Published in final edited form as:

Vulnerable Child Youth Stud. 2008 April 1; 3(1): 16–23. doi:10.1080/17450120701660602.

Children's body mass index and nutrition intake in HIV/AIDS

CHINQING LIN¹, LI LI², GUOPING JI³, SHENG WU², and ALAN SEMAAN²

¹Department of Epidemiology, University of California at Los Angeles (UCLA), CA, USA

²Center for Community Health, UCLA, CA, USA

³Anhui Center for Disease Control and Prevention, Hefei, China

Abstract

HIV/AIDS in China poses many challenges for caregivers and their children. A total of 154 caregivers of HIV/AIDS-affected families were interviewed to examine the children's nutrition intake and body mass index (BMI) in the context of HIV/AIDS in the family. The results showed that 25% of children in HIV/AIDS-affected families were underweight or at risk of being underweight according to US criteria. More than half the children reported that their consumption of protein such as meat, eggs or milk ranged from not at all to two times during the past month. About 40% of the children sometimes or often went hungry due to insufficient food. The study findings underscore the need to improve the nutrition and general health of children of people living with HIV/AIDS.

Keywords

HIV; China; child BMI; nutrition

Introduction

There are an estimated 650 000 people living with HIV/AIDS (PLWHA) in China, many of whom are parents (China Ministry of Health, 2006). Parents living with HIV must cope not only with their own physical health symptoms, complex medication regimens (Gwadz et al., 1999), stigma (Herek & Capitanio, 1993) and fear of AIDS-related death, but must also care for their family (Armistead & Forehand, 1995; Rotheram-Borus, Murphy, Miller, & Draimin, 1997). Previous studies have demonstrated that many children affected by HIV/AIDS were not able to have a normal childhood (Bor, Miller, & Goldman, 1993; Pequegnat et al., 2001; Rotheram-Borus, Flannery, Rice, & Lester, 2005; Rotheram-Borus, Lee, Gwadz, & Draimin, 2001; Schuster, et al., 2000; Wekesa, 2000). Studies have shown that chronically ill parents were not able to provide proper care for their children. Fewer resources, such as food and health care, were available to meet their basic needs (Adetunji, 2000; Wekesa, 2000). In a study conducted by Seeley and Kajura (1993), it was shown that HIV/AIDS depletes family resources and leaves families in great need of physical, material and social support. In addition, the daily challenges and emotional distress have the potential to impact a caregiver's parenting abilities severely (Kotchick et al., 1997).

When the family as a unit deals with the illness, there can be an increased strain on the children's role in the family and the quality of parenting. Children face such challenges as their caregiver's

illness and reduced parenting capacity, the need to help care for sick parents and younger siblings, a shift in family role, financial deprivation and stigma and discrimination. All these challenges can contribute to psychosocial stress in the children and lead to poor nutrition and health status. Previous studies have documented that children's morbidity was correlated closely with quality of parenting (Ware, 1984). Similarly, the increased morbidity among AIDS orphans may be attributed to a lack of parenting. Fostered AIDS orphans in West Africa were found to have a higher mortality than children in general (Oni, 1995; Bledsoe, Ewbank, & Isiugo-Abanihe, 1988). A study by Lindblade, Odhiambo, Rosen, and DeCock (2003) also showed that sub-Saharan AIDS orphans' nutrition and health were compromised compared to children in general, and the impact was greater on younger children.

In a family-orientated society such as China, the impact of HIV/AIDS on family and children is tremendous (Li et al., 2006; Yang et al., 2006). Although there has been much discussion about AIDS orphans in Africa, there is a scarcity of research examining the well-being of children in HIV/AIDS-affected families in China. In this study we examine the nutritional health of HIV/AIDS-affected children. We hypothesize that HIV/AIDS in the family impact negatively children's health and nutritional status.

