

HIV positive children living in orphanages and home care: Assessment of nutritional deficiencies and opportunistic infections

Ravishekar N. Hiremath¹, Ravi Nimonkar¹, Rahul Thombre²,
Pushkar Kumar¹

Departments of ¹Community Medicine and ²Dermatology, AFMS, New Delhi, India

ABSTRACT

Objectives: With the introduction of antiretroviral treatment (ART), opportunistic infections (OIs) reduced a lot and most HIV-associated OIs are preventable and treatable with safe cost-effective interventions. But however, in order to prevent and early diagnosis, we need to have baseline estimation of OIs among HIV positive children and other factors associated, especially nutritional deficiencies. **Methodology:** A cross-sectional study was carried out in pediatric outpatient department (OPD) of a large multicentric hospital among 106 children. Data were collected by means of pretested predesigned semi-structured questionnaire prepared on consultation with experts in the subjects and clinical assessment was done in day light to detect signs of nutritional disorders. Institutional ethical clearance was taken, and strict confidentiality was maintained. **Results:** Majority (39.6%) of the children belong to 5–9 years. Children were equitably distributed between orphanage and family care giver. Bitot's spots, cheilosis, and gum bleeding were found to be more than twice as common in subjects living with family, as compared to those living in orphanage while aphthous ulcer, knock knee, bow leg were found to be more than twice as common in female subjects as compared males. The prevalence of Pneumonia, Mumps, Herpes zoster, Pulmonary Tuberculosis, Oral candidiasis, and recurrent upper respiratory tract infections (URTI) was found to be about twice as common in subjects living with family, as compared to those living in orphanage while males had more Chicken pox, Herpes zoster, Pulmonary Tuberculosis, Oral candidiasis, and Recurrent URTI as compared to those in females. **Conclusion:** Vitamin deficiencies and opportunistic infections were higher than the prevalence reported by the various studies done on normal children. All efforts to be made to improve adequate nutrition to HIV positive children and ensure protection against opportunistic infections especially for children in home-based care.

Keywords: HIV positive children, home care, nutritional deficiencies, opportunistic infections, orphanages

Introduction

The role of micronutrients in immune function and communicable disease is well-established. The vital role of individual and multiple micronutrients within the prevention, care and treatment of HIV infection and related conditions however merits further

attention. Several studies on micronutrients and HIV are under way, and new findings should be available soon. Low blood levels and decreased dietary intakes of some micronutrients are associated with faster HIV disease progression and mortality and increased risk of HIV transmission as indicated by observational studies.^[1]

However, these studies methodological limitations preclude definitive conclusions about the connection between micronutrient intake and blood levels, and HIV infection.

Address for correspondence: Dr. Pushkar Kumar,
Public Health Specialist and Nutritionist, Pune, Maharashtra, India.
E-mail: kpushkar45@yahoo.in

Received: 08-11-2021

Revised: 07-03-2022

Accepted: 15-03-2022

Published: 14-10-2022

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_2203_21

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Hiremath RN, Nimonkar R, Thombre R, Kumar P. HIV positive children living in orphanages and home care: Assessment of nutritional deficiencies and opportunistic infections. J Family Med Prim Care 2022;11:5293-7.

Some studies show that there is evidence that supplements of, for example, B-complex vitamins, and vitamins C and E,^[2-5] can improve immune status, prevent childhood diarrhea, and enhance pregnancy outcomes, including better maternal prenatal weight gain and a reduction of fetal death, preterm birth and low birth weight. The effect of those micronutrients on HIV disease progression and mortality is under study. Micronutrients that have produced positive health outcomes in HIV uninfected populations include zinc supplementation for reducing diarrhoea and pneumonia morbidity in children. The safety and effectiveness of zinc supplements in HIV-infected adults and children are now being studied.^[1] Diet with micronutrients at RDA level should be consumed by HIV positive children. However, this might not be enough to correct nutritional deficiencies in HIV-infected individuals. Results from several studies raise concerns that some micronutrient supplements, e.g., vitamin A, zinc, and iron,^[6,7] can produce adverse outcomes in HIV infected populations. Safe upper limits for daily micronutrient intakes for PLWHA still need to be well established. At the same time, baseline data on clinically diagnosed nutritional deficiencies must be maintained.^[1]

