NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 53 Number 1, April 2022 Pg. 14-22
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng

Sources and Deficiency Diseases of Vitamin A: Awareness among Households in Akwa Ibom State, Nigeria

[*]Udoh, E. S. and Offor, O. S.

[*]Department of Agricultural Economics and Extension,
Akwa Ibom State University Obio Akpa Campus, P.M.B 1167, Uyo, Nigeria
[*]Corresponding Author's email: ekaette.udoh@gmail.com

Abstract
The study assessed the knowledge of households about sources and deficiency diseases of Vitamin A in Akwa Ibom State, Nigeria. A multi-staged sampling procedure was used to select 457 respondents. Data were collected with the aid of a structured questionnaire and analyzed descriptively. Results show that less than half of the population are informed about all five selected sources (43.11%) and all three deficiency diseases (45.73%). The study reports a gap of one source and two deficiency diseases, between the uninformed and the informed line, respectively. Furthermore, the results indicate an exact gap of three and two selected sources and deficiency diseases, respectively, of vitamin A between the uniformed and informed. Intensity of the margin implies that the information gap is equally critical for selected sources; and more critical for deficiency diseases comparing the mean and two-thirds of the mean as critical index, respectively. The study therefore, recommends awareness campaigns to bridge the gap between the uniformed and informed; specifically emphasizing beef/liver, sweet potatoes and yeast as sources; and risk of diarrhoea and measles as deficiency diseases.

Keywords: Knowledge, vitamin A, sources, deficiency diseases, Akwa Ibom

Introduction

Micronutrient deficiency conditions are widespread among 2 billion people in developing and developed countries. These are subtle epidemics of vitamin and mineral deficiencies affecting people of all sexes and ages, as well as certain risk group such as women of reproductive age, pregnant and lactating mothers, children under five and the elderly (Tulchinsky, 2010). Some of the micronutrients that are commonly deficient in the body include; vitamin A, folate, iron, iodine, and zinc (Merson *et al*., 2012). However, vitamin A deficiency is the most common of them all, with severe health challenges, especially, in children. Vitamin A is a fat-soluble vitamin which includes; retinol, retinal, retinoic acid, and retinyl esters (Coates *et al*., 2010; Catharine *et al*., 2006). It is found as retinol in animal sources such as dairy products and as pro-Vitamin A precursors in plant sources, namely: vegetables (dark green leafy) and fruits (mango, carrots) (Bowman and Russell, 2001). It is required in minute quantities for immune function, maintaining epithelial integrity, vision, healthy growth, and reproduction (Coates *et al*., 2010). Vitamin A plays an indispensable role in the sustenance of epithelial linings, and is consequently essential for the restoration of damaged mucosal epithelial cells in the body (Bates, 1995; Edem, 2009.).

Vitamin A deficiency (VAD) is the leading cause of preventable blindness in children. It causes Xerophthalmia, a cascade of ocular manifestations like night blindness, Bitot's spots, and corneal ulcerations and lesions (Merson *et al*., 2012). An estimated 250000–500000 vitamin A-deficient children become blind every year, and approximately half of them die within a year of becoming blind. Vitamin A deficiency is also associated with an increased risk of child mortality, especially from diarrhoea and measles (Allen *et al*., 2006). More often than not vitamin A deficiency develops in an environment of ecological, social and economic deprivation, thus making developing countries prone to this disorder. Vital indices for vitamin A deficiency are diets low in sources of vitamin A (i.e. dairy products, eggs, fruits and vegetables), poor nutritional status, and a high rate of infections, in particular, measles and diarrhoeal diseases (Walker *et al*., 2013). In sub-Saharan Africa, VAD is a contributing factor to the high rate of childhood morbidity and mortality in the region, in addition to pediatric blindness (Aguayo and Baker, 2005; Gilbert, 2007; Gogate *et al*., 2009). Although only 1.7% of the under-five mortality in low- and middle-income countries were attributed to VAD, 95% of these deaths occurred in sub-Saharan

Africa and south Asia where 2% of deaths (same in both regions) were attributed to VAD (Stevens *et al*., 2015).

