Cognitive, neurological and adaptive behaviour functioning among children with perinatally-acquired HIV infection

Snehacare Home

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Background

- Number of HIV-infected children born every year in India : 55,000 (NACO, 2009)
- Increased access to ART for children will result in improved survival.
- HIV is now a chronic disease.
- Neurocognitive and behavioral functioning of HIV-infected children: an important area to address.

Existing knowledge

- Early infancy: Delay in motor and mental development.
  - *Drotar D et al. Peds 1997; Chase C et al. Pediatrics 2000.*
- Later childhood: Poorer neurocognitive functioning in comparison to HIV-uninfected children.
  - *Jeremy RJ, et al. Pediatrics 2005; 380-7*
- Impact of ART: improvement in some test scores.
  - *Martin SC, et al. Dev Neuropsychol 2006*
- Other risk factors: malnutrition, poverty, parental illness and death.

Specific Aims

1. To examine the effects of HIV infection on cognitive, neurological, and behavioral functioning on children by comparing these areas in HIV-infected and HIV-uninfected children.

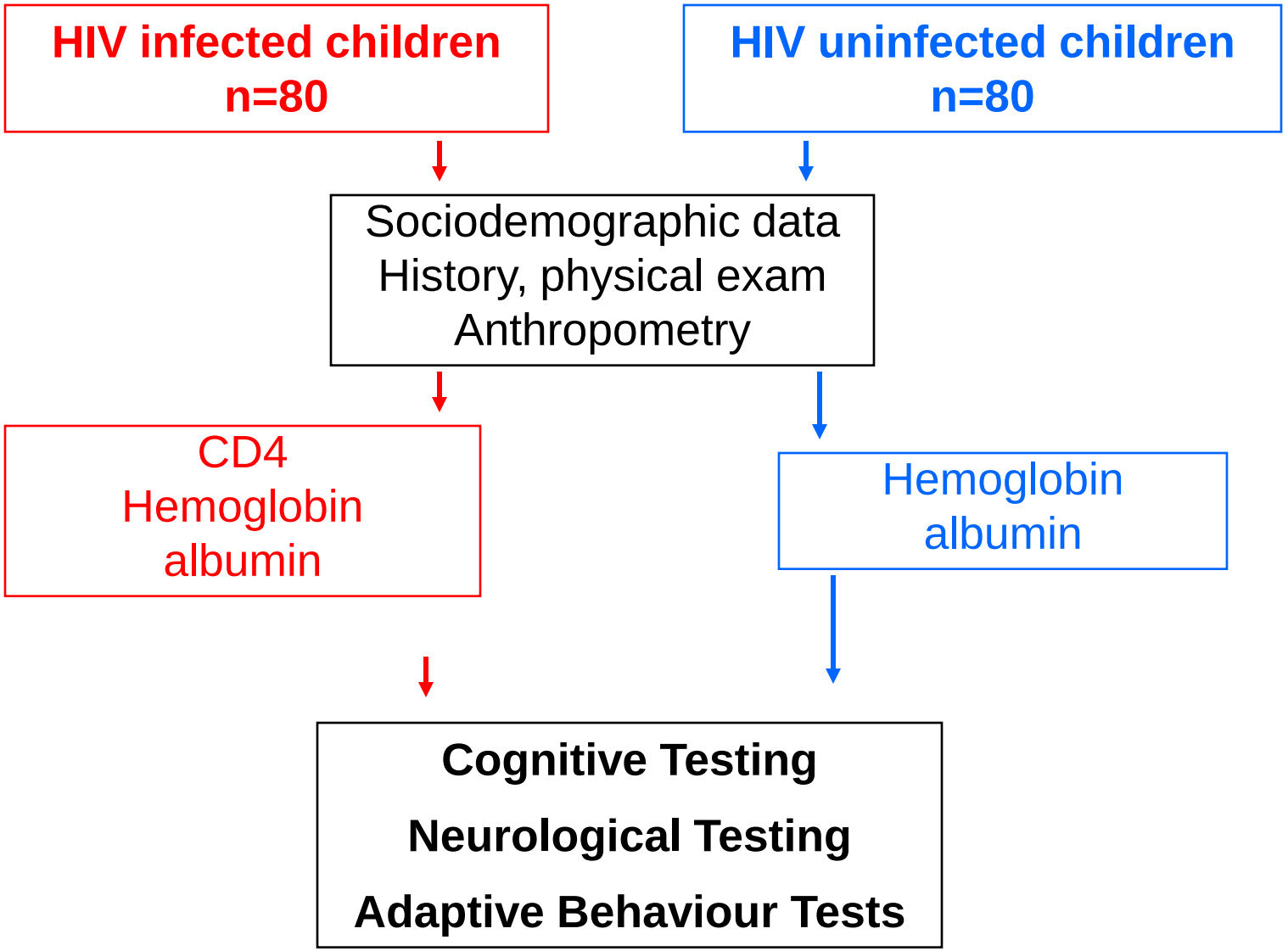
2. To determine whether socio-demographic, clinical, immunological, and treatment status predict adaptive behavior and neurocognitive functioning in HIV-infected children.