On the other side, OIs forms the significant factor for increased morbidity and mortality attributing to about 94.1% deaths^[8,9] among HIV positive children. OIs lead to poor quality of life, impaired response to anti-retroviral drugs, progression of disease is hastened and worsening of socioeconomic conditions of family and increased medical costs. In developing countries tuberculosis, oral candidiasis, varicella zoster, Pneumonia, herpes zoster, dermatophyte infections and even pneumocystis pneumonia tender to occur. Hence variety of actions need to be taken on priority like early initiation of ART, immunization, prophylaxis, reduced exposure, and maintenance of highest level of hygiene and sanitation.^[10] With the introduction of ART, OIs reduced a lot and most HIV-associated OIs are preventable and treatable with safe cost-effective interventions. But however, in order to prevent and early diagnosis, we need to have baseline estimation of OIs among HIV positive children and other factors associated with. Primary care providers and family physicians should be aware of these statistics and situation, so that they can take pro-active and prompt measures to prevent and control OIs and nutritional deficiencies among HIV positive children. Thus, this study was carried out with an objective of assessment of OIs and nutritional deficiencies among HIV positive children.

Methods

The Study was cross-sectional epidemiological, which was carried out at Pediatric HIV outpatient department (OPD) of tertiary care center of Western Maharashtra where in all HIV Positive children (less than 15 years) who were attending the OPD for routine checkup were included. A total of 106 children who attended the OPD during the period of six months duration were included after taking informed consent from parents/guardians. Data were collected by means of pretested predesigned

semi-structured questionnaire prepared on consultation with experts in the subjects and clinical assessment was done in day light to detect signs of nutritional disorders as per standard definitions, by the interviewer himself after enough training. Data were entered in excel sheet and analyzed by means of SPSS software. Institutional ethical clearance was taken, and strict confidentiality was maintained.

Results

Majority (39.6%) of the children belong to 5–9 years followed by 9–12 years (24.5). Children were almost equitably distributed between orphanage and family care giver. 89.6% belong to Hindu family [Table 1]. The children were clinically examined for signs of nutritional deficiencies. Table 2 shows the association of nutritional deficiencies with care giver and gender of study participants. The association was statistically not significant ($P = 0.4157$ for care giver and $P = 0.7395$ for gender). However, certain vitamin deficiency signs like Bitot's spots, cheilosis, and gum bleeding were found to be more than twice as common in subjects living with family, as compared to those living in orphanage. Certain vitamin deficiency signs like aphthous ulcer, Knock Knee, bow leg were found to be more than twice as common in female subjects as compared males. Table 3 shows the association of opportunistic infections with care giver and gender of study participants. The association was statistically not significant ($P = 0.5421$ for care giver and $P = 0.3281$ for gender). However, the prevalence of most of the infections like Pneumonia, Mumps, Herpes zoster, Pulmonary Tuberculosis, Oral candidiasis, Recurrent URTI, etc., was found to be about twice as common in subjects living with family, as compared to those living in orphanage. The prevalence of infections like Chicken pox, *Herpes zoster*, Pulmonary Tuberculosis, Oral candidiasis, Recurrent URTI, etc., was found to be more common in males, as compared to those in females.

Table 1: Sociodemographic parameters of study participants

	Total	
	Frequency	percentage
Age group (Years)		
2-3	11	10.4
3-5	16	15.1
5-9	42	39.6
9-12	26	24.5
12-15	11	10.4
Sex		
Male	58	54.71
Female	48	45.29
Caretaker		
Orphanage	54	50.9%
Family*	52	49.1%
Religion		
Hindu	95	89.6
Muslim	11	10.4
Total	106	100

Table 2: Association of nutritional deficiencies with care giver and gender of study participants