There are myriads of empirical studies on vitamin A. Some of these studies focused on only vitamin A, while others considered this vitamin in concert with other micronutrients. Such combined studies include prevalence and factors affecting anthropometric failure, vitamin A and Iron deficiency in Nigeria (Ayogu *et al*., 2016); knowledge and use of dietary supplements in Nigeria (Aina and Ojedokun, 2014); prevention and control of micronutrient deficiencies in developing countries (Berti *et al*., 2014); and status and dietary intake of multiple-named micronutrients (Harika *et al*., 2017). Others include micronutrient deficiencies and related factors in school-aged children in Ethiopia (Herrador *et al*., 2014); Caregivers nutrition knowledge (Onyeneke *et al*., 2019); micronutrient deficiency conditions on a global note (Tulcninsky, 2010), awareness of consumption of dietary supplements in Saudi-Arabia (AlTamimi, 2019); the epidemiology of global micronutrient deficiencies (Bailey *et al*., 2015) and micronutrient deficiencies and gender (Darnton-Hill *et al*., 2005).

Similarly, literature is filled with studies specifically on Vitamin A, such as, the relationship between vitamin A deficiency and diaorrhea (Abolurin *et al*., 2018), Vitamin A supplementation coverage in multiple countries (Wirth *et al*., 2017:), Nigeria (Aremu *et al*., 2010; Adamu and Muhammad, 2016; Aghaji *et al*., 2019), and other Sub-Saharan countries (Kupka *et al*., 2016; Janmohamed *et al*., 2017). Other Vitamin A particular studies include: knowledge on vitamin-A rich foods (Rahman and Sapkota, 2014), vitamin A deficiency and child survival (Aguayo and Baker, 2005); and awareness of middle-aged men (John and Brundha, 2016). However, there is a dearth of information on sources of Vitamin A and its deficiency diseases in Nigeria, particularly, in Akwa Ibom State. Empirical studies on these issues are limited in literature, thereby, inhibiting evidence-based policies that would enhance the intake of diets rich in Vitamin A and reduce the occurrence of Vitamin A deficiency diseases, especially, among children. The study therefore, investigated the prevalence, margin and intensity of selected sources of Vitamin A and its deficiency diseases.

Methodology

Study Area

The study was conducted in Akwa Ibom State. The State is located in the South-South geopolitical and South East ecological zones of Nigeria. It is one of the Niger Delta States. The State lies between latitudes 4º33′ and 5º33′ North of the Equator, and longitudes 7º35′ and 8º25′ East of the Greenwich Meriden. The estimated total area is put at 7,249km^2 (excluding disputed areas), and has a shoreline of 129km on the Atlantic Ocean to the South. It shares borders with Cross River State to the East, Abia State to the North, and Rivers State to the West (Ajana, 1996; Uwatt 2000). The 2006 provisional census puts the population at 3,920,208, out of which 2,044,510 are males, while 1,875,698 are females. There are three senatorial districts in Akwa Ibom State. One of these is Akwa Ibom North East senatorial District also known as Uyo senatorial district. This senatorial district is made up of the following Local Government Areas (LGAs): Etinan, Ibesikpo Asutan, Ibiono Ibom, Itu, Nsit Atai, Nsit Ibom, Nsit Ubium, Uruan, Uyo. Another senatorial district is the Akwa Ibom North West Senatorial district typically called Ikot Ekpene senatorial district. This second senatorial district consists of the following LGAs: Abak, Essien Udim, Etim Ekpo, Ika, Ikono, Ikot ekpene, Ini, Obot Akara, Oruk Anam, Ukanafun. The third senatorial district is called Akwa Ibom South senatorial district and is usually referred to as Eket senatorial district. It is made up of these LGAs: Eastern Obolo, Eket, Esit Eket, Ibeno, Ikot Abasi, Mbo, Mkpat-Enin, Okobo, Onna, Oron, Urue Offong/Oruko. The people of Akwa Ibom typically consume carbohydrate staples such as cassava, yams, cocoyams and rice. Cassava is eaten in many varied forms but two popular ones- *gari* and *fufu*. These meals of gari and fufu are typically consumed with soups which comprise, primarily of dark green leafy vegetables and palm oil; among other ingredients. These are vitamin A-rich sources. Since it is a coastal region, the protein preferences consistently include but are not limited to fish and other sea foods. They also eat fair amounts of red meat, organ meat and white meat such as goat meat and chicken.

