Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.4, No.7, 2014

Assessment of Vitamin A Status of Under-Five Children in Orphanages of Federal Capital Territory, Abuja, Nigeria

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Abstract
Assessment of vitamin a status of under-five children in orphanages of federal capital territory, Abuja, Nigeria was conducted. The objective of the study was to assess the vitamin A status of the under-five children in the orphanages of Federal Capital Territory using biochemical method and determine the relationship between the dietary intakes vitamin A with the biochemical status of the under-five children. A cross sectional descriptive study was carried out on 200 under-five orphans, between 0-5 years living in ten orphanages in Abuja, Nigeria. Blood samples were analysed to determine the Vitamin A status of the under-five children also questionnaires were used to collect information on feeding practices of the children. The values obtained from nutrient intakes were compared with FAO/WHO recommended nutrients intake. Biochemical results from this study, revealed high prevalence of vitamin A deficiency (VAD) (20.0%) among the under-five children. Majority (80.0%) of the children had normal vitamin A status, while 20.0% had marginal vitamin A deficiency (serum retinol concentration < 20 ug/dl). The prevalence of VAD was common in children aged 7-24 months. However, age of children did not have an effect on vitamin A status (χ^2 = 1.145; df=2, P=0.642). Correlation between dietary intake vitamin A and biochemical status of the children revealed that adequate dietary adequate dietary vitamin A intake was significant (P<0.05) with serum retinol. There is low caregiver to child ratio (1:5) and low socio-economic status. VAD is of public health importance in Nigeria therefore more concerted effort by all the stakeholders should be put in place to minimize it menace.
Keywords: Assessment, Vitamin A Status, Under-Five Children, Orphanages

Introduction

Micronutrients are nutrients required by the body in small amount for proper body functions [(1)]. Micronutrients which include vitamins and minerals play vital roles in body growth and development, reproduction, brain functions and resistance to diseases among others. Vitamin A, iron, iodine and recently zinc are the major micronutrients of public health importance especially in developing country like Nigeria [(2)]. This is because of the magnitude and seriousness of their deficiencies and consequences on health, learning capacities and productivity of affected people. Micronutrient deficiencies increase morbidity and mortality rates not only in children under-five years, pregnant and lactating mothers, who are more vulnerable but also to the general populace including vibrant adolescents[(3)]. It is generally known that the prevalence of malnutrition and micronutrients deficiency increases rapidly in under-five children because of rapid growth and development, therefore deficiency of these nutrients jeopardises the normal health, growth and development of the child. Children may look healthy and their diets may provide adequate energy and protein but are lacking in micronutrients. This is referred to as “hidden hunger”.

Vitamin A is a fat soluble vitamin that is of great significance to the body especially its role as immune booster and for health eye sight. Vitamin A deficiency (VAD) is a major public health problem. The most vulnerable group for VAD includes under-five children and pregnant women in low-income countries. In children, VAD is the leading cause of preventable visual impairment and blindness. Twenty six percent of vitamin A–deficient children live in Africa, with the largest number in Ethiopia [(4)]. VAD affects almost 1 in every 3 children in Nigeria [(5)]. World Health Organization has classified Nigeria among 34 countries in the world with serious problem of VAD related nutritional blindness and xerophathalmia[(5)]. VAD significantly increases the risk of severe illness and death from common childhood infections, particularly diarrheal diseases and measles [(6)].

Infants and young children are one of the vulnerable groups in the society. They are more vulnerable when they are denied their rights to proper feeding and good nutrition. Nigeria ranks 14th in global assessment of under-five mortality rate and approximately one million children die annually in Nigeria before their 5th birthday [(7)]. Nigeria is among the 20 countries in the world that account for 80% of undernourished children. The causes of this public health problem in Nigeria are complex and multidisciplinary. However, poor quality and quantity of foods given to children play a major role [(3)]. There are more orphanages in the country presently than before.

