Central African Journal of Public Health
2016; 2(2): 89-98
http://www.sciencepublishinggroup.com/j/cajph
doi: 10.11648/j.cajph.20160202.17

Vitamin a Supplementation Coverage and Correlates of Uptake Among Children 6-59 Months in the South Dayi District, Ghana

Doris Hadzi[1], Geoffrey Adebayo Asalu[1, *], Hayford Mawuli Avedzi[2], Prince Kubi Appiah[1], Elvis E. Tarkang[1]

[1]School of Public Health, University of Health and Allied Sciences, Hohoe, Ghana

[2]School of Public Health Sciences, University of Alberta, Alberta, Canada

Email address:

geoffreyasalu1@gmail.com (G. A. Asalu)

[*]Corresponding author

To cite this article:

Doris Hadzi, Geoffrey Adebayo Asalu, Hayford Mawuli Avedzi, Prince Kubi Appiah, Elvis E. Tarkang. Vitamin a Supplementation Coverage and Correlates of Uptake Among Children 6-59 Months in the South Dayi District, Ghana. *Central African Journal of Public Health* Vol. 2, No. 2, 2016, pp. 89-98. doi: 10.11648/j.cajph.20160202.17

Received: September 13, 2016; **Accepted**: October 20, 2016; **Published**: December 9, 2016

Abstract: *Introduction:* Vitamin A is essential for immune function, vision, reproduction, and cellular communication. Insufficient amounts of vitamin A decreases children's ability to resist diseases and increases risks for childhood deaths, hospital stay, and missed school days. Two annual doses of vitamin A supplementation (VAS) for children 6-59 months, with a coverage threshold of 70% as recommended by UNICEF in settings with high deficiency. *Methodology:* For this cross-sectional study, we assessed nutrition knowledge of vitamin A among caregivers with children 6-59 months and coverage of VAS in the South Dayi District, Volta Region, Ghana, using structured questionnaires. Child health records were reviewed to determine immunization and vitamin A supplementation status of the children. Data were analyzed using the Statistical Package for Social Sciences SPSS (version 20.0) at 95% confidence intervals. *Result:* A total of 418 caregiver-child pairs participated in this study and health records of all children (49% female, ages 6-59 months) were examined for VAS coverage. Overall, VAS coverage in the 12 months preceding the study was 64.3%. Among caregivers with mean age ± SD (30.4 ± 7.4 years), 65% had inadequate nutrition knowledge of vitamin A food sources and 62% did not know deficiency symptoms or diseases linked to vitamin A. Caregiver knowledge (OR: 1.7) age of child (OR: 1.2) and being a female child (OR: 2.3) were significantly associated with receipt of vitamin A supplementation among children ($p<0.05$). *Conclusion:* Vitamin A supplementation coverage was below the WHO recommended threshold and caregiver knowledge was inadequate in the South Dayi District. Caregiver-centered approaches are needed for improving vitamin A nutrition and supplementation among children in the district.

Keywords: Vitamin A Supplementation Coverage, Correlates, Children, South Dayi District, Ghana

1. Introduction

Vitamin A is one of the micronutrients of public health importance just like iron, iodine, zinc and folic acid. Vitamin A is a micronutrient for maintaining immune function, eye health, vision, growth and survival in human beings [1]. Infants and children require more vitamin A to help them to grow faster and enable them to prevent and combat infections [2]. There are animals (retinol) and plants (carotenoid) sources of vitamin A in foods. Animal sources of vitamin A include; milk, butter, cheese, liver, and fish liver oil, while plants sources of vitamin A include; green leafy vegetables, deeply colored yellow and orange fruits, and vegetables such as mangoes and pawpaw [3]

Deficiency or inadequate vitamin A intake causes vitamin A deficiency disorders (VADD). The term VADD is defined as a comprehensive term that covers all aspects of the deficiency state of vitamin A and includes adverse effects on health, survival and vision [4]. Vitamin A deficiency (VAD) predisposes children to increased risk of a range of problems, including respiratory diseases, diarrhea, measles and vision

problems, and can lead to death [4, 5].

Vitamin A deficiency is a major contributor to under-five mortality [6]. It has been estimated that about 4 million children under the age of 5 are affected by xerophthalmia, a serious eye disorder that can be caused by moderate to severe Vitamin A deficiency, which can lead to blindness [7]. Far greater number of children show no external signs of vitamin A deficiency but live with dangerously low vitamin A stores, leaving them vulnerable to infections and with reduced immunity to fight common childhood diseases [8]. Also, insufficient amounts of vitamin A decreases children's ability to resist diseases and therefore increases risks for childhood deaths, hospital stay, and missed school days.

In order to combat vitamin A deficiency disorders, different countries have adopted different strategies. Countries such as Latin America are well vested in food fortification as a way of preventing vitamin A deficiency disorders however; delivery of high dose supplement of vitamin A has shown to be a principal strategy for controlling vitamin A deficiency [8]. Vitamin A supplementation is recommended in infants and children 6 -59 months of age as a public health intervention to prevent morbidity and mortality in settings where vitamin A deficiency is perceived as a problem [2]. The goal of vitamin A supplementation is universal coverage which refers to a coverage threshold of 70%, and this represents the minimal coverage at which countries can expect to observe reduction in child mortality [8].