Method

Data collection

The data for this study were collected from Anhui, China. Anhui province has a large population of over 63 million people, with 56 counties comprising 17 prefectures governed directly by the province. More than 99% of the population in this province is Han Chinese, and the rest are minority ethnic groups such as Bai, Yi, etc. (China Internet Information Center, 2006). Anhui is one of the provinces with a high HIV prevalence, where most existing HIV infections (over two-thirds) were caused by paid plasma donation (Wu, Liu, & Detels, 1995; Wu, Rou, & Detels, 2001). In 2005 it was estimated that there were between 10 000 and 49 999 HIV-infected individuals living in this area (Lu et al., 2006). Because the spread of HIV through plasma donation occurred primarily during the early 1990s, many HIV-infected individuals in this area currently have children aged 6–18 years.

The population for this study consisted of caregivers of HIV/AIDS-affected children between the ages of 6 and 18. Children were considered to be affected by HIV/AIDS if one or more family members were either living with or had died from HIV/AIDS. Participants were recruited from the hospital or clinic where they received health-care services or were referred by other caregivers already recruited for the study. Referrals occurred through word of mouth. The study was advertised through a flyer announcing a 'Children and Family Health Study'. Each consenting caregiver took part in a face-to-face anonymous interview lasting approximately 1 hour at either a community building or at the participant's home, depending on the choice of the participant. A total of 154 caregivers participated in the face-to-face interviews between December 2005 and June 2006.

The study was reviewed and approved by the Institutional Review Boards (IRB) of the University of California and the Anhui Center for Disease Prevention and Control. Individual informed consent was obtained prior to participation in the survey, and \$7 was given to study participants for their participation.

Measures

The interview consisted of a survey on HIV/AIDS-affected family members, which contained a total of 147 questions assessing children's basic characteristics, caregiver's demographics, family's background information, children's height, body weight and nutrition intake. The

children's basic characteristics collected in this study included children's age, gender, whether they are attending school and health status rated by caregiver. Caregiver's demographics included age, gender and education. Family background information included number of people in the family, number of children in the family, family's average annual income and the health status of the participant and his/her spouse. Children's nutrition intake was assessed by asking the caregivers to recall the frequency of the child's consumption of fruit, animal-source protein and vegetables, how often they ate breakfast and how often they went hungry because of insufficient food at home during the past month. This diet assessment tool was adapted from the 2003 China global school-based student health survey, developed by the World Health Organization (WHO), and has been validated in Chinese schoolchildren. The children's heights and weights were reported by the caregivers. Children's body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2). After BMI was calculated, the BMI number was plotted on the CDC BMI-for-age growth charts to obtain a percentile ranking. The percentile was used to indicate the relative position of the child's BMI among children of the same sex and age. We used the percentile to categorize the children into five categories: underweight, at risk of being underweight, healthy weight, at risk of being overweight and overweight (Kuczmarski et al., 2002).

Data analysis

SAS statistical software (version 9.1) was used for data analyses. First, we calculated the prevalence of being underweight, at risk of underweight, healthy weight, at risk of overweight and overweight. Secondly, differences of prevalence were compared between groups with different child characteristics, caregiver characteristics and family backgrounds using χ^2 tests or Fisher's exact test (if one or more of the cells had an expected frequency of five or less). Thirdly, we examined the relationship between frequencies of nutrition intake and being underweight or at risk of being underweight using χ^2 tests or Fisher's exact test.

Results

The majority of the caregivers were the child's parents: 48% were mothers, 36% were fathers and 15% were grandparents. Most caregivers were 46 years or younger (88%), and approximately 58% of the participants were women. Caregivers had an average of 2.7 years of education, and almost half the participants were illiterate. A total of 79.9% of the interviewed caregivers were HIV-positive; 102 (66.2%) of the fathers and 88 (57.1%) of the mothers were HIV-positive and 13 (8.4%) fathers and 10 (6.5%) of the mothers had died from HIV/AIDS by the time of the interview. Most families (74%) consisted of fewer than four members. Of the participating families, 45% consisted of two HIV-positive parents, 40% consisted of one HIV-positive parent and 15% had at least one parent die from AIDS. The families in this study reported an average annual income of 606 Yuan (US\$75.8), which was much lower than the China average annual income of over 10 000 Yuan (\$1,250) (Zaobao News, 2005).