Data Collection

Data for the study was cross-sectional. These were obtained using a structured questionnaire that was administered to households, in 2018, following a multistage sampling procedure. First, three LGAs were purposively selected from each senatorial zone in the State. Each of the three LGAs so selected represented an urban, semi-urban and rural area. In Uyo senatorial district; Uyo, Itu and Ibiono LGAs were selected. Samples were drawn from Eket, Onna and Mkpat-Enin LGAs in Eket senatorial district. Secondly; Ikot Ekpene, Ikono and Etim Ekpo LGAs were sampled in Ikot Ekpene senatorial district. Secondly, six communities were randomly selected from each of the selected Local Government Areas. Lastly, 10 households were randomly selected from each of the selected LGAs, giving a total of 540 households (180 from each senatorial zone). Respondents were the food preparers within the household. However, only 457 questionnaires were duly and properly completed.

Analytical Framework

The data were analyzed by descriptively estimating the prevalence, mean margin and intensity of knowledge of sources and knowledge of deficiency diseases of vitamin A; following Udoh and Udoh (2020).

***Knowledge of Sources of Vitamin A, ksva (Threshold Scores)*:** The *ksva* is a score representing the number of sources for which a household food preparer reports knowledge divided by the total number of selected

sources (five) of Vitamin A presented in Table 3. Based on two critical indices 0.65 and 0.44, the prevalence, margin and intensity of households with respect to the knowledge of selected sources of vitamin A, considered collectively, are described. The first critical index, 0.65, used for this analysis is the mean *ksva*. The second critical score, 0.44, used to describe the prevalence is two- thirds (2/3) of the mean *ksva*. These critical indices namely the mean and two-thirds of the mean are used to dichotomize household food preparers. Household food preparers with *ksva* values equal and above to the critical indices are on the informed line and informed, respectively. On the other hand, those with values below these indices are uninformed.

***Knowledge of Deficiency Diseases of Vitamin A, kdva (Threshold Scores)*:** The *kdva* is a score representing the number of deficiency diseases for which a household food preparer reports knowledge divided by the total number of deficiency diseases (three) of Vitamin A given in Table 4. With respect to two critical indices 0.54 and 0.36, the prevalence, margin and intensity of households as regards the knowledge of deficiency diseases of vitamin A, considered collectively, are described. The first critical index, 0.54, used for this analysis is the mean *kdva*. The second critical score, 0.36, used to describe the prevalence is two- thirds (2/3) of the mean *kdva*. The critical indices namely the mean and two-thirds of the mean are used to dichotomize household food preparers such that household food preparers with *kdva* values equal and above to the critical indices are on the informed line and informed, respectively; whereas those with values below, are uninformed.

Prevalence: Two measures of prevalence were reported in this study namely: percentage prevalence and disaggregated mean prevalence.

Percentage Prevalence: The first measure is simply a percentage of households who fall below (uninformed) equal/above to (informed line/informed) the critical indices. This measure uses an indicator function that takes on a value of 1 for un-informed and informed household food preparers with respect to knowledge of sources of vitamin A and knowledge of its deficiency diseases, and expresses it as a proportion of the total number of households. The values obtained are subsequently multiplied by hundred (100) and reported as percentages. This is obtained as given in equations 1a, b and 2a, b. Equations 1a and 2a present the percentage prevalence for the uninformed and the informed, respectively, about knowledge of sources of vitamin A. On the other hand, equations 1b and 2b present the percentage prevalence for the uninformed and the informed, respectively, about knowledge of deficiency diseases of vitamin A

Percentage prevalence of *ksva* Using the mean as critical index,

$$ksva_{pp} = \sum_{i=1}^{N} 1(ksva < 0.65)\,{}^{1}/_{N}$$

Percentage prevalence of *kdva* Using the mean as critical index,

$$kdva_{pp} = \sum_{i=1}^{N} 1(kdva < 0.54)\,{}^{1}/_{N} \ldots\ldots\ldots 1a, b$$

$$ksva_{pp} = \sum_{i=1}^{N} 1(ksva \geq 0.65)\,{}^{1}/_{N}$$

$$kdva_{pp} = \sum_{i=1}^{N} 1(kdva \geq 0.54)\,{}^{1}/_{N} \ldots\ldots\ldots 2a, b$$