In the year 2000, approximately 190 million children aged 6- 59 months received at least one high dose of vitamin A supplements, representing global coverage of 68%. It was estimated that only 26 of the 103 priority countries attained effective coverage levels in 2000, which means that they reached at least 70% of children with two rounds of supplementation [8]. However, in 2009, about 77% of pre-school children in more than the 103 priority countries received two doses of vitamin A supplements [2].

In Sub-Saharan Africa (SSA), 45 priority countries supplement vitamin A capsules to infants and children 6- 59 months of age. It was reported that regional coverage exceeds 70% every year except in 2003 when there was a reduction in the coverage to 65% [8]. However, millions of children are still not fully covered with the recommended two annual doses. In addition to the supplementation, more than half of the countries are supporting food fortification as a complementary strategy. In Ghana, the most vitamin A deficient regions were reported to be the three northern regions namely; Northern, Upper East and Upper West regions and the analysis of results of ten major vitamin A supplementation field trials in the three northern regions of Ghana found that a 23% reduction in overall childhood mortality was achieved [9]. This shows that vitamin A supplementation is cost effective and would decrease all causes of child mortality. The Ghana Demographic and Health survey (2008) [10] revealed that, the national coverage of vitamin A in children 6-59 months in the 6 months preceding the survey was 56%, a considerable decline from 78 percent in 2003 Ghana Demographic and Health survey [11].

In South Dayi District, the vitamin A coverage was low for the past three years (2013 to 2015). The South Dayi nutrition report 2014 showed that 48% of the target population of children (6 to 59 months) was administered vitamin A supplement [12]. This coverage was low because the expected annual coverage of vitamin A should not be less than 70% [8]. This increase was insignificant in preventing deficiency disorders in the district. Also, the target set for the year 2014 was to increase vitamin A supplementation coverage in the district by 10% while only 1% of the target was achieved at the end of the year. In view of this, the study aimed to determine vitamin A supplementation coverage and factors that influence Vitamin A supplementation uptake in the South Dayi District.

2. Methods

2.1. Study Site

South Dayi is one of the 25 administrative districts in the Volta Region of Ghana. It was created in the year 2005 and occupies an area of about 1000 square kilometers. The district shares common boundary with Afadzato South District and Ho-West District in the north, with Asuogyaman District in South west, and with the Volta Lake at the South eastern part. The projected population of the district in 2015 was 52,793 people [12]. There are four (4) sub districts namely: Kpalime/ Tongor, Kpeve/ Azokoe, Dzake and Peki sub districts in the district; and there are about 21 hard-to-reach communities in the district particularly communities along the Volta lake which do not have access to good roads. The district also has some mountainous communities within it that are hard to reach as well. The district capital Kpeve, is a vibrant market community with two market sessions in a week (Tuesdays and Fridays). The main occupation of the people in the district is farming and fishing.

2.2. Study Population

The study was conducted among caregivers with children between the ages of 6 months and 59 months who were living in the South Dayi District.

2.3. Study Design

A descriptive cross-sectional study design was employed to determine VAS coverage and assessed Vitamin A nutrition knowledge among caregivers having children between 6 months and 59 months who were living in the South Dayi District.

2.4. Sample Size

The study had 418 participants as its sample size. The sample size was determined using Snedecor, G., and Cochran (1989) sample size formula: $n = (Z\alpha/_2)^2 P (1-P)/e^2$ [14]. The sample size was determined based on three factors: the

confidence level desired or alpha level $(Z\alpha/_2)^2$ of 95%, margin of error permitted e^2 = 6% and p = percentage of vitamin A supplementation coverage estimate in South Dayi District in year 2014 being 48% [13]. The formula yielded an estimated sample size of 266. This sample size was multiplied with a design effect of 1.5 to arrive at 399. The sample size was further increased by 5% to account for incomplete responses and missing data. Thus, the required sample was: N = n+ (n x 5%) = 399+ (399×0.05) = 418.

2.5. Sampling Method

A multistage stratified sampling procedure was employed for sample selection. In the first stage, probability proportional to size was used to select samples from the various sub districts. The second stage involved the use of a simple random probability sampling technique to select four communities each from every sub district. In each community the central point was located. The interviewer stood at that point and tossed a pen. The first house in the direction of the tip of the pen was entered. One participant each was interviewed in a house. In a house where there were several households with caregivers who were within the target population, a simple random sampling technique was used to select one participant. The third house from the subsequent house was the next house that was selected.

2.6. Data Collection

Data was collected from parents/caregivers with children between 6 months and 59 months who were living in the South Dayi district through a face-to-face interview using structured questionnaires. The study excluded caregivers whose children were below 6 months or above 59 months of age and/or were living in the district less than a year. The study also excluded caregivers whose children did not have a child health record book. The child record book confirmed the age of the child and the number of vitamin A capsules the child had taken.