The children in this study had a mean age of 13.5 years. Among them, 56% were male, two of 154 children were HIV-positive and 12% were currently not attending school. About one-third (31%) of the children did not eat fruit during the past month and 38% only ate fruit once to twice during the past month. More than half (54%) of the children did not eat animal-source protein at all or ate only one to two times during the past month. About 14% of the children have felt hungry most of the time, or always, because of not enough food, and only 40% of the children ate breakfast on a regular basis.

Among the 154 caregivers, only 76 reported the child's height and weight. According to the US CDC children's BMI standard (2007), 11.8% of the 76 children's BMI were under the 5th percentile, indicating underweight, with 13.2% being between the 5th and 15th percentile,

suggesting at risk of being underweight; 55.3% of the children were at a healthy weight and 19.7% were overweight or at risk of being overweight (Table I).

Table II shows the association between child, primary caregiver and family characteristics and being underweight or at risk of being underweight. More female children in this study were underweight or at risk of being underweight (39.5% versus 10.5%). Attending school was marginally negatively associated with being underweight or at risk of being underweight. More children who were underweight or at risk of being underweight were found in families with younger (less than 40 years old) caregivers and female caregivers.

Table III shows nutrition intake for those who reported children's height and weight. The children who ate vegetables less frequently and did not eat breakfast regularly were more likely to be underweight or at risk of being underweight.

Discussion

Our findings show that the health and nutrition of the children in HIV/AIDS affected families was greatly compromised. About one-fourth of the children were underweight or at risk of being underweight according to the US CDC standard. The results provided further evidence that the average BMI of children in HIV/AIDS-affected families was lower than the average BMI for the population of children in general. Although there may be concerns about applying the US CDC BMI standard to Asian children, previous studies using the CDC BMI charts among Chinese children have obtained results similar to those found among US children. In a study in Shanghai (2004), Luo and colleagues showed that the BMI distribution for Shanghai boys up to the age of 16 was comparable to the CDC BMI charts for boys, but the distribution was lower for older boys. Shanghai girls were similar to American girls in their BMI distribution up to the age of 10, after which they had lower BMIs. Overall, children from a general Chinese population and American children are comparable regarding BMI distribution.

In recent years, people's diets in China have changed significantly. According to China's National Nutrition Survey, between 1982 and 1992 consumption of cereal components and tubers decreased by 12% and 47%, and consumption of meat, eggs, fats and oil increased by 38%, 60% and 61%, respectively (Chen, 1999). Obesity among adolescents is becoming the new public health challenge to Chinese society. In contrast, the results of this study revealed that the children from HIV/AIDS-affected families still consume a surprisingly poor diet. A considerable proportion of the children did not have enough vitamin and/or protein intake, and some felt hungry due to a lack of food. As a comparison, a study of schoolchildren in China showed that most of the students had three meals every day and reported a high frequency of intake of fruit and vegetables between 60% and 70% ate fruit and vegetables every day. A total of 52.2% of rural boys and 63.5 of rural girls ate fruit daily, and 38.5% of rural children drank milk at least once a day or more often (Shi, Lien, Kumar, & Holmboe-Ottesen, 2005). This highlights that HIV/AIDS-affected children's nutrition is greatly compromised compared to children in general in China.

Poverty is the biggest challenge for HIV-affected families in developing countries. Our study showed that the average annual income of HIV/AIDS-affected families is far below the national standard. However, we did not find a significant association between family income and children being underweight or at risk of being underweight. We speculate that the reason may be that incomes for these families were universally lower than the national average, and the variance of income in these families was not large enough to show its impact on children's nutritional health. Nevertheless, previous findings suggest that the economic hardships associated with HIV/AIDS in the family can be devastating. Some caregivers who are HIV-positive are not able to work due to their poor physical health (UN General Assembly, 2005),

while others had lost their jobs because they tested HIV-positive (Cao, Pang, & Wu, 2005). The combination of lower family income due to unemployment and increasing health-care costs may hinder access to basic resources such as food, housing, medication and education for children (*China Nanfang Zhoumo News*, 2004).