The prevalence of vitamin A deficiency in the country for under-five children is 29.5% [(8)]. It is worthy to note that this survey was conducted on non-orphans. No large scale surveys have been conducted in respect to micronutrient status of orphans in the FCT. Only a few studies have examined the impact of orphan status on child health and nutrition. Children under-five are particularly more vulnerable to the effects of orphan hood because they are undergoing rapid development and require nurturing, proper care, and adequate access to food

and health care services.

The objective of the study was to assess the vitamin A status of the under-five children in the orphanages of Federal Capital Territory using biochemical method and determine the relationship between the dietary intakes vitamin A with the biochemical status of the under-five children.

This study would provide information on the vitamin A status of the under-five children in orphanages of FCT. The generated data and information will be an evidence for strong advocacies to policy makers and stakeholder, which will subsequently inform their decisions on, appropriate nutrition intervention programmes geared towards improvement of the lives of orphans in FCT and Nigeria as a whole. It will also form a based line data for other researchers that would want to work on under-five nutritional status especially among orphans and vulnerable children.

Materials and Methods

Study area

The study was carried out in Federal Capital Territory (FCT) Abuja, North Central Nigeria. FCT has a rapid population growth which is facilitated by the expansion of the satellite towns in the sub-urban areas. The census population of FCT is 1.4 million [(9)]. It has a growth rate of 9.5%. it has an estimated population of about two million, one hundred and ninety one thousand, nine hundred and ninety three persons (2, 191, 993) for the year 2011 and under five children in FCT for year was 438, 399 [(9)]. FCT is made up of six area councils namely: Abaji, Abuja municipal area council (AMAC), Bwari, Gwagwalada, Kuje and Kwali area councils. FCT has 10 registered orphanages distributed in three Area Councils namely; Abuja municipal area council which has 50% of the total orphanages, Gwagwalada and Kwali area councils. One of the orphanages is owned by the government and the remaining 9 are owned by private individuals, organizations and non-governmental organisation (NGOs).

Study design

The study is a cross-sectional descriptive study.

Population of the study

The population for the study was all the 200 under-five children in the registered orphanages of FCT as at the time of the study.

Sample for the study

All the 200 under-five children in the orphanages were used for the study. Males were 96 under-five children while females were 104 under-five children living in ten orphanages. They were purposively selected and recruited for this study [(10)]. Thus they served as the sample size for the survey. A sub sample consisting of 20% of the sample (40subjects) were used for biochemical analysis. This number was drawn from the orphanages using random sampling by balloting without replacement.

$$\frac{20}{100} \times 200 = \textbf{40 children}$$

Ethical clearance and consent form

Before the implementation of the project, extensive consultation was undertaken between the researcher, and the management of the orphanages. This was made possible with the help of introductory letters from department of Home Science, Nutrition & Dietetics University of Nigeria Nsukka and the department of child's welfare, Social Development Secretariat Federal Capital Territory. The study was approved by Federal Capital Territory, Health Research Ethics Committee. All ethical issues were adhered; informed verbal consent was obtained from the management of the orphanage prior to the commencement of the study. Neither children nor workers/management of the orphanage, were paid to participate in the study, participation was voluntary.

Data collection instruments and methods

Questionnaire

A well-structured validated and pre-tested questionnaire was used in this study to collect background information of the orphanage, staff/caregivers and children which includes child's sex, age, number of children, staff strength and educational background of caregivers.

Collection of blood sample and preparation

The process of blood samples collection was conducted with consideration for the health and safety of both collector and subjects [(11)]. A soft tubing tourniquet was tired around the upper arm (above the elbow) of each child by a phlebotomist and medical laboratory scientist. The cubical fossal (puncture site) was cleaned with a clean cotton wool and 70% alcohol and then allowed to dry. With the assistance of health workers/caregivers in the orphanages the child was held and positioned to prevent excessive movement. A venepuncture was made with the needle directed upwards in the line of the vein and the plunger of the syringe pulled gradually to allow in blood. Three ml of blood was collected and carefully dispensed into two different sterile plain bottles. 1ml of the blood was dispensed into ethylenediaminetetracetic acid (EDTA) bottle for malaria analysis while two ml was dispensed into a plain bottle without anticoagulant. This is allowed to clot inside a black polyethylene bag to

avoid light degradation of vitamin A [12].

