View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by AJOL - African Journals Online

Niger J Paed 2016; 43 (1): 26 –29

ORIGINAL

Akintan PE
Akinsulie AO
Temiye E
Esezobor C

Anthropometric measurements of HIV-infected children aged one to five years in a tertiary hospital in Lagos Nigeria

DOI:http://dx.doi.org/10.4314/njp.v43i1.5

Accepted: 12th October 2015

Akintan PE (✉)
Department of Paediatrics,
Lagos University Teaching Idi-Araba,
Lagos Nigeria
Email:akintanpatricia@yahoo.com

Akinsulie AO, Temiye E, Esezobor C
Department of Paediatrics,
College of Medicine , University of Lagos and Lagos University Teaching Idi-Araba , Lagos Nigeria

Abstract*: Objectives:* To determine the association between HIV infection and anthropometric measures (weight, height, mid-upper arm circumference and head circumference) of children aged one to five years.
Method: A cross sectional descriptive study using structured questionnaire and measurement of weight, height, head and mid-upper arm circumference of 846 infected children and matched controls.
Results: The mean weights of the controls were significantly higher than those of the infected children at all age groups (p<0.005) while, the controls were significantly taller than the infected children after 49months (p=0.019). The controls had bigger arm than the infected (p=<0.029) while the head circumference was also significantly higher in the controls (p=<0.033) with the difference being more in the children aged less than 3 years.
Conclusion: HIV infection has a profound association with growth being earliest on the head size, followed by weight and then height.

Key words: HIV, children, weight, height, MUAC, head circumference

Introduction

In children under five years of age HIV/AIDS accounts for 7.7% of mortality worldwide[1,2]leading to 19% and 36% rise in infant and under five mortality respectively.[2-5]Gains in child survival attributed to implementation of survival strategies had been severely eroded by increasing mortality for pediatric HIV infections. There is a high level of malnutrition in children in Africa, with one in every under five being malnourished[6,7]. Weng et al [8]studied the association between maternal HIV infection and birth weight and found that HIV infected children weighed less than HIV-negative children born to HIV seropositive mother. The weight of the uninfected babies did not defer significantly from that of the reference population[8]. In the European collaboration study[9], in children of HIV infected mothers; there was no significant difference in length or weight between the infected and non-infected children at birth. Subsequently there was statistically significant difference in both weight and length between the HIV infected children and those who were not[9].The difference in growth was observed to increase after 2 years of age for height and 4 years for weight. HIV-infected children with serious symptoms lagged behind asymptomatic children in both height and weight and the difference was noticed to increase with age.[9]

Anthropometry is widely used in assessing nutritional status. The most common anthropometric measurements used are weights and height/length. Weight is increase in body mass, while height/length signifies increase in skeletal size. Hence, wasting and stunting are deficit in tissue mass and slowing in skeletal growth respectively[11]. Height gain is a much slower process than weight gain, but once attained cannot be lost. A stunted child signifies a chronic condition. A child can lose weight after an acute or chronic illness or might not gain weight appropriately. Other anthropometric measurements include: occipito-frontal circumference OFC), which is an indicator of the size of the head and its content; the mid upper arm circumference (MUAC), an estimation of the soft tissue mass of the arm and an objective index of thinness; MUAC in combination with occipito-frontal circumference; skin folds thickness, which is the measure of tissue fat and; chest circumference which is useful under the age of 3 years usually in combination with head circumference. All these measurements are reported in relation to appropriate standard reference values for the age of the child[11]. In this study, weight, height, mid-upper arm and head circumference were studied as these measurements are widely applicable for the age groups studied. These measurements are easily measurable, non-invasive and can be compared with other studies