N/B: This was similarly obtained using two thirds of the mean for ksva (0.44) and kdva (0.36).
Where N = total number of respondents
$ksva_{pp}$ ***= percentage prevalence of knowledge of sources of vitamin A***
$kdva_{pp}$ ***= percentage prevalence of knowledge of deficiency diseases of vitamin A***

Disaggregated mean Prevalence: This is the second measure of prevalence reported in this study. This is essentially a mean computed based on actual values of *ksva* and *kdva* respectively for both categories of household food preparers- uninformed and informed. This measure, by implication, measures the exact gap between the informed and uninformed. This measure is obtained as seen in equations 3a, b and 4a, b. Equations 3a and 4a present the disaggregated mean prevalence for the uninformed and the informed, respectively, about knowledge of sources of vitamin A. On the other hand, equations 3b and 4b present the disaggregated mean prevalence for the uninformed and the informed, respectively, about knowledge of deficiency diseases of vitamin A.

Disaggregated mean prevalence of *ksva* Using the mean, 0.65, as critical index:

$$ksva_{pa} = \sum_{i=1}^{N} (ksva < 0.65)\,{}^{1}/_{n}$$

n = number of households with *ksva* < 0.65

Disaggregated mean prevalence of *kdva* Using the mean, 0.54, as critical index:

$$kdva_{pa} = \sum_{i=1}^{N} (kdva < 0.54)\,{}^{1}/_{n} \ldots\ldots 3a, b$$

n = number of households with *kdva* < 0.54

$$ksva_{pa} = \sum_{i=1}^{N} (ksva \geq 0.65)\,{}^{1}/_{n}$$

n = number of households with *ksva* ≥ 0.65

$$kdva_{pa} = \sum_{i=1}^{N} (kdva \geq 0.54)\,{}^{1}/_{n} \ldots\ldots 4a, b$$

n = number of households with *kdva* ≥ 0.54

N/B: This was similarly obtained using two thirds of the mean for ksva (0.44) and kdva (0.36).
$ksva_{pa}$ ***= disaggregated mean prevalence of knowledge of sources of vitamin A***
$kdva_{pa}$ ***= disaggregated mean prevalence of knowledge of deficiency diseases of vitamin A***

***Mean margin*:** This is essentially a deviation from the threshold scores computed based on the total number of students, N and those who do not use food labels, n. The rationale for this being that number of students that do not use food labels prove the basis for recommendation in terms of targeted (geared only at household that do use food labels) and untargeted geared at all students in the universities whether they use or do not use food labels. It measures the gap between the respondents who are informed and those who are not, assuming that respondents who are informed have *ufli* values exactly equal to the threshold scores. Simply put, it captures the difference in index values between un-informed and informed line of household food preparers with respect to knowledge of sources of Vitamin A and knowledge of deficiency diseases of Vitamin A. By implication, multiplying this measure by the total number of items presented gives the value by which the number of sources or deficiency diseases known by the population should be increased to ensure all respondents are informed, i.e have a score exactly equal to the threshold score.

This measure is obtained as presented in equations 5a, b and 6a, b. Equations 5a and 6a depict the mean margin of knowledge of sources of vitamin A. Similarly, equations 5b and 6b present the mean margin of knowledge of deficiency diseases of vitamin A.

Mean margin of *ksva*
Using the mean, 0.65, as critical index,

$$ksva_{mm} = \sum_{i=1}^{N} (0.65 - < 0.65) \frac{1}{N}$$

$$ksva_{mm} = \sum_{i=1}^{N} (0.65 - < 0.65) \frac{1}{n}$$

n = number of households with *ksva* < 0.65

Mean margin of *kdva*
Using the mean, 0.54, as critical index,

$$kdva_{mm} = \sum_{i=1}^{N} (0.54 - < 0.54) \frac{1}{N} \ldots\ldots 5a, b$$

$$kdva_{mm} = \sum_{i=1}^{N} (0.54 - < 0.54) \frac{1}{n} \ldots\ldots 6a, b$$

n = number of households with *kdva* < 0.54

N/B: This was similarly obtained using two thirds of the mean for ksva (0.44) and kdva (0.3).
$ksva_{mm}$ = mean margin of knowledge of sources of vitamin A
$kdva_{mm}$ = mean margin of knowledge of deficiency diseases of vitamin A