Serum was subsequently prepared in the laboratory by centrifuging the clotted blood samples at 500 revolutions per minutes for 7minutes and later collected into a legibly labelled serum bottles. This was immediately tied in a black polyethylene bag to avoid isomerization of retinol and freeze in refrigerator. It was thereafter transported under dark cover in a giostyle. The temperature inside the giostyle was maintained at 4^{o}C with frozen ice packs and presented for serum analysis at the Department of Chemical Pathology University College Hospital (UCH) Ibadan, Nigeria. The serum samples were run in triplicates for vitamin A after which the average was taken

Biochemical analysis

Vitamin A status analysis

Vitamin A (retinol) analysis was evaluated using High Performance Liquid Chromatography (HPLC) as recorded [12].

Apparatus: Pipette, HPLC, test tubes, beakers, volumetric flask and centrifuge.

Reagents: Acetonitrile, Hexane, Isopropyl alcohol, Retinol, 2, 6, diren-butyl-p-cresol, Asocobic acid Triton *x* 100 and Lithuim chloride

Procedure: the sample was first extracted by measuring 0.125µl of blood serum into a set of clean test tubes which was made up to 500µl in volume with ultra- pure water. A 10g/l of ascorbic acid was added as an antioxidant after which the sample was vigorously mixed for 15 minutes. About 400µl of acetonitrile and hexane were added respectively, to the sample, the mixture was centrifuged for 2minutes at 8000 rpm. Thereafter, the supernatant was collected for Vitamin A (Retinol) determination on HPLC [13]. Vitamin A deficiency was defined as serum retinol of <10g/dl and < 20g/dl was taken to be marginal deficiency [14].

Data analysis

Administered questionnaire were checked for accuracy, completeness and consistency. The questionnaire was coded and analysed using the computer programme, statistical package for social sciences (SPSS) for window version 16. Chi-square and Pearson correlation coefficient was used to determine relationship between variables.

RESULTS

Background Information of the Orphanages

Table 1a: Characteristics of the orphanages

	Frequency	Percentage
Ownership		
Government	1	10.0
Private	6	60.0
NGOs	2	20.0
Faith-based	2	20.0
Total	**10**	**100.0**
Income level per month (₦)		
100,000-300,000	2	20.0
301,000-500,000	5	50.0
501,000-700,000	1	10.0
>700,000	2	20.0
Total	**10**	**100.0**
Source of funding		
N= multiple response		
Self-sponsorship	7	70
Donation by government	5	50
Donations by private organizations	4	40
Donation by individual	6	60
Sources of electricity		
N= multiple response		
Government only	2	20.0
Generator only	4	40.0
Both	7	70.0
Access to health care		
First aid	8	80.0
Availability to functional health facility	2	20.0
Total	**10**	**100.0**
Recreational activities		
Available	8	80.0
Not available	2	20.0
Total	**10**	**100.0**

Table 1 shows the characteristics of the orphanages. More than half (60.0%) of the orphanages were privately

owned, 20.0% were owned by non-governmental organizations (NGOs) and faith-based organizations while only 10.0% were government owned. Half (50.0%) of the orphanages received income within the ranges of N301,000 and N500,000. Twenty percent (20.0%) received funds within N100,000 and N300,000 while 20.0% of them received funds, above N700,000. Ten percent (10%) received funds between the range of N501,000 and N700,000. Majority of the orphanages (70%) got their income through self-sponsorship, 60% of the income were from private individuals, while half (50%) were from government, a little below half (40%) got their income from private organization. Majority (70.0%) of the orphanages got their electricity from both government and generator (private) sources, 40.0% got from generator only while 20.0% got from government source only. A greater percentage (80.0%) of the orphanages had first aid as their only access to health care while 20.0% had no access to functional health facility. Majority (80.0%) of the orphanages had recreational activities while 20.0% of them had no recreational activities.