Method

The study, a cross sectional one, was conducted in the Paediatrics Department of Lagos University Teaching Hospital over a one year period from June 2009 to July 2010.A total of 846 children HIV infected and non-infected aged 1-5 years were studied. Approval for the study was obtained from the Research and Ethics Committee of Lagos University Teaching Hospital. Written informed consent was obtained from the parents or guardians of the children. Children showing evidence of malnutrition were referred to the dietician for intervention and to the Child Survival Unit of Paediatrics Department for food demonstration. HIV-infected children below the age of five years irrespective of HAART use were recruited consecutively as they presented to the Paediatrics Special Clinic, which provide comprehensive antiretroviral therapy services. Some HIV-infected children were not on HAART as at the time of enrolment either as a result of not being eligible or being worked up for commencement. The controls were recruited from the well-baby clinic (for growth monitoring); paediatrics surgical clinic (children with hydrocoele, or followed up after appendicectomy or herniotomy); immunization clinic and the respiratory clinic (those followed up after treatment for bronchopneumonia) of the hospital. Children with chronic medical condition affecting growth were exempted from the study. For each HIV-infected subjected, one healthy HIV-uninfected control of the same age group, gender and socioeconomic status as the subject was recruited,
For the HIV-infected children already attending the Paediatric Specialist Clinic confirmatory evidence of HIV infection (HIV DNA PCR for those less than 18 months and HIV antibodies for those older than 18 months) was obtained from their case notes. A questionnaire to collect various information about the subjects, controls and parents was used. It was administered by the interviewer, and was designed to answer questions such as HIV status of parents, health of the mother or caregiver, use and duration of antiretroviral drugs.

A focused physical examination of both subjects and control was done. The parameters measured included weight, height/length, occipito- frontal and mid upper arm circumference. Subjects were weighed in kilogram to the nearest 0.1kg using an electronic Seca^{TM} scale. Study participants were weighed barefooted with underwear only. The scale was adjusted and checked for accuracy after every 10 readings by calibration. Height was measured to the nearest centimeter using a graduated panel fixed to the wall. The children were asked to stand erect with body against the wall looking straight ahead, the lower border of the eye socket being in the same horizontal plane as the external auditory meatus[12,13]. The MUAC was measured using a non-stretch tape at a midpoint of the distance between the acromion of the shoulder joint and the olecranium process of the elbow, while occipito-frontal circumference was measured placing the tape at the frontal area just above the eyebrow through to the occiput.[12]All laboratory analyses were done by the laboratory scientists at the PEPFAR/APIN laboratory.

The controls were screened using the immunochromatographic test, which detects HIV antibody, which if present would react with HIV antigen coated on the strip. The test strips used were the Determine^{TM} HIV – 1/29 manufacture by Abbott Laboratories Illinois U.S.A for HIV antibody detection. The parents or guardians received pre- and post-test counseling and the results of the HIV tests were adequately communicated to them.
All data obtained from the study were stored in an access file and were analyzed using the Epiinfo version 3.5.1 in conjunction with the nutritional software NUTSTAT. Measures of central tendency were computed for all quantitative variables like weight, height, occipito-frontal circumference and MUAC. Categorical variable were compared using the chi-square, while continuous variable were analyzed using the student t test. Statistical significant value was taken at $p < 0.05$

Results

Table 1: General characteristics of the children studied

Variables	Subjects n (%) N (%)	Control n (%) n (%)	Total n (%)
Gender			
Male	215(25.4)	208 (24.6)	423(50)
Female	204(24.1)	219(25.9)	423(50)
Age(months)			
12 -24	104(12.2)	107(12.6)	211 (24.9)
25 -36	105(12.4)	108(12.7)	213(25.2)
37 -48	105(12.4)	107(12.6)	212(25.1)
49 -60	105(12.4)	105(12.4)	210(24.8)

There were equal numbers of male and female 423 males and 423 females giving a ratio 1:1. The children were evenly distributed among the various age groups.

Mean Weight and height -for -age

The mean weights and heights with respect to age groups is shown in table 2. The mean weight was consistently higher for all age intervals in the HIV-negative children compared to the HIV-positive children. The controls were taller than the HIV-infected children but this only reached statistical significant level in the age group 46-60 months.

Table 2: Mean weights and Heights of Subjects and Controls

Age-group (Months)	Variable	HIV-positive Mean ± SD	HIV-negative Mean ± SD	T-test	p-value
12-24	Weight (kg)	9.6±1.7	10.1± 1.8	2.52	0.000*
	Height (cm)	76.7±6.7	77.1±6.1	0.27	0.560
25-36	Weight (kg)	12.2± 2.1	13.7± 1.2	3.43	0.007*
	Height (cm)	87.9±6.6	89.2±7.6	0.53	0.262
37-48	Weight (kg)	14.3± 2.6	16. 7 ±1.4	4.65	0.000*
	Height (cm)	94.8±5.9	98.9±6.7	0.93	0.349
49-60	Weight (kg)	16.1± 2.8	18.5 ±2.3	3.38	0.001*
	Height (cm)	104.5±6.6	108.4±7.5	2.36	0.019*

*significant

Mean MUAC and OFC of subjects and controls

Table 3: shows the MUAC and occipito-frontal circumference (OFC) of both groups of children studied. At all at age groups the controls had larger MUAC than the

HIV-infected children. The controls also have higher OFC than the HIV-infected children up to the age of 36 months but afterwards the difference was not statistically significant.