2.7. Ethical Considerations

The participation in this study conformed to the required ethical principles regarding the use of human subjects. Participation in the study was voluntary and formal consent were sought from the caregivers. Ethical approval was granted by the Ghana Health Service Ethical Review Committee through the University of Health and Allied Sciences before the commencement of this study.

2.8. Data Analysis

Data was analysed using SPSS version 20.0 and frequencies and percentages were reported for categorical variables. Mean and standard deviation were determined for continuous variables and correlations were used to determine the associations between variables. A binary logistic regression was used to determine the predictors of receipt of vitamin A capsule and a p-value <0.05 was considered significant.

Knowledge on vitamin A was determined by three questions from the questionnaire. These are: the ability of a caregiver to correctly identify the vitamin A supplementation capsule among other drugs that were presented, the ability to voluntarily tell at least two natural food sources of vitamin A and the awareness of a caregiver on the medical effects of vitamin A deficiency by identifying at least two medical effects. A score of five and above was awarded for good knowledge while a score of less than five was awarded for poor knowledge on vitamin A. Thus the ability to identify the vitamin A supplementation capsule was scored one, the ability to voluntarily tell two natural food sources of vitamin A was scored two and the ability of a caregiver to identify two medical effects of vitamin A was also scored two.

3. Results

3.1. Background Characteristics of Caregivers

A total of 418 caregivers were interviewed, of these the minimum age was 15 years while the maximum age was 62 years with a mean (±Standard Deviation (SD)) of 30.4 (±7.4) years. From the age distribution, 3.8% were teenagers, majority (50.5%) were between the ages of 25 and 34 years and 4.3% were above 45 years. Seventy-nine percent of them was married while 2.1% were single. Of the total interviewed 96% were biological parents and the remaining 4% were foster parents. Less than half of the respondents (43.3%) were from the Kpalime/ Tongor sub district while 11.5% were selected from Dzake sub district (Table 1).

Table 1. *Demographic characteristics of caregivers.*

Characteristics	No. of Caregivers (n)	Percentage (%)
Age group (years)		
15-19	16	3.8
20-24	67	16.0
25-34	211	50.5
35-44	106	25.4
45+	18	4.3
Marital status		
Married	330	79.0
Single	84	20.1
Divorce	4	0.1
Status of caregiver		
Biological	403	96.4
Foster	15	3.6
Sub district		
Kpalime/ Tongor	181	43.3
Dzake	48	11.5
Peki	119	28.5
Kpeve/ Adzokoe	70	16.8

3.2. Socio-Economic Background of Caregivers/Parents

The highest level of education attained by most of the mothers was secondary education (66.9%), which comprises junior high schools, senior high schools, technical and vocational schools. Mothers who did not attend any school constitute 9% while 2% had tertiary education. For fathers, approximately 70% attained secondary education level while

7% did not attend school.

Occupation wise, most of the mothers interviewed (33%) were petty traders while 25.1% were unemployed. Forty two percent (42%) of the fathers were artisans and only 1% engaged petty trading (Table 2).

Table 2. *Socio-Economic Characteristics of parents.*

Characteristic	Mother		Father	
	Number	**Percentage**	**Number**	**Percentage**
Level of education				
No education	38	9.1	20	7.2
Basic	81	19.4	68	16.3
Secondary	289	69.1	280	66.9
Tertiary	10	2.4	40	9.6
Total	418	100	418	100
Occupation				
Unemployed	105	25.1	27	6.5
Farmer	77	18.4	142	34
Petty trader	139	33.3	4	1
Own business	0	0	23	5.5
Office worker/ professional	17	4.1	44	10.5
Artisan	80	19.1	178	42.6
Total	418	100	418	100

3.3. The Time Taken to Get to the Nearest Health Facility

It was found out that averagely, majority of caregivers (92.8%) were able to access a health facility within 30 minutes (Figure 1).

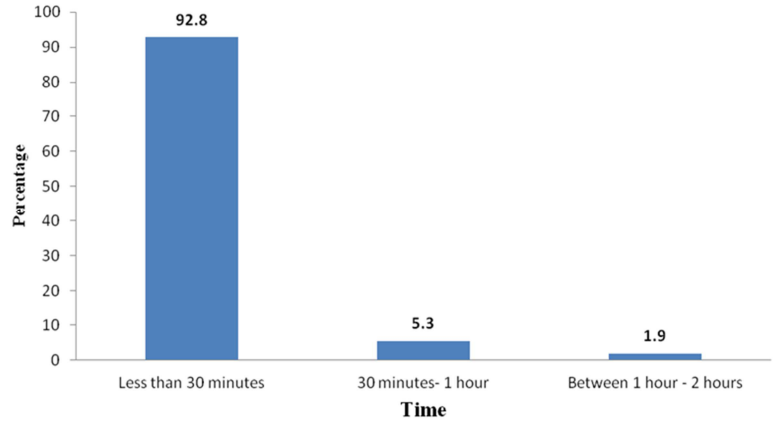

Figure 1. *The time taken to get to the nearest health facility.*

3.4. Reasons for Visiting a Health Facility with Your Child

About 65.1% of caregivers visited a health facility because of ill-health of their children and only 2.9% of caregivers mentioned visiting a health facility in order to get vitamin A supplements for their children (Figure 2).