Table 1b: Characteristics of orphanages

	Frequency	**Percentage**
Staff strength		
1-10	3	30.0
11-20	6	60.0
>20	1	10.0
Total	**10**	**100.0**
Toilet system		
Water system	9	90.0
Pit latrine	1	10.0
Total	**10**	**100.0**
Source of water		
N= multiple response		
Pipe borne water	6	60.0
Borehole	7	70.0
Well	2	20.0
Water vendors	4	40.0
Source of obtaining children		
N= multiple response		
Police	5	50.0
Social welfare	8	80.0
Parents/relative	4	40.0
Streets, dustbins, bush	3	30.0

Table 1b shows the characteristics of the orphanages. More than half (60.0%) of the orphanages had 11-20 staff, 30.0% had 1-10 staff while 10.0% had 20 staff and above. Majority (90%) of the orphanages had water system as their toilet facilities while 10% of them used pit latrine. More than half (70.0%) of the orphanages used borehole as source of water, 60% rely on government for their water supply, 40% of them buy water from water vendors while 20% got their water from well. Majority (80.0%) of the orphanages obtained children from social welfare, 50.0% of them obtained children from police, 40.0% of them obtained from parents/relatives and 30.0% of them obtained children from streets, dustbins and bush.

Table 2: Background characteristics of the children in the orphanages

	Frequency	Percentage
Sex of the children		
Male	96	48.0
Female	104	52.0
Total	**200**	**100.0**
Age distribution (in months)		
0-6	15	7.5
7-24	87	43.5
25-60	98	49.0
Total	**200**	**100.0**
Education		
No of eligible children receiving education	98	100.0
No of eligible children not receiving education	0	0.0
Total	**98**	**100.0**

Table 2 shows the background characteristics of the children in the orphanages. More than half (52.0%) were females while 42.0% of them were males. Slightly less than half (49.0%) of the children fell within the age range of 25-60 months, 43.5% fell within 7-24 months while 7.5% fell within 0-6 months. All (100%) eligible children are receiving education/attending school.

Background information of staff of the orphanages

Table 3: Background information of the staff

	Frequency	Percentage
Level of Education		
Primary education	25	20.5
Secondary education	37	30.3
OND/NCE & Diploma	29	23.8
HND & B.Sc	19	15.6
PGD/Masters	12	9.8
Total	**122**	**100.0**
Age (in years)		
25-34	21	17.2
35-44	34	27.9
45-54	42	34.4
>54	25	20.5
Total	**122**	**100.0**
Position of staff		
Admin staff	17	13.9
Health workers	9	7.4
Caregivers/nannies	40	32.8
Cooks	16	13.1
Security men	11	9.0
Cleaners	19	15.6
Drivers	10	8.2
Total	**122**	**100.0**

Table 3 shows the background information of the staff. About 30.3% of the caregivers had secondary education, 20.5% had primary education, 23.8% had OND/NCE & Diploma Certificates, 15.6% had HND and B.Sc certificates and 9.8% had PGD/Masters education. Less than a half (34.4%) of the staff fell within the age range of 45-54 years, 27.9% fell within 35-44 years and 20.5% were above 54 years. However, only 17.2% fell within 25-34 years. About 33.0% of the staff were caregivers/nannies, 15.6% were cleaners and13.9% of them were administration staff. About 13.0% were cooks, 9.0% were security men and 8.2% were drivers. The least (7.4%) were health workers.

Figure 1 shows the caregiver-to-child ratio. There were 40 caregivers for 200 children in the orphanages. This is in the ratio of 1:5.