Nutritional Deficiencies	Orphanage (n=54)	Living with Family (n=52)	Statistical association	Male (n=58)	Female (n=48)	Statistical association
Pale Conjunctiva	45 (83.3%)	48 (92.3%)	P: 0.4157	51 (87.9%)	44 (91.7%)	P: 0.7395
Edema	9 (16.7%)	7 (13.5%)		9 (15.5%)	7 (14.6%)	
Rough Skin	32 (59.3%)	26 (50%)		33 (56.9%)	25 (52.1%)	
Loss of Subcutaneous tissue	22 (40.7%)	28 (53.8%)		26 (44.8%)	24 (50%)	
Angular Stomatitis	24 (44.4%)	24 (46.2%)		27 (46.6%)	21 (43.8%)	
Aphthous Ulcer	17 (31.5%)	7 (13.5%)		9 (15.5%)	15 (31.3%)	
Bitot's Spot	1 (1.9%)	3 (5.8%)		2 (3.4)	2 (4.2%)	
Bow Leg	1 (1.9%)	1 (1.9%)		0 (0%)	2 (4.2%)	
Cheilosis	14 (25.9%)	27 (51.9%)		25 (43.1%)	16 (33.3%)	
Conjunctival Xerosis	4 (7.4%)	3 (5.8%)		3 (5.2%)	4 (8.3%)	
Dental Caries	39 (72.2%)	39 (75%)		41 (70.6%)	37 (77.1%)	
Gum Bleeding	2 (3.7%)	5 (9.6%)		5 (8.6%)	2 (4.2%)	
Gum Spongy	12 (22.2%)	14 (26.9%)		16 (27.6%)	10 (20.8%)	
Knock Knee	3 (5.6%)	1 (1.9%)		1 (1.7%)	3 (6.3%)	

Table 3: Association of opportunistic infection with care giver and gender of study participants

Opportunistic Infection	Orphanage (n=54)	Living with Family (n=52)	Statistical association	Males (n=58)	Females (n=48)	Statistical association
Chicken pox	14 (26%)	15 (28.8%)	P: 0.5421	19 (32.7%)	10 (20.8%)	P: 0.3281
Pneumonia	6 (11%)	13 (25%)		9 (15.5%)	10 (20.8%)	
Otorrhoea	7 (12.7%)	3 (5.8%)		5 (8.6%)	5 (10.4%)	
Mumps	6 (11%)	11 (21.2%)		9 (15.5%)	8 (16.7%)	
Pulmonary TB	9 (16.7%)	13 (25%)		13 (22.4%)	9 (18.7%)	
Herpes zoster	6 (11%)	12 (23.1%)		11 (19%)	7 (14.6%)	
Scabies Rash	5 (9.3%)	6 (11.5%)		6 (10.3%)	5 (10.4%)	
Pneumocystis carinii	1 (1.9%)	2 (3.8%)		0 (0%)	3 (6.2%)	
Oral candidiasis	8 (14.8%)	14 (26.9%)		15 (25.9%)	7 (14.6%)	
Recurrent URTI	2 (3.7%)	7 (13.5%)		6 (10.3%)	3 (6.2%)	
Herpetic Keratitis	1 (1.9%)	2 (3.8%)		3 (5.17%)	0 (0%)	
Anal warts	0 (0%)	4 (7.7%)		4 (6.9%)	0 (0%)	

Discussion

Vitamin A deficiency signs

In the present study, signs of vitamin A deficiency in the form conjunctival xerosis and Bitot's spots were found to be 6.6% and 3.8%, respectively. A review by Sachdev *et al.* on Recent Trends in Nutritional Status of Children in India mentioned that the prevalence of clinical vitamin A deficiency (Bitot's spots) was found to be 0.21%.^[11] The study by NNMB reported the overall prevalence of Bitot's spots among 1–5-year-old children, an objective sign of vitamin A deficiency to be about 0.8%. The overall prevalence of night blindness was about 0.3% and that of conjunctival xerosis was about 1.8%. This prevalence is more than studies done on the normal children.

Vitamin C deficiency

In the present study signs of vitamin C deficiency in the form bleeding and spongy gums were 6.6% and 24.5%, respectively. The study conducted by Verma *et al.*^[12] observed prevalence of vitamin C deficiency in 5.3% of school children. A study by Singh *et al.* in under five children in draught affected desert areas of west Rajasthan in the year 2006 stated the prevalence of vitamin

C to be 0.1%.^[13] This prevalence is higher than the prevalence reported in studies done on normal children.