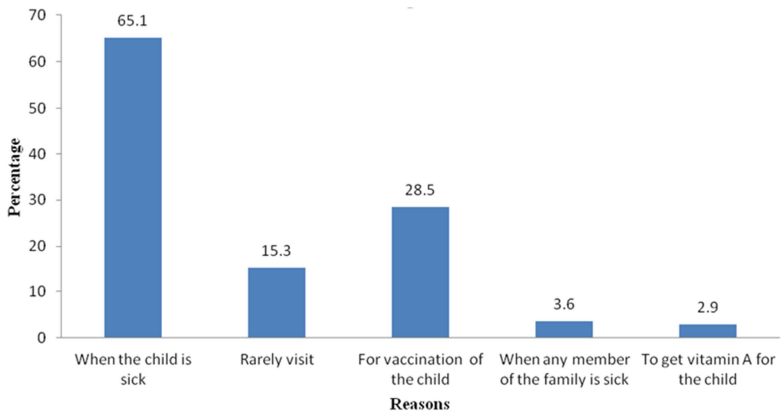

Figure 2. *Reasons for visiting a health facility with your child.*

3.5. Places Where Vitamin A Supplements Were Given

Approximately 62.9% of the caregivers reported that the vitamin A was received at a clinic, 5% reported that it was only received at home while 32.1% reported that it was received both at clinic and home.

3.6. Health Facility Practice

Caregivers were asked when last their children received vitamin A, if they were informed by the health worker the next time they should bring their children for another dose. About 14.6% of caregivers reported that they were informed while 85.4% were not informed. The majority (96.7%) of the caregivers reported that they have never been told of a shortage of vitamin A capsule since they started attending child welfare clinics (CWC) with their children, while 14 (3.3%) reported that they have been sent back home before, due to shortage of vitamin A capsules.

3.7. Demographic Characteristics of Children

The child health record books of the 418 children between the ages of 6 to 59 months were examined for immunization and vitamin A supplementation status. The minimum number of the children was between 6- 11 months age group (17.9%). More than half (57.7%) of the children were between the ages of 24 to 59 months. 50.7% were males while the females formed 49.3%, as shown in Table 3.

Table 3. *Demographic characteristics of children.*

Characteristic	Number	Percentage
Age of child (months)		
6- 11	75	17.9
12-23	102	34.4
24-59	241	57.7
Sex		
Male	213	50.7
Female	205	49.3

3.8. Vitamin A Coverage in the Last 12 Months

Table 4 shows the coverage of vitamin A among the children who participated in the study. The total vitamin A coverage among the children who received at least one dose of vitamin A in the last 12 months was 64.3%. Only 46.4% received the two required doses while 17.9% received one dose. More females (70.7%) than males (58.3%) received vitamin A in the last 12 months (P=0.022). The uptake of vitamin A in the last 12 months also varied among the age groups. A high coverage of 90.7% was observed among children of the age category of 6-11months while a low coverage of 44% of vitamin A was observed among children between the ages of 24 and 59 months (P< 0.0001).

Table 4. *Vitamin A coverage in the last 12 months.*

	Received all doses of Vit A	Received only one dose of Vit A	Not received Vit A.	No of children	Pearson Chi2	P-value
	n= 194(%)	n=75(%)	n=149(%)	N=418(%)		
Age of child (months)						
6-11	68(90.7)	0	7(9.3)	75		
12-23	79 (77.5)	15(14.7)	8(7.8)	102	174.582	<0.0001
24-59	47 (19.5)	60(24.9)	134 (55.6)	241		
Sex						
Male	92(43.2)	32(15.0)	89(41.8)	213	7.623	0.022
Female	102(49.8)	43(20.9)	60(29.3)	205		

3.9. Im Munization Status of Children

The majority (81.6%) of the children was fully immunized, 17% of the children were partially immunized and only 1.4% of children were not immunized.

3.10. Caregivers' Knowledge on Vitamin A

The correct identification of vitamin A capsule was very high (92.8%) however, 7.2% of caregivers could not identify the vitamin A capsule. Most of the caregivers (67.7%) could not mention any natural source of vitamin A. Approximately, 23% mentioned one source of vitamin A rich foods, while only 0.5% was able to correctly mention four natural sources of vitamin A. Caregivers showed poor knowledge in mentioning the health effects of vitamin A deficiency. About 62.7% could not tell any medical effect of vitamin A deficiency. Only 3.4% mentioned night blindness as a medical effect and none mentioned death as a consequence of vitamin A deficiency. Out of the total of 418 caregivers interviewed, 148 (35.4%) showed good knowledge on vitamin A while, 270 (64.6%) showed poor knowledge on vitamin A (Table 5).