***Intensity*:** This measure is the margin squared and it essentially measures the severity of the gap between uninformed and informed household food preparers as regards knowledge of sources of Vitamin A and knowledge of deficiency diseases of Vitamin A. It is calculated based on the mean margin. This measure is obtained as given in equations 7a, b and 8a, b. Equations 7a and 8a show the intensity of the mean margin of knowledge of sources of vitamin A. Similarly, equations 7b and 8b depict the intensity of the mean margin of knowledge of deficiency diseases of vitamin A.

Intensity of the mean margin of *ksva*:
Using then mean, 0.65 as critical index:

$$ksva_{imm} = \sum_{i=1}^{N} (0.65 - < 0.65) \frac{1}{N})^2 \ldots\ldots\ldots 7a, b$$

$$ksva_{imm} = \sum_{i=1}^{N} (0.65 - < 0.65) \frac{1}{n})^2$$

Intensity of the mean margin of *kdva*:
Using then mean, 0.54 as critical index:

$$kdva_{imm} = \sum_{i=1}^{N} (0.54 - < 0.54) \frac{1}{N})^2 \ldots\ldots\ldots 7a, b$$

$$kdva_{imm} = \sum_{i=1}^{N} (0.54 - < 0.54) \frac{1}{n})^2 \ldots\ldots\ldots 8a, b$$

n = number of households with ksva < 0.65 ***n = number of households with kdva < 0.54***
N/B: This is similarly obtained using two thirds of the mean for ksva (0.44) and kdva (0.36).
$ksva_{imm}$ = intensity of the mean margin of knowledge of sources of vitamin A
$kdva_{imm}$ = intensity of the mean margin of knowledge of deficiency diseases of vitamin A

Results and Discussion

Summary Statistics of Continuous variables and Descriptive Statistics of Dummy Variables

Table 1 reports summary statistics of continuous variables. Results (Table 1) show that the household food preparers have spent about 13 years acquiring secondary school education, implying moderate literacy. It further shows the presence of mean of 1 child below 5 years and 1 adult above 65 years. Table 2 presents the descriptive statistics of dummy variables. Over 90% of the population are married and employed females (Table 2).

Frequency distribution of knowledge of sources of Vitamin A and its deficiency diseases

Results of the respondents' knowledge of sources of vitamin A and its deficiency diseases are presented in Tables 3 and 4, respectively. It can be shown (Table 3) that at least 70% of households' food preparers are aware that carrots and mangoes, palm oil and yeast (76.15%, 74.40% and 70.45%) are sources of Vitamin A. It can also be observed from this table that the food preparers in household in the study area are least aware that sweet potatoes is a source of vitamin A. This awareness skewed in favour of carrots and mangoes is plausible because carrots and mangoes are readily available in Akwa Ibom State and as such have gained popularity as sources of vitamin A. Similarly, palm oil is widely known because, for decades, it has featured as an intrinsic part of most meals in the South East of Nigeria. Uti and Edet (2005) found that 94% of mothers mentioned palm oil as a source of Vitamin A. Similarly, Rahman and Sapkota (2014) report that 96%, 83% and 90% of mothers grew, knew importance of, and included Vitamin A rich foods in the diet of their children respectively. Table 4 reveals that respondents are least aware of the risk of diarrhea and most aware of night blindness and severe vision impairment. This is plausible because night blindness and severe vision impairment is the most prevalent and most visibly critical deficiency disease of vitamin A. Global studies (Wirth *et al*., 201; Harika *et al*., 2017) and research in the Nigerian context (Adamu and Muhammad, 2016; Aghaji *et al*., 2019) corroborate this fact.

Knowledge of sources of Vitamin A: Prevalence, mean margin and intensity

Prevalence of knowledge of sources of vitamin A

Results of prevalence of knowledge of sources of vitamin A are presented in Table 5. This includes the percentage prevalence and disaggregated mean prevalence. Both measures reported figures for the uninformed and uninformed.

***Percentage Prevalence*:** As seen in Table 5, 56.89% and 43.11% of the respondents were un-informed and informed with respect to knowledge of selected