Vitamin B complex deficiency

In the present study, the prevalence of angular stomatitis, aphthous ulcer, and cheilosis were found to be 45.3%, 22.6%, and 38.7%, respectively. This indicates a deficiency of B complex vitamins, (esp. Riboflavin) in the HIV positive children. Verma *et al.*^[12] found that 4.4% of urban school children were suffering from vitamin B complex deficiency. NNMB reported the prevalence of angular stomatitis, a sign of B-complex deficiency in 0.8% of the preschool children. The prevalence found in the present study is higher than the findings of the above studies done on normal children. This emphasizes the need of multivitamin supplementation in HIV positive children. However, the findings of the present study could not be compared with other studies done on HIV positive children.

Vitamin D deficiency

The prevalence of vitamin D deficiency, as elicited by knock knees and bow leg, are found to be 1.9% and 3.8%, respectively,

in the present study. The study by Grover *et al.* reported prevalence of vitamin D deficiency in 1.2% of school age children using bowlegs and beading of ribs as the sign's indicative of this deficiency.^[14] The findings of the present study indicate that prevalence of vitamin D deficiency among HIV positive children is more than similar studies done on normal children.

Dental caries

Dental caries was found to be the second most common clinical sign in children in the present study after pallor. The prevalence of dental caries was found to be 73.6% in our study which was much higher than study carried out by Goyal *et al.*, where in prevalence of dental caries was 53.18% in community in Western Maharashtra.^[15]

Opportunistic infections

The prevalence of most of the OIs was found to be more common in subjects living with family, as compared to those living in orphanage. Also, few infections found to be more common in males, as compared to those in females. While OIs in HIV positive adult are mainly due activation of already persistent infections, but in children OIs are basically due to primary acquisition of infective pathogens.^[16] Hence, self precautions and environmental hygiene play an important part in children. Children living with families thus required to adhere to the environmental sanitation measures and personal hygiene measures stringently. In a study carried out by Melkamu MW *et al.*^[17] showed incidence of 9.7 per 100 child years in 15 years retrospective study. Especially children who were not taking OI prophylaxis, advanced disease, CD4% below threshold and having fair to poor ART adherence were the one who had more OIs than others. Similarly, the incidence in Asian based study showed 10.5 per 100 years of observations^[18] and United States of America based study showed incidence of 4.99 per 100 years^[19] and Brazil (2.63 per 100 person years).^[8]

The children detected to be suffering from acute deficiencies and OIs should be given immediate attention by concerned health authorities and should be kept under surveillance to monitor their growth. Quantification of these OIs and nutritional deficiencies among HIV positive children will thus help primary care providers and family physicians where focus has to be made in taking pro-active and prompt measures to prevent and control OIs and nutritional deficiencies among HIV positive children.

Conclusion

The findings of the study showed various vitamin deficiencies and opportunistic infections were higher than the prevalence reported by the various studies done on normal children. The study findings are a valuable baseline data of the current nutritional deficiencies of HIV positive children living in Western Maharashtra. Adequate nutrition, which is best achieved through consumption of a balanced healthy diet, is thus vital for

health and survival for all HIV-infected children. All efforts to be made to improve adequate nutrition to HIV positive children especially those living in family care who are neglected the most and ensure protection against opportunistic infections by practicing stringent hygiene and sanitation measures. To achieve better understanding of the problems of malnutrition in these HIV positive children, further in depth and detailed studies should be carried out.