Female children may face a greater proportion of the burden of HIV/AIDS. In this study, more female children were underweight or at risk of being underweight than male children. Preference for male children is known to exist in Chinese society. Families, especially in rural areas, have a strong preference for male children whom they entrust with old-age security and carrying on the family line; unwanted daughters are sometimes neglected (Chan et al., 2002; Chan, Blyth, & Chan, 2006). The preference for male children may be one of the explanations for the finding that female children had a higher likelihood of being underweight. The result suggests that female children in HIV/AIDS families are in greater need of care and attention.

This study has some limitations. First, only about half the caregivers reported their children's weight and height. This may be attributable to self-selection bias. We compared the demographic and family factors of the caregivers who reported the child's height and weight with those who did not report and found no significant difference. We therefore assume that the failure to report was of a random pattern. Secondly, the study was conducted with a large proportion of former plasma donors in a poor rural area. The results might not be generalizable to PLWHA who were infected through other transmission routes or live in other areas with different economic situations. Thirdly, only families who had children between the ages of 6 and 18 were included in the study. Families with children younger than 6 years old may face different challenges.

Despite the limitations, this study revealed the level of malnutrition that exists among children affected by HIV/AIDS in Anhui, China. The results offer implications for future HIV interventions in Anhui and other regions in China, calling for detailed and systematic assessments of feeding patterns and children's health status in HIV/AIDS-affected families. There is a need for comprehensive programmes and interventions that address the economic, psychosocial and nutritional challenges that PLWHA and their families face. It is important to integrate nutritional services into existing primary care programmes and to educate health-care providers about the nutritional obstacles that HIV/AIDS-affected families face. In developing such programmes for HIV/AIDS-affected families, significant attention should be given to the needs of the parents and caregivers as they relate to the healthy development of their children with appropriate consideration for the differences between boys and girls.

References

- Adetunji J. Trends in under-five mortality rates and the HIV/AIDS epidemic. *Bulletin of the World Health Organization* 2000;78:1200–1206. [PubMed: 11100615]
- Armistead L, Forehand R. For whom the bell tolls: parenting decisions and challenges faced by mothers who are HIV seropositive. *Clinical Psychology: Science & Practice* 1995;2:239–250.
- Bledsoe CH, Ewbank DC, Isiugo-Abanihe UC. The effect of child fostering on feeding practices and access to health services in rural Sierra Leone. *Social Science & Medicine* 1988;27:627–636. [PubMed: 3147514]
- Bor R, Miller R, Goldman E. HIV/AIDS and the family: A review of research in the first decade. *Journal of Family Therapy* 1993;15:187–204.
- Cao XB, Pang L, Wu ZY. Reasons and patterns of AIDS stigma and intervention strategies. *Chinese Journal of AIDS/STD* 2005;11:243–245.
- Centers for Disease Control and Prevention. About BMI for Children and Teens. [accessed 1 June 2007]. May 222007 Available at: http://www.cdc.gov/nccdphp/dnpa/bmi/childrens_BMI/about_childrens_BMI.htm

