
  - Khaye: 13
- Moderate
  - GSH: 6
  - Khaye: 5
- Severe
  - GSH: 27
  - Khaye: 2
- Missing
  - GSH: 0
  - Khaye: 1
Results - Grades of performance

Mental scale

- Within normal limits
- Non-optimal
- Moderate
- Severe
- Missing

GSH
Khaye

11
8
0
0

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## Results – Other variables - AIMS

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Median quotient</th>
<th>IQR</th>
<th>P value</th>
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<tbody>
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<td>64.43-98.90</td>
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<td>52.75</td>
<td>33.37-73.85</td>
<td>.06</td>
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<td>61.72-95.72</td>
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<td>62.13</td>
<td>37.29-78.95</td>
<td>.33</td>
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<tr>
<td>No HAART</td>
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<td>74.42</td>
<td>49.11-93.42</td>
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</tbody>
</table>
Results – Language

Rossetti Language Scale

N=17

Interaction    Pragmatics    Gesture    Play    Comprehension    Expression
Results – Language

Language age over chronological age, N=5

3 monthly intervals

Interaction  Pragmatics  Gesture  Play  Compre.  Express

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Results – Instrumentation

• Items related to body parts – impact because of requirement of obtaining 100%
• Bayley – simple words, e.g. cup ikomityi, apraxia would make it difficult
• Prepositions incorporated into verbs, so difficult to test concept of preposition, eg. Faka means put in and beka put down.
Results – Instrumentation

• Blue and green same word, ihlaza, mothers teach english word. Colours not a focus.
• Lack of toys impacts on play.
• Problems with tenses.
• Counting in English by rote, but concept not clear.
Nutrition - 29 children

- Mean age of children was 30 (+/- 17) months,
- 31% - underweight
- 14% - wasted.
- 69% - stunted,
- Stunted children had less total body water, fat free mass and CD4 counts than children who were not stunted, with no difference in fat mass.
- Mean dietary intakes of folate, vitamin D, vitamin E, calcium, iron, zinc and selenium below 2/3 of RDA.
Discussion

• As expected, the children showed considerable developmental delay, despite the fact that many of them were receiving HAART.

• Results are preliminary studies, need to do long term follow-up with a view to identifying appropriate intervention.
Discussion

• Khayelitsha children perform better on motor scale than mental scale.
• However number of Khayelitsha children who performed very badly. ? High prevalence of HIV in community.
• The BSID, particularly the mental scale will need to be normed if it is to be used with this group of children.
Future questions

• How much of the developmental delay is due to poverty, parental ill health or maternal depression? All are confounding factors.
Unanswered questions

• Does maternal participation in prevention of MTCT programmes impact on the child’s development?
• Does the age at which ART is started impact on the child’s development?
• It is not clear if developmental delay will resolve if treatment continues and this needs to be investigated.
• What type of intervention is most likely to improve the areas in which the children show significant delay?
Conclusion

- There is a whole generation of children who are growing up with HIV and who will need support to enable them to achieve their maximum potential.
- The school system should be provided with information in order to help plan.
Acknowledgements

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Thank You