Ethical approval

Ethical clearance for the study was taken from institutional ethical clearance committee before the start of the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. WHO Technical Consultation on Nutrient Requirements for People Living with HIV/AIDS (2003: Geneva, Switzerland). World Health Organisation. Available from: https://www.who.int/nutrition/publications/Content_nutrient_requirements.pdf. [Last accessed on 2021 Jun 01].
2. Maggini S, Pierre A, Calder PC. Immune function and micronutrient requirements change over the life course. *Nutrients* 2018;10:1531.
3. Micronutrient Information Center Immunity in Depth; 2016 Linus Pauling Institute. Available from: <http://lpi.oregonstate.edu/mic/health-disease/immunity>. [Last accessed on 2021 Jun 01].
4. Maggini S, Beveridge S, Sorbara JP, Senatore G. Feeding the immune system: The role of micronutrients in restoring resistance to infections. *CAB Rev* 2008;3:1-21.
5. Maggini S, Wintergerst E, Beveridge S, Hornig D. Selected vitamins and trace elements support immune function by strengthening epithelial barriers and cellular and humoral immune responses. *Br J Nutr* 2007;98:S29-35.
6. WHO Nutrient requirements for people living with HIV/AIDS: Report of a technical consultation, World Health Organization, Geneva, 13-15 May 2003. Available from: http://www.who.int/nutrition/publications/Content_nutrient_requirements.pdf. [Last accessed on 2021 Jun 01].
7. Forrester JE, Sztam KA. Micronutrients in HIV/AIDS: Is there evidence to change the WHO 2003 recommendations? *Am J Clin Nutr* 2011;94:1683S-9S.
8. Candiani TM, Pinto J, Cardoso CA, Carvalho IR, Dias AC, Carneiro M, *et al.* Impact of highly active antiretroviral therapy (HAART) on the incidence of opportunistic infections, hospitalizations and mortality among children and adolescents living with HIV/AIDS in Belo Horizonte, Minas Gerais State, Brazil. *Cad Saude Publica* 2007;23(Suppl 3):S414-23.
9. Mermin J, Were W, Ekwaru JP, Moore D, Downing R, Behumbiize P, *et al.* Mortality in HIV-infected Ugandan adults receiving antiretroviral treatment and survival of their HIV-uninfected children: A prospective cohort study. *Lancet* 2008;371:752-9.

10. National ART guidelines for prevention, care and treatment: Ministry of health Ethiopia. The Ethiopian FederalMinistry of Health. 2017. Available from: <https://www.afro.who.int/sites/default/files/2019-04/National%20Comprehensive%20HIV%20Care%20Guideline%202018.pdf>. [Last accessed on 2021 Jun 01].
11. Sachdev HPS. Nutrition status of Children and Women in India, Recent Trends. Bulletin of the Nutrition foundation of India, 2012:18.
12. Verma P, Saini L, Gupta S. Nutritional status of children in a welfare home. Indian Paedtr 1976;13:499-506.
13. Singh M, Fotedar R, Lakshminarayana J, Anand P. Studies on the nutritional status of children aged 0-5 years in a drought-affected desert area of western Rajasthan, India. Public Health Nutrition 2006;9:961-7.
14. Grover SB, Mehta SP. Morbidity pattern and socio-economic background of school children. Indian J Prev Soc Med 1978;9:77-84.
15. Goyal RC, Sachdeva NL, Somsundaram KV. Oral Health Status of rural community in Western Maharashtra. Indian Journal of PSM 1994;25:138-45.
16. Treating Opportunistic Infections Among HIV-Exposed and Infected Children Recommendations. CDC, the National Institutes of Health, and the Infectious Diseases Society of America. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5314a1.htm>. [Last accessed on 2021 Jun 01].
17. Melkamu MW, Gebeyehu MT, Afenigus AD, et al. Incidence of common opportunistic infections among HIV-infected children on ART at Debre Markos referral hospital, Northwest Ethiopia: a retrospective cohort study. BMC Infect Dis. 2020;20:50.
18. Prasitsuebsai W, Kariminia A, Puthanakit T, Lumbiganon P, Hansudewechakul R, Siew Moy F, *et al.* Impact of antiretroviral therapy on opportunistic infections of HIV-infected children in the therapeutic research, education and AIDS training asia pediatric HIV observational database. Pediatr Infect Dis J 2014;33:747-52.
19. Ylitalo N, Brogly S, Hughes MD, Nachman S, Dankner W, Van Dyke R, *et al.* Risk factors for opportunistic illnesses in children with human immunodeficiency virus in the era of highly active antiretroviral therapy. Arch Pediatr Adolesc Med 2006;160:778-87.