- Chan CL, Blyth E, Chan CH. Attitudes to and practices regarding sex selection in China. *Prenatal Diagnosis* 2006;26:610–613. [PubMed: 16856223]
- Chan CL, Yip PS, Ng EH, Ho PC, Chan CH, Au JS. Gender selection in China: Its meaning and implication. *Journal of Assisted Reproduction and Genetics* 2002;19:426–430. [PubMed: 12408537]
- Chen J. Dietary changes and disease transition in China. *Nutrition* 1999;15:330–331. [PubMed: 10319371]
- China Internet Information Center. China through a lens. [accessed 23 April 2007]. 2006 Available at: <http://www.china.org.cn/english/features/61244.htm>
- China Ministry of Health. 2005 Update on the HIV/AIDS epidemic and response in China. China Ministry of Health; Beijing: 2006.
- China Nanfang Zhoumo News. AIDS mother: The unreachable population? China Nanfang Zhoumo News. November 11;2004
- Gwadz M, De Vogli R, Rotheram-Borus MJ, et al. Behavioral practices regarding combination therapies for HIV/AIDS. *Journal of Sex Education & Therapy. Special Issue: Researching HIV/STD risk behavior: Implications for prevention* 1999;24:81–88.
- Herek GM, Capitanio JP. Public reactions to AIDS in the United States: A second decade of stigma. *American Journal of Public Health* 1993;83:574–577. [PubMed: 8460738]
- Kotchick BA, Forehand R, Brody G, et al. The impact of maternal HIV infection on parenting in inner-city African American families. *Journal of Family Psychology* 1997;11:447–461.
- Kuczmarski RJ, Ogden CL, Guo SS, Grummer-Strawn LM, Flegal KM, Mei Z. 2000 CDC growth charts for the United States: methods and development. *Vital Health Statistics* 2002;11:1–190.
- Li L, Wu S, Wu ZY, Sun S, Cui HX, Jia MH. Understanding family support for people living with HIV/AIDS in China. *AIDS and Behavior* 2006;10:509–517. [PubMed: 16741672]
- Lindblade KA, Odhiambo F, Rosen DH, DeCock KM. Health and nutritional status of orphans <6 years old cared by relatives in western Kenya. *Tropical Medicine and International Health* 2003;8:67–72. [PubMed: 12535253]
- Luo F, Shen Y, Tu Y, et al. BMI distribution of 6–18 year old children and adolescents in Shanghai, China. *Chinese Journal of Endocrinology and Metabolism* 2004;20:506–509.
- Lu F, Wang N, Wu Z, et al. Estimating the number of people at risk for and living with HIV in China in 2005: Methods and results. *Sexually Transmitted Infections* 2006;82(Suppl 3):87–91.
- Oni JB. Fostered children's perception of their health care and illness treatment in Ekita Yoruba households, Nigeria. *Health Transition Review* 1995;5:31–24.
- Pequegnat W, Bauman LJ, Bray JH, DiClemente R, DiIorio C, Hoppe SK. Measurement of the role of families in prevention and adaptation to HIV/AIDS. *AIDS and Behavior* 2001;5:1–19.
- Rotheram-Borus MJ, Flannery D, Rice E, Lester P. Families living with HIV. *AIDS Care* 2005;17:978–987. [PubMed: 16176894]
- Rotheram-Borus MJ, Lee M, Gwadz M, Draimin B. An intervention for parents with AIDS and their adolescent children. *American Journal of Public Health* 2001;91:1294–1302. [PubMed: 11499122]
- Rotheram-Borus MJ, Murphy DA, Miller S, Draimin BH. An intervention for adolescents whose parents are living with AIDS. *Clinical Child Psychology & Psychiatry* 1997;2:201–219.
- Schuster MA, Kanouse DE, Morton SC, et al. HIV-infected parents and their children in the United States. *American Journal of Public Health* 2000;90:1074–1081. [PubMed: 10897185]
- Seeley J, Kajura E. The extended family and support for people with AIDS in a rural population in South West Uganda: a safety net with holds? *AIDS Care* 1993;5:55–74. [PubMed: 8461362]
- Shi S, Lien N, Kumar BN, Holmboe-Ottesen G. Socio-demographic differences in food habits and preferences of school adolescents in Jiangsu Province, China. *European Journal of Clinical Nutrition* 2005;59:1439–1448. [PubMed: 16118652]
- United Nations General Assembly. Kofi Annan's Message on International Day of Families. [accessed 16 January 2007]. May 152005 2005 Available at: <http://www.un.org/esa/socdev/family/IntObs/IDF/IDFFrames/IDF2005.htm>
- Ware H. Effects of maternal education, women's roles, and child care on child mortality. *Population and Development Review* 1984;10:191–214. (Suppl.: Child Survival: Strategies for Research).

- Wekesa E. The impact of HIV/AIDS on child survival and development in Kenya. *AIDS Analysis Africa* 2000;10:12–14. [PubMed: 12349435]
- Wu Z, Liu Z, Detels R. HIV-1 infection in commercial plasma donors in China. *Lancet* 1995;346:61–62. [PubMed: 7603178]
- Wu Z, Rou K, Cui H. The HIV/AIDS epidemic in China: History, current strategies and future challenged. *AIDS Education and Prevention* 2004;16:7–17. [PubMed: 15262561]
- Wu Z, Rou K, Detels R. Prevalence of HIV infection among former commercial plasma donors in rural eastern China. *Health Policy and Planning* 2001;16:41–46. [PubMed: 11238429]
- Yang X, Wu Z, Duan S, et al. Living environment and schooling of children with HIV-infected parents in southwest China. *AIDS Care* 2006;18:647–355. [PubMed: 16971271]
- Zaobao News. Annual income of Chinese people has reached over 10,000 Yuan (20 August). [accessed 13 June 2006]. 2005 Available at: <http://www.zaobao.com/stock/pages13/china050820a.html>