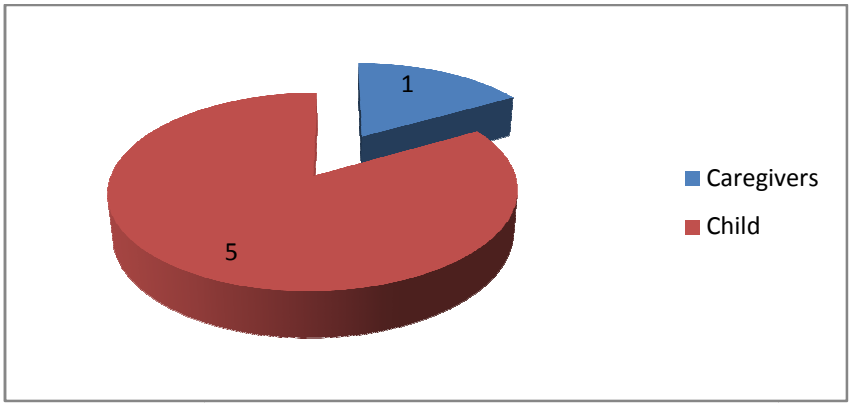

Figure1: shows the caregiver-to-child ratio

Table 4: Nutrition intervention programmes on the children. N= multiple responses

	Frequency	Percentage
Growth monitoring	-	-
Vitamin A supplementation	169	84.5
Deworming	158	79.0
MUAC screening	-	-
Severe Acute Malnutrition Management	-	-
Micronutrient deficiency control	-	-

Table 4 shows the nutrition intervention programmes carried out on the children among the orphanages. More than a half (84.5%) of the children had vitamin A supplementation and another 79.0% received albendazole (deworming tablets) in their orphanages during the Maternal New born Child's Heath Week (MNCHW). Other interventions such as growth monitoring, mid upper arm screening (MAUC) screening, Severe Acute Malnutrition Management, Micronutrients deficiency control were not conducted in the orphanages.

Table 5: Health care practices of the children

	Frequency	Percentage
Immunization		
Completely immunized	179	89.5
Not completely immunized	21	10.5
Total	**200**	**100.0**
Various Antigens received. N= Multiple responses		
OPV	200	100.0
DPT	150	75.0
HBV	200	100.0
Yellow fever	200	100.0
Measles	185	92.5
Children that slept under Insecticide Treated Nets (ITN)		
Slept under ITN	158	79.0
Did not sleep under ITN	42	21.0
Total	**200**	**100.0**

Keys:
OPV: oral polio vaccine DPT: Diphtheria pertussis tetanus
HBV: Hepatitis B vaccine

Table 5 shows the health care practices of the children. Majority (89.5%) of the children had completed immunization in accordance with their age and a few (10.5%) were yet to complete immunization. All (100.0%) eligible children received antigens of oral polio vaccine (OPV), hepatitis B vaccine (HBV) and yellow fever. About 93.0% received antigens of measles while 75.0% received diphtheria pertussis tetanus (DPT). Majority (79.0%) of the children slept under insecticide treated nets (ITN) and 21.0% did not sleep under ITN.

Biochemical status of the children (0-60 months) in the orphanages

Table 6: Biochemical assessment result of the children

Serum retinol	
Vitamin A deficient	19.38±0.64
Normal	60.68±11.78

Table 6 shows the biochemical results of the children. Majority (80.0%) of the children had a normal vitamin A status while less than a quarter (20.0%) were vitamin A deficient.

Table 7: Mean biochemical measurements of the normal children according to age

Age (months)/Sex	**Serum retinol (µg/dl) >20.0**
0-6 months	
Male	34.23±1.14
Female	28.23±2.13
7-24 months	
Male	24.56±0.08
Female	27.89±0.07
25-60 months	
Male	25.78±1.10
Female	28.35±0.98

Table 7 shows the mean biochemical measurements of the children. The mean value of those that are vitamin A deficient are 19.38±0.64

Discussion

The objectives of this cross-sectional descriptive study carried out in the orphanages of Federal Capital Territory, Nigeria is the need to assess the feeding practices, anthropometrics, vitamin A, iron and zinc status of the under-five children in these institutions, so as to provide evidence based data that will inform nutrition/health interventions for the under-five orphans.