Table 3: Mean MUAC and OFC of the children studied

Age group (months)	Variable	HIV-positive Mean ±SD	HIV-negative Mean ±SD	T test	p-value
12-24	MUAC (cm)	14.2± 3.5	14.5± 1.1	1.53	0.016*
	OFC (cm)	45.2 ± 2.4	47.0 ± 1.9	3.37	0.000*
25-36	MUAC (cm)	14.8± 1.4	15.4± 1.0	5.82	0.000*
	OFC (cm)	48.0± 1.9	48.6 ± 1.6	2.13	0.033*
37-48	MUAC (cm)	15.2± 1.3	16.3± 0.8	7.45	0.000*
	OFC (cm)	48.9± 4.7	49.6 ± 1.6	1.29	0.085
49-60	MUAC (cm)	15.7± 1.1	16.4± 1.0	2.19	0.029*
	OFC (cm)	50.3± 2.1	50.7 ±0.9	3.22	0.398

*significant

Discussion

The weights for age of the HIV infected were significantly lower than that of the control at all age groups. This was similar to other studies[9, 14, 15] which reported that HIV infected children weighed less than the negative control with the difference in weight increasing as the children grew older. This is most likely due to the persistent effect of HIV on the weight of children. The difference in weight was observed to increase with age between the HIV infected children and the controls. There is increase demand and metabolism as children grow, and if intake is inadequate, growth can be impaired. HIV infection cause immune suppression leading to recurrent infection placing an extra demand on the body's requirement.

The mean height of the HIV-infected children was lower than those of the controls at all ages but was only significant after the age of 4years.A similar trend was observed in a study[9] but the difference in height occurred earlier at 2years. This may be due to the prevalence of a high level of stunting in the general population in a country such as Nigeria. This high level of stunting in the general population means that differences in height between HIV-infected children and the general population may not be evident until a much longer period. Height is a much slower process than weight and takes a longer time to become evident; hence, a deficit may not be obvious in a short time. Other studies.[14, 17, 18] also showed that HIV infected children were shorter than their controls.

The mid upper aim circumference of the HIV infected children were significantly lower than those of the control at all age groups. Though there is limited date comparing mid upper arm circumference of HIV infected children with non-infected control, however the finding is similar to a study[19] where infected children had lower mid arm circumference compared to controls implying loss of subcutaneous fat and muscle bulk. The head size of the HIV infected children, was significantly smaller than those of control before the age of 3 years. Rapid brain growth occurs in the first 2years of life and any chronic illness that affects children during these would have a profound effect. This differs from another study[20] where there was no significant difference between HIV infected and controls; this may have been as a result of the difference in care and early commencement of ARV in that study.

This study supports the multi-faceted adverse effects of HIV infection on the growth of the child. Repeated and chronic infections in the presence of immune-suppression in HIV-infected children further worsen postnatal growth[18, 20], as a result about 50% of HIV-infected children die before their second birth day in the era prior to widespread use of antiretroviral drugs in younger children [21]. HIV-infected children were shorter, and weighed less with smaller heads and mid upper arms, being statistically significant levels at different age groups and these were consistent with findings from other studies[9, 16-19, 22-23,] . The conduct of the study in the Paediatric Special Clinic implies early detection of HIV infection in these children and interventions including use of HAART that may have alleviated the adverse effect of HIV infection on malnutrition.

Conclusion

HIV-infected children aged 1-5 years have poorer anthropometric measures of nutrition such as weight, height, MUAC and head circumference when compared to age and sex-matched HIV-negative children. This indicates that malnutrition is more common in HIV-infected children compared to HIV-negative children
Limitation to the study. A prospective study design would have better demonstrated the growth rate of the children with HIV infection.