Table 5. *Caregivers' knowledge on vitamin A.*

Variables	Number (N=418)	Percentage
Correct identification of vitamin A		
Yes	388	92.8
No	30	7.2
No. of natural sources of vitamin A mentioned		
None	283	67.7
One	96	22.9
Two	30	7,2
Three	70	1.7
Four	2	0.5
Medical effects of vitamin A mentioned		
Poor growth	45	10.8
Night blindness	14	3.4
Frequent illness	104	24.9
Death	0	0
Does not know	262	62.7
Overall knowledge on Vitamin A		
Poor	270	64.6
Good	148	35.4

3.11. Factors Associated with Vitamin A Uptake

In both the unadjusted and adjusted model, variables such as age of a caregiver, age of child, sex of child, level of education of mother, mother and fathers' occupations and knowledge on vitamin A have shown an association with an uptake of vitamin A as shown in Table 6 and Table 7.

Table 6. *Correlated variables associated with Vitamin A uptake in unadjusted model.*

Variable		Odds ratio	P value
Age of caregiver (years)	< 20	1	<0.0005
	20-24	0.3	
	25-34	0.1	
	35-44	0.1	
	45+	0.1	
Age of child (months)	6-11	1	<0.0001
	12-23	1.2	
	24-59	0.1	
Sex of child	Male	1	0.005
	Female	1.7	
Level of education of mother	No education	1	0.039
	Primary	1.1	
	Secondary	2.0	
	Tertiary	1.4	
Occupation of mother	Unemployed	1	0.01
	Farmer	0.4	
	Petty trading	0.6	
	Own business	1	
	Civil/ public worker	0.6	
	Artisan	0.6	
Occupation of father	unemployed		0.04
	Farmer	0.4	
	Petty trader	0.3	
	Own business	0.2	
	Civil/ public servant	0.9	
	Artisan	0.7	
Knowledge on vitamin A	Poor knowledge	1	0.011
	Good knowledge	1.7	

Table 7. *Variables significantly associated with uptake of vitamin A in an adjusted model.*

Variable		Odds ratio	P value
Age of caregiver (years)	35-44	0.21	0.202
	< 20	1	
	20-24	0.41	0.463
	25-34	0.20	0.166
	45+	0.40	0.478
Age of child (months)	6-11	1	
	12-23	1.1	0.884
	24-59	0.07	0.000
Sex of child	Male	1	
	Female	2.3	0.001
Level of education of mother	No education	1	
	Primary	0.6	0.330
	Secondary	0.9	0.779
	Tertiary	0.2	0.173
Occupation of mother	Unemployed	1	
	Farmer	0.7	0.413
	Petty trading	0.7	0.334
	Own business	1	0.466
	Civil/ public servant	1.2	0.791
	Artisan	0.6	0.266
Occupation of father	unemployed	1	
	Farmer	0.5	0.259
	Petty trader	0.2	0.363
	Own business	0.2	0.053
	Civil/ public worker	1.3	0.673
	Artisan	0.7	0.607
Knowledge on vitamin A	Poor knowledge	1	
	Good knowledge	2.2	0.0005

4. Discussion

The study revealed that, 64.3% of the children received at least one dose of vitamin A supplement in the last 12 months, slightly lower than the WHO recommended figure of 70% [8]. More effort should be made to increase the coverage in the study setting. Our finding is however higher than what is contained in the Ghana Demographic and Health Survey 2008 report where 56% of children 6-59 months received a vitamin A supplementation six months prior to the survey. Our observed coverage is also higher than what other researchers have reported in India [14-15]. However, the vitamin A coverage reported in other similar studies were higher than the coverage for this study [15-16]. The difference in coverage may be due to the different strategies such as intensive home visits, routine child welfare clinics and schools; used in distributing the vitamin A capsules at different places, differences in health worker motivation and knowledge of caregivers.

There was a significant difference in coverage among the age groups ($p<0.0001$). A high coverage (90.7%) was observed among 6 to 11 months group while a low coverage (44.4%) was observed among 24 to 59 months group. Coverage in terms of sex also varied. It was observed that, females had a higher coverage (70.7%) than males (58.2%) with an odds ratio of 2.3. This means that females were 2.3 times more likely to take vitamin A supplements than males (OR=2.3, P=0.001, 95% CI=1.377, 3.718).

Even though the recommended coverage is 70% of one dose of vitamin A every six months, the vitamin A coverage of at least one dose in the past twelve months could not achieve this target. This could be due to the failure of the health workers to inform the caregivers about the next time their children would be due for another dose of vitamin A. The non-commitment on the parts of health workers towards nutrition programmes makes nutrition interventions ineffective [17]. Also, this low coverage may be as a result of improper record keeping. Some of the caregivers said they could remember that their children were given vitamin A supplements in the last 12 month but the child health record book recorded otherwise. Health workers are expected to routinely mark children's health card each time they receive a vitamin A supplement for record keeping.