Methods

- **Study design:** Pilot cross-sectional study (2009-2010)
- **Setting:**
  - St. John's pediatric infectious diseases clinic.
  - St. John's general pediatric clinic
  - Sneha Care Home and Vishwas Home
- **Inclusion criteria:**
  - Children 4 -16 years
- **Exclusion criteria:**
  - Life-threatening illness or severe opportunistic infections.
  - Known HIV encephalopathy or other progressive neurological disease processes.
- **Sample size:**

  60 in each group. (20% loss) – Total 80 in each group.

Methods


HIV infected children
n=80
HIV uninfected children
n=80
Sociodemographic data
History, physical exam
Anthropometry
CD4
Hemoglobin
albumin
Hemoglobin
albumin
Cognitive Testing
Neurological Testing
Adaptive Behaviour Tests

Specific Testing Tools

Cognitive Testing

- 3.5 to 6 yrs: Wechsler Preschool & Primary Scales of Intelligence (WPPSI)
- 7-16 yrs: Wechsler Intelligence Scale for Children, 3rd Ed (WISC-III) (Verbal and Performance IQ)

Neurological Testing

- Motor, sensory, cranial, cerebellar examinations.
- Soft neurological signs using Physical and Neurological Examination for Soft Signs (PANESS) tool.

Adaptive Behaviour

- Ability to adjust to different situations for day-to-day functioning.
- The Vineland Adaptive Behaviour Scales (VABS) assesses personal and social functioning.

Results: Patient characteristics

Parameters	HIV Positive (82)	HIV Negative (85)	p
Age (yrs)	8.5 ± 2.7	8.7 ± 2.8	0.7
Males (%)	59 (47, 71)	55 (45, 65)	0.7
Orphans (%)	29 (19, 39)	38 (29, 49)	0.2
Income (mean INR per month)	3500	3800	0.4
Parental education (yrs)	9	10	0.1
Underweight (%)	71 (62, 82)	36 (26, 46)	< 0.001*
Stunted (%)	83 (75, 91)	28 (17, 37)	< 0.001 *
Anemia (%)	39 (28, 52)	23 (13, 33)	0.02 *

Soft Neurological signs

PANESS Score	HIV Positive (82)	HIV Negative (85)	p
Total Score	7.5 (3, 13)	4 (2, 10)	0.02*
Age 4-6 yrs	16 (12, 20)	16 (8, 21)	0.8
Age 7-10 yrs	5.5 (3, 9)	3 (1, 5)	0.008*
Age ≥ 11 yrs	3 (1, 6)	2 (1, 5)	0.3
Males	8.5 (5, 16)	5 (2, 10)	0.03*
Females	5 (2, 13)	4 (1, 10)	0.4

- HIV-infected children had higher (worse) scores.
- Difference most marked at ages 7-10 yrs.
- Males with HIV had more abnormal soft neurological signs.

Cognition: IQ Scores

IQ Score	HIV Positive (82)	HIV Negative (85)	p
Total IQ Score	**75 ± 13**	**88 ± 15**	**< 0.001**
IQ Verbal	78 ± 14	90 ± 17	< 0.001
IQ Performance	76 ± 13	87 ± 15	< 0.001
Total IQ Orphans	**75 ± 13**	**89 ± 13**	**< 0.001**
Total IQ Non-orphans	**75 ± 13**	**87 ± 17**	**< 0.001**

- HIV-infected children had lower IQ scores compared to HIV-uninfected children, irrespective of age, sex, orphan status, anemia status

Adaptive behaviour (VAB)

VAB Score	HIV Positive (82)	HIV Negative (85)	p
Total score	94 ± 10	95 ± 13	0.6
Age			ns
Males vs Females			ns
Orphans	96 ± 9	89 ± 10	0.008
Non-orphans	94 ± 10	99 ± 13	0.01

- Adaptive behaviour scores were similar for both HIV-infected and uninfected children – at all ages, and both in males and females.
- Orphans with HIV had higher scores than orphans without HIV.
- Among non-orphans, HIV-infected children had lower scores.

Multivariate regression analysis

Cognition

- Among all factors, HIV status, weight-for-age Z score and Hemoglobin were independent factors that affected IQ scores.

Adaptive behaviour and soft neurological signs

- HIV status had no independent effect

Conclusions

- Both groups were well-matched for age, gender and socio-economic status. Significant difference in nutritional status and anemia prevalence.
- IQ scores: HIV-infected children scored lower compared to HIV-uninfected children.
- Abnormal soft neurological signs: HIV-infected children had higher risk.
- Adaptive behaviour was similar in both HIV-infected and uninfected children. Among orphans, HIV-infected orphans had a better adaptive score than HIV-uninfected orphans.

Study Impact

- Understanding the pathogenesis of neurocognitive changes in HIV infection - early identification.
- Early interventions such as special education, speech therapy, and targeted counseling.
- Model residential facilities for orphaned children which incorporate a holistic approach to childcare can contribute towards improved adaptive behaviour in these children.

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