Children's BMI-for-age percentiles and weight status categories based on US CDC standard (*n* = 76)

Table 1

BMI-for-age percentiles	Suggests the children are:	No.	%
At or over the 95th percentile	Overweight	8	10.5
Between the 85th and 95th percentiles	At risk of being overweight	7	9.2
Between the 15th and 85th percentiles	Healthy weight	42	55.3
Between the 5th and 15th percentiles	At risk of being underweight	10	13.2
Under the 5th percentile	Underweight	9	11.8

Table II

Child, primary caregiver and family characteristics by children's weight status of underweight or at risk of underweight.

Underweight or at risk of underweight					
	No.	%	No.	%	p
Children's characteristics					
Age (years)					
6–12	21	27.6	4	19.05	
13–18	55	72.4	15	27.3	0.5625
Gender					
Male	38	50.0	4	10.5	
Female	38	50.0	15	39.5	0.0071
Health status rated by caregiver					
Very poor or poor	4	5.3	1	25.0	
Fair	21	27.6	4	19.1	
Good or excellent	51	67.1	14	27.5	0.8085
Attending school					
Yes	66	86.8	14	21.2	
No	10	13.2	5	50.0	0.0501
Caregiver's characteristics					
Age (years)					
≤40	29	38.2	12	41.4	
41–45	27	35.5	4	14.8	
≥46	20	26.3	3	15.0	0.0009
Gender					
Male	38	50.0	4	10.5	
Female	38	50.0	15	39.5	0.0071
Education					
Illiterate	13	17.1	4	30.8	
Elementary school not finished	13	17.1	4	30.8	
Elementary school or higher	15	19.7	2	13.3	0.4791
Family characteristics					

	Underweight or at risk of underweight			
	No.	%	No.	p
Family size				
Less than 4 people	51	67.1	14	27.5
4–6 people	13	17.1	3	23.1
More than 6 people	12	15.8	2	16.7
Number of children in the family				0.8564
One	20	21.4	3	15.0
Two	28	37.7	9	32.1
Three	22	29.2	5	22.7
More than four	6	11.7	2	33.3
Average annual income per person				0.5482
≤400 Yuan/year	22	30.1	6	27.3
401–700 Yuan/year	20	27.4	4	20.0
>701 Yuan/year	31	42.5	9	29.0
Family HIV status				0.7926
≤1 parents HIV ⁺ , both alive	37	49.3	8	21.6
Both parents HIV ⁺ , both alive	28	37.3	8	28.6
At least one parent died because of HIV	10	13.3	3	30.0
				0.7076

Table III

Nutrition intake by children's weight status of underweight or at risk of underweight.

	No.	%	No.	%	p
The frequency of eating fruit					
Less than 2 times per month	45	59.2	13	28.9	
2 times per month to 1 time per day	28	36.8	5	17.9	
At least one time per day	3	4.0	1	33.3	0.4419
The frequency of eating vegetables					
Less than 2 times per month	6	7.9	4	66.7	
2 times per month to 1 time per day	15	19.7	4	26.7	
At least 1 time per day	55	72.4	11	20.0	0.0064
The frequency of eating meat, eggs and milk					
Less than 2 times per month	39	51.3	10	25.6	
2 times per month to 1 time per day	28	36.8	6	21.4	
At least 1 time per day	9	11.8	3	33.3	0.0526
How often child goes hungry because of not enough food					
Never or rarely	50	65.8	12	24.0	
Sometimes	20	26.3	3	15.0	
Most of the time or always	6	7.9	4	66.7	0.0054
The frequency of child eating breakfast					
Never or rarely	11	14.5	2	18.2	
Sometimes	11	14.5	5	45.5	
Most of the time or always	54	71.0	12	22.2	0.2581