As recommended, children from 6 months to 11 months of age are expected to receive one dose of vitamin A while the second dose is expected to be given after 12 months of age [8]. Out of the 64.3% coverage observed in this study, only 46.4% received all the full doses of vitamin A in the last 12 months. The effective coverage of only 46.4% means that more than half of the children could not receive the full recommended supplementation of one dose every six month. The failure in receiving the full recommended dose of vitamin A by the children may make them prone to vitamin A deficiency disorders such as night blindness, reduce immune function and decrease resistance to infections. Also, about 96.7% of the caregivers reported that they were not informed when next to bring their children for vitamin A; therefore once the children finished their vaccination, only few came back for further vitamin A doses, which may have resulted in

the low coverage.

The child welfare clinic (CWC) is a static or an outreach clinic organized in various communities where services such as vaccination, supplementation of vitamin A, growth monitoring, and family planning services are provided. Sometimes caregivers attend this clinic just for the immunization of their children and forget about how important the other services are. Comparing the immunization coverage and the vitamin A coverage in this study, the immunization coverage (82%) was higher than the vitamin A coverage (62%). It can be said that, caregivers viewed CWC sessions as places for immunization therefore immunization was more utilized than vitamin A supplementation. A similar finding was reported by Singh et al (2013) where 71.7% of the children had received measles immunization but only 47.8% of the children had received vitamin A [14]. Meanwhile, according to Bharmal et al (2001), 88% and 74.8% coverage for immunization and vitamin A respectively was achieved in Pakistan [18]. From these studies it can be said that immunization sessions were used as a main strategy to increase vitamin A supplementation coverage [14].

Caregivers of about 92.8% reported that averagely, they were able to access health facilities within 30 minutes. This was because CWC sessions were organized in all the communities surveyed once every month. This has brought healthcare closer to the community members. Therefore the low coverage may not be attributed to lack of access to a health facility. The main reason given by the caregivers (65.1%) for visiting a health facility was because of the ill health of their children. A further 28.5% of caregivers gave vaccination of their children as their reason for visiting CWC. However, only 2.9% knew vitamin A supplementation is done at CWC. This showed that, majority did not know the importance of vitamin A supplementation, therefore did not deem it necessary to send their children for supplementation. Health workers therefore need to include education of caregivers on vitamin A in their health education and promotion activities. Caregivers of about 62.9% reported that their children received vitamin A at clinics, 5% reported home as a place where it was received, while 32.1% reported both clinics and homes as places where it was given. The failure in achieving the recommended coverage of at least 70% means that these places are not exhaustive therefore vitamin A supplementation should be extended to crèches and nurseries as part of school health services.

From the study, about 85.4% of the caregivers said they were not informed by health workers when next to bring their children for vitamin A supplementation like the way it was done for vaccination. Due to this, most caregivers did not send their children for vitamin A supplementation after the last vaccination was taken resulting in the low coverage of vitamin A. In terms of shortage of vitamin A supplements, 96.7% of the respondents said they were never told by health workers that there had been shortage of vitamin A when they sent their children for vitamin A supplementation. Therefore shortage of vitamin A could not be a reason for the low coverage of vitamin A.

The knowledge of caregivers on vitamin A was assessed by asking questions regarding their ability to identify vitamin A supplementation capsules, ability to mention different sources of vitamin A rich foods and their ability to mention as many as possible the health effects of vitamin A deficiency. A high percentage of the caregivers (93%) were able to correctly identify the vitamin A supplementation capsules. Their ability to identify the capsule could be that, they had ever witnessed their children receiving vitamin A supplements from the health workers.

Nonetheless, more than half (67.7%) of the participants did not know any natural source of vitamin A. Only 22.9% were able to identify one natural source of vitamin A. This finding is similar to the finding in a study conducted in New Delhi to determine knowledge among women regarding VAD. From that study, 41.8% women had no idea about the foodstuffs rich in vitamin A [19]. Nevertheless, knowledge on vitamin A rich foods was high (91%) among mothers of pre-school children in a study conducted in Nepal. From that study almost 91% of respondents grew vitamin A rich foods in their gardens and took it in their daily meals as diets [20].

Caregivers demonstrated poor knowledge on the medical effect of vitamin A deficiency. More than half (62%) of the respondents said they did not know any medical effect of vitamin A deficiency. In general, knowledge on vitamin A was poor. Majority of the caregivers (64.6%) showed poor knowledge and 35.4% had good knowledge on vitamin A. The reason for the poor knowledge may be that, health workers did not include education on vitamin A in the health education activities organized at CWC, which resulted in caregivers having low knowledge on vitamin A. Another study conducted in Zambia revealed that 58% of mothers had medium level of knowledge on vitamin A rich foods. However, 68% of the mothers knew the importance of vitamin A [3].

Also, in our study, only 3.4% of respondents could identify night blindness, a serious eye condition, as a medical effect of vitamin A deficiency. Similarly, a study conducted in Malawi to ascertain knowledge, attitude and practice on vitamin A revealed that, only 2.6% reported that vitamin A promotes good eyesight, while 15% reported that it protects from disease [21]. However, a similar study reported 95% of respondents knowing about night blindness as a medical effect of vitamin A [20]. These discrepancies may be due to the various strategies used in giving out information on vitamin A deficiency. Mediums such local radios, televisions, and the internet can be used to increase knowledge on vitamin A [22]. However, family and community involvement such as the organization of outreach services and durbars can be effective in increasing knowledge on vitamin A [23].