Authors' contributions
AP Conceived the study and with the others all participated in the study design sample collection analysis of the result and its interpretation. All authors contributed to the discussions. The final draft of this work was jointly approved by all the authors.
Conflict of interest: None
Funding: None

Acknowledgement:

We wish to express our gratitude to all the children, parent and care giver who participated in the study. We also acknowledge al laboratory staff for their commitment and dedication

References

1. UNAIDS Global summary of HIV/AIDS epidemic Updates [Internet] 2008 DEC. [cited Mar 2006] Available from. www.unaids.org/en/HIV_data/epi2008/default. asp.
2. UNAIDS Fact sheet 2007 sub-Sahara Africa UNAID [Internet] 2008Jan [cited Feb 2008] Available from http://www.unaids.org/en/HIV_data/epi2007/default.asp.
3. Tindyebywa et al.The Handbook on Paediatric AIDS in Africa by USAID's Regional Economic Development Services http://www.fhi.org/en/HIVAIDS/pub/guide/ mans1.htm.
4. UNAIDS DEC. 2006 Sub-Sahara Africa, summary of HIV/AIDS epidemic Updates 0-23. www.unaids.org/en/HIV_data/epi2006/default.asp.
5. AIDS Epidemic update. Joint United Nations Programme 0n HIV/AIDS (UNAIDS) and World Health Organization (WHO). 2006 Dec.http://www: WHO. Int./ HIVAIDS. UNICEF. Statistical tables (nutrition). The state of the world's children. New York: Oxford University Press, 2006:104.
7. UNICEF. Statistical tables (basic indicators, nutrition, health, HIV/AIDS, demographic indicators, economic indicators). The state of the world's children. New York: Oxford University Press, 2005.
8. Weng S, Butery M. Chao A et al Perinatal human immunodeficiency virus-1 transmission and intrauterine growth: a cohort study in Butare, Rwanda. *Paediatrics. 1998; 102(2):24.*
9. Newell ML, Borja M C, Peckham C. Height, weight, in children Born to mother with HIV infection in Europe collaboration study. *J Amer Acad Paed. 2003; 111:52-60*
10. Iroha EO, Ezeaka VC, Akinsulie AO et al. Maternal HIV infection and intra uterine growth: a prospective study in Lagos, Nigeria. *West Afr J Med. 2007 26(2):121-5.*
11 Use and interpretation of anthropometric indicator of nutritional status Review Analysis *Bull WHO.1986;64: 941.*
12. Saxena N, Nayor Deepika, Kapil U Prevalence of underweight Stunting and wasting. 2003 April http://www.indianpaediatrics.com.
13. Jane MD Physical growth of Nigerian Yoruba children *Trop Med Jr 1974 ;26:389-98.*
14 Berhane R, Bagenda D Marum L et al Growth failure as a prognostic indicator of mortality in HIV infection. *J Amer Acad Paed. 1997; 100:7-12.*
15. Bobat R: Growth in early child hood in cohort of children of HIV infected women from Durban South Africa. *Ann Trop Paed. 2001; 21:203-10*
16. Agostoni, CZuccotti G V,M Giovannini, et al Growth in the first two years of uninfected children born to HIV-1 seropositive mothers *Arch Dis Child 1998;79:175-8*
17. Dunger DB, Kahn K.Nutritional status and HIV in rural South African children. *BMC Pediatr. 2011 Mar 25; 11:23.*
18. Arpadi .S. M Growth failure in children with HIV infection, *http://www.jaids.com JAIDS 2000; 25:537-42.*
19. Matee MI, Lyamuya EF, Simon EE, et.al, Clinical predictors of HIV-1 infection among preschool children in Dar es Salaam, Tanzania. *East Afr Med J. 1995;72(11):694-8.*
20. Chantry CJ, Byrd RS, Englund JA, et .al Growth, survival and viral load in symptomatic childhood human immunodeficiency virus infection. *Pediatr Infect Dis J. 2003;22(12):1033-9.*
21. Fergusson P, Chinkhumba J. Grijalva-Eternod C. et.al Nutritional recovery in HIV-infected and HIV-uninfected children with severe acute malnutrition. *Arch Dis Child 2009 ; 94: 512-16*
22. Kurawige Jean-Baptiste, Gatsinzi T, Vera Kleinfeldt V etal .HIV -1 Infection among malnourished children in Butare, Rwanda. *J Trop Paediat 1993; 39(2):92-6*
23 Seitaboth S, Brady MF, Lurie M, et al. Malnutrition in HIV infected Cambodian children Int. Conf AIDS. 2004 Jul; 15: www.research.brown.edu/pdf/1100925759.pdf