Background information of the orphanages

This section presents information on characteristics of the orphanages, children and staff as well as their socioeconomic status. Private individuals (60.0%) owned the largest number of orphanages. This finding is similar to a survey conducted by Federal Ministry of Women Affairs and Social Development on orphanage situation in Nigeria, which showed that private individual owned majority of the orphanages (48.6%) in Nigeria [(15)]. Twenty percent (20.0%) were owned by non- governmental organizations (NGOs) and Faith based organization (FBO). This was surprising because, with so many NGOs and FBOs emerging lately, it would have been expected that most of them would have ventured into running orphanages since orphans are more vulnerable than non-orphans. Only 10.0% of the orphanages were owned by government, this revealed that government is declining in management of orphanages. Government is concentrating more on regulatory and supervisory work, leaving the management in the hands of private individuals, philanthropies NGOs and FBOs. Previous study carried out on orphanages in Nigeria reported that 27.0% of the orphanages were owned by NGO and FBO while 24.2% of them were owned by government [(15)].

Majority of the orphanages (70.0%) got their electricity from both government and generator sources. They rely more on generator (40.0%) than national electricity (20%). This was attributed to the irregular source of energy from government, which led to majority of the orphanages having generator to complement electricity supply from government. A greater percentage (80.0%) of the orphanages had first aid boxes as their only access to health care and also recreational facility, respectively as compared to 20.0% of them that had no access to functional health facility and recreational equipment. These findings are in line with the Federal Ministry of Women Affairs and Social Development survey on situation of orphans and vulnerable children in Nigeria [(15)], where it stated that 83.2% of the orphanages had available first aid boxes and another 81.8% had recreational facility. Half (50.0%) of the orphanages received funds within the ranges of ₦301,000 and ₦500,000, while 20.0% received funds more than ₦700,000.

The orphanages source of income (70.0%) were mainly self-sponsored especially those that were privately owned, while 60.0% were from private philanthropic individuals. According to Social Development Secretariat, Federal Capital Territory Administration, it is government responsibility to provide monthly subventions to the orphanages, which should be the major source of income for the orphanages. Contrary to their opinion half of the orphanages (50.0%) claimed they had received government subventions, at one point but it was quite irregular.

The study showed that the government owned orphanage received its income mainly from government

subventions. This was not surprising since the orphanage was owned by government. The study revealed that orphanage ownership had an influence on source of income. The chi-square analysis showed that there is significant association ($p<0.05$) between income level and the prevalence of malnutrition. Nutritional status of the under-five improved with increased income among the orphanages, while those of the orphanages that received funds between N301,000 and N500,000 recorded the highest prevalence of stunting (33.0%). Majority of the children that had nutritional problems were from low income orphanages. Report revealed that an increase in household income is associated with improved nutritional status of children [16]. Income influenced the nutritional status of the children in this study.

Majority (80.0%) of the orphanages obtained children from social welfare. Half of the orphanages (50.0%) recorded that the children in their homes were brought in by the police. These findings were in line with the Federal Ministry of Women Affairs and Social Development survey where it stated that social welfare department and police were the highest source of obtaining children in the orphanages [17]. Forty percent of the orphanages obtained children from parents/relatives. This was attributed to high level of poverty in Nigeria [18], which makes it difficult for parents to successfully take care of their children. Federal Ministry of Women Affairs and Social Development report revealed that most parents and relatives take their children to orphanages when it becomes difficult to provide necessary care to their children [17].

Vitamin A status of the under-five children

Biochemical results from this study, revealed high prevalence of vitamin A (20.0%) among the under-five children. Majority (80.0%) of the children had normal vitamin A status, while 20.0% had marginal vitamin A deficiency (serum retinol concentration < 20 ug/dl). This is in line with result from previous studies that recorded 28.1% vitamin A deficiency [19]. At the national level, 24.8% of children under-five suffered from marginal deficiency (serum retinol concentration < 20 ug/dl) while 4.7% had serum retinol concentration < 10 ug/dl and hence, were suffering from severe vitamin A deficiency [8].

The study showed that there were more males that were vitamin A deficient than females among the under-five children. The prevalence of vitamin A deficiency (10.0%) was common in children aged 7-24 months. Children aged 6 months and below had the least prevalence (2.5%) of vitamin A deficiency. However, age of children did not have an effect on vitamin A status ($\chi^2 = 1.145$; df=2, P=0.642). Twenty percent of the under-five children having vitamin A deficiency (VAD) is still of public health importance. Measles (12.5%) was among the morbidity pattern of the children. There is a dangerous vicious cycle between VAD, diarrhoea, measles infection and malnutrition [20]. This needs to be broken in order to reverse the child back to a state of good health, which centers on good nutrition with adequate vitamin intake, measles vaccination and a clean environment. Majority of children having good vitamin A status might be attributed to synergistic effects of dietary intake and wide coverage of vitamin A supplementation. Adequate dietary vitamin A intake of the children was significant ($P<0.05$) with serum retinol.

The National vitamin A fortification and supplementation programme which is a cost effective approach tends to improve vitamin A status among the vulnerable populations. Black reported that the 23.0% reduction in mortality among children aged 6-59months was associated with adequate vitamin A supplementation [21]. UNICEF reported that Nigeria has attained 98.0% of vitamin A supplementation [22]. However, FCT recorded very low vitamin A supplementation coverage (24.0%) during the November, 2011 Maternal Newborn and child's Health Week (Nutrition unit, FCT, PHCDB). This contributed to the marginal deficiency recorded in this study Vitamin A which is a fat soluble vitamin can be stored in the liver up to six months depending on the infection level of the individual [23].

The role of vitamin A in immunity cannot be overemphasized, risk of infection increases with vitamin A deficiency [4]. Lack of vitamin A can affect iron metabolism when deficiency of both nutrients coexist and particularly when there is a high load of infection. The maximum haemoglobin response occurs when iron and vitamin A deficiencies are corrected together. Vitamin A deficiency appears to influence the availability of storage iron for use by hematopoietic tissues [24]. Generally, the overall prevalence of VAD is decreasing markedly in Nigeria [22]. This is attributed to the increased awareness of VAD as a public health problem and increased vitamin A supplementation and fortification programmes.

Conclusion

Provision of adequate nutrition during infancy and early childhood is a basic requirement for the development and promotion of optimum, health and behaviour of the child. This study recorded high prevalence of malnutrition among the under-five children in FCT orphanages. This was linked to dietary deficiencies of some macro-and micro nutrients, especially protein, carbohydrates, vitamin A, iron and zinc. Generally, the overall prevalence of VAD is decreasing markedly in Nigeria. Vitamin A deficiency recorded in the study though mainly marginal indicates that VAD is still of public health importance in Nigeria. The consequences of faulty micronutrients deficiency such as vitamin A among these children are bad eye sight, susceptibility to infection, low immunity, low cognitive responses, poor productivity and development. Micronutrient deficiency

precipitates malnutrition which puts these children at risk of morbidity severity and mortality of several infections. The current strategy being adopted by the government such as fortification and supplementation of Vitamin A to the vulnerable groups should be strengthened and sustained.

Recommendations

- Nutrition education directed at caregivers, health workers and managements of the orphanages is imperative. This will help improve the feeding practices, hygiene and nutritional status of the children.
- Vitamin A which is currently supplemented to children 6-59months and post-partum mothers in the country should be extended to the non-breastfed children of 0-6months. They can benefit from low doses of vitamin A supplementation of 50,000 iu [(14)].
- Multiple mix supplementations should be promoted and adopted. For example, micronutrients of public health importance such as iron, zinc, iodine and vitamin A can be integrated and effectively delivered to the vulnerable children in a single dose.

Acknowledgements

Sources of funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors, although my organization FCT Primary Health Care Board, HHSS-FCTA Abuja Nigeria paid for my Masters degree tuition and sustenance. **Conflicts of interest**: There are no conflicts of interest. Acknowledgements: The author would like to thank Professor N. M. Nnam for supervising this work.

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