There was no significance association between caregivers' age and uptake of vitamin A in multivariate analysis. However, in a bivariate analysis there was an association (<0.0005). This finding is opposite to what was reported by Semba *et al* [15]. According to that study, greater maternal

age was associated with a child receiving vitamin A. Also from our study, there were no associations between level of education of mother, occupation of mother and father and receipt of vitamin A. However, other studies have shown significant association between these variables. Semba *et al* [15] and Semba *et a*l [24] both reported in their studies that maternal education of more than 10 years was significantly associated with a child receiving vitamin A. Maternal occupation was also identified in a study conducted by Aremu *et al* [22], as a determinant of vitamin A supplementation uptake.

Variables that were significantly associated with a receipt of vitamin A were age of a child, sex of a child and knowledge of caregivers on vitamin A. The age of a child was significantly associated with a receipt of vitamin A ($p<0.001$). It was realized from the study that, receipt of vitamin A decreases as age increases. The coverage of vitamin A was higher (90.7%) among age category 6 to 11 months while it was lower (44.4%) among age category 24 to 59 months. The odds of receipt of vitamin A among age group 24 to 59 months was 0.1 less than in age group 6 to 11 months. This could be attributed to the fact that the last antigen, measles vaccine, which is given at 18 months is taken before the child reaches age 24 months. Therefore, most caregivers did not send their children to CWC again for them to be given vitamin A supplements after the last vaccine. Also at this age, most children start attending school. The low coverage among the age group could be due to the fact that the children were in school, therefore missed CWC sessions. Most caregivers therefore did not see it necessary to send their children to CWC again where vitamin A is mostly given. This resulted in the disparities among age groups in terms of receipt of vitamin A.

The sex of a child was also found to be a determinant of vitamin A uptake in this study. The results from this study showed that females were 2.3 more likely to receive vitamin A than males ($p< 0.001$). However, it was observed in a vitamin coverage study in India that the coverage was higher in males as compared to females, but the difference was insignificant [14]. In India, because of their dowry system where the female pays dowry to the male at the time of marriage, the male sex is preferred to the female sex. Therefore the high coverage among the males reported could be that, health care was sought for the males more than the females. However, females are seen in the African society as the weaker vessels compared to males; therefore they need more medical attention than males. This may have influenced caregivers to send their female children for vitamin A supplementation than the male children, resulting in the large coverage among the female.

Caregivers' knowledge on vitamin A was also found to be a determinant of uptake of vitamin A in their children. This was statistically significant with receipt of vitamin A ($p= 0.005$). From our study, majority (64.6%) of the caregivers had poor knowledge on vitamin A and only 35.4% had good knowledge on vitamin A. This factor also contributed to the low coverage of vitamin A because good knowledge on vitamin A would have influenced the importance caregivers attached to the vitamin A supplementation program in order to achieve the recommended coverage of at least 70% [8]. Children of those who had good knowledge on vitamin A from this study were 2.2 more likely to receive vitamin A than children of caregivers who had poor knowledge on vitamin A. Good knowledge on vitamin A is identified from this study as a prerequisite to increase vitamin A supplementation coverage.

5. Study Limitations

Access to the hard-to-reach areas like the over banks communities was due to lack of adequate safety boats and transport. The child health record book was a prerequisite for the study, therefore children without the child record book were excluded from the study which meant their immunization and vitamin A status were not determined.

6. Conclusion

Vitamin A deficiency is a serious public health issue that is detrimental to health, especially of children. Supplementation of two high doses of vitamin A, an annual coverage of at least 70% is regarded as effective in the prevention of VADD.

The coverage of at least one dose of vitamin A supplementation was (64.4%) which was still less than the recommended coverage of 70%. Effective coverage of one dose among those children below 12 months and two doses among 12 months to 59 months was 46.4%. The coverage of vitamin A was found from this study to be higher among females than in males. It was also higher among the age category 6 to 11 months and was lower in 24 to 59 months. The difference could be due to the non-patronage of CWC by caregivers with children of this age group because they would have taken their last vaccination. It was determined from this study also that, variables such as age of a child, sex of a child and knowledge of caregivers on vitamin A significantly influenced the uptake of vitamin A in children.

Recommendations

1. The health service should develop programs that will help in the supplementation of vitamin A in schools so that children who missed the supplementation sessions can still be captured in school for vitamin A supplementation.
2. The health service should motivate and remunerate health workers especially those in charge of vaccination and vitamin A supplementation.
3. Effective health promotion and education activities by health workers should be geared towards increasing the knowledge of caregivers on vitamin A, especially on the food sources and the medical effects of vitamin A. This can be produced in the form of posters, pictures in English and local languages that could be placed in strategic positions in the communities. These materials

should be used by the health workers in training the community members, especially caregivers of under-five.

Authors' Contribution

DH conceived and partly financed the study. DH also coordinated data collection and input. GAA was instrumental in the design, analysis and did the zero draft of the paper. PAK and MA contributed in the review of the paper. EET did the critical review and finalization of the paper for publication.

Competing Interest

The authors have no competing interest or any conflict of interest.

References

[1] Maziya-Dixon, B. B., Akinyele, I. O., Sanusi, R. A., Oguntona, T. E. Nokoe, Sagary, K. & Harris, E. W. (2006). Vitamin A deficiency is prevalent in children less than 5 y of age in Nigeria. The Journal of nutrition, 136(8), 2255-2261.

[2] WHO. (2011). Vitamin A supplementation in infants and children 6–59 months of age. Geneva: World Health Organization, 269, 16.

[3] Lungu G. (2015). A study to determine mothers knowledge and practices towards vitamin A supplements and food rich in vitamin A in Mpanshya - Chongwe District.

[4] McLaren, Donald, Stewart, Frigg, Martin, & Leben, Arbeitskreis, Sehen. (2012). Sight and life manual on vitamin A deficiency disorders (VADD): Task Force Sight and Life 2nd Ed. Basel.

[5] Mayo-Wilson, E. Imdad, A., Herzer, K. Yakoob, M. Y., & Bhutta, Z. A. (2011). Vitamin A supplements for preventing mortality, illness, and blindness in children aged under 5: systematic review and meta-analysis. BMJ, 343, d5094.

[6] WHO. (2002). The world health report 2002: reducing risks, promoting healthy life: World Health Organization.

[7] West, K. P. (2002). Extent of vitamin A deficiency among preschool children and women of reproductive age. The Journal of Nutrition, 132(9), 2857S-2866S.

[8] UNICEF. (2007). Vitamin A Supplementation: A decade of progress. UNICEF Nutrition Section, New York.

[9] David Patricia. (2003). Evaluating the Vitamin A Supplementation Programme in northern Ghana: Has it contributed to improved child survival? Micronutrient Initiative and JSI.

[10] Ghana statistical and Macro International Inc. (2008). Population and Housing Census.

[11] Ghana statistical and Macro International Inc. (2003). Population and Housing Census.

[12] Ghana Health Service (2014). South Dayi District Annual Nutrition Report.

[13] Snedecor, George W. and Cochran (1989). Statistical Method (8th ed.) Lowa State: Lowa State University.

[14] Singh, A., Kadri A. M, & Jain S. (2013). Coverage study on Vitamin A supplementation amongst children aged 12-23 months in urban slums of Ahmedabad city. Healthline, Journal of Indian Association of Preventive and Social Medicine, 4(1), 19-22.

[15] Semba, Richard D., De Pee, Saskia, Sun, Kai, Bloem, Martin W., & Raju V. K. (2010). The role of expanded coverage of the national vitamin a program in preventing morbidity and mortality among preschool children in India. The Journal of nutrition, 140(1), 208S-212S.

[16] Gebremedhin S., Loha E., Abebe Y., & Dese G. (2009). Assessment of vitamin Asupplementation coverage and its association with childhood illness in Boloso Sore Woreda, Welayta Zone, SNNP Region, Ethiopia. Ethiopian Journal of Health Development, 23(3).

[17] Gongwer C. R. & Aryeetey R. (2014). Implementing nutrition interventions in Ghana at district level: Gaps and opportunities. African Journal of Food, Agriculture, Nutrition and Development, 14(2).

[18] Bharmal F. Y. & Omair A. (2001). Evaluation of vitamin A supplementation in Gulshan-e-Sikandarabad. Evaluation.

[19] Matta, S., Matta, P. & Gupta, V. (2006). Knowledge among women regarding vitamin A deficiency: A hosital based study. Indian J. Prev. Soc. Med, 37(3&4), 138-141.

[20] Rahman, A., & Sapkota, M. (2014). Knowledge on vitamin A rich- foods among mothers of preschool children in Nepal: impacts on public health and policy concerns. Science Journal of Public Health 2 (4), 316-322.

[21] Chilima D. M., Kalimbira A. A., Mtimuni B. M. (2005). Vitamin A knowledge and supplementation in Malawi. Bunda Journal of Agriculture, Environmental Science and Technology, 3 (63-72), 1726-3220.

[22] Aremu Olatunde, Lawoko Stephen, & Dalal Koustuv. (2010). Childhood vitamin A capsule supplementation coverage in Nigeria: a multilevel analysis of geographic and socioeconomic inequities. The Scientific World Journal, 10, 1901-1914.

[23] Bhutia Dechenla Tshering. (2011). Vitamin A Coverage Among Under Five Children: A Critical Appraisal of Vitamin A Supplementation Program in India: Royal tropical institute (KIT).

[24] Semba, Richard D. De, Pee, Saskia, Sun, Kai Bloem, Martin W, & Raju V. K. (2008). Coverage of the national vitamin A supplementation program in Ethiopia. Journal of tropical pediatrics, 54(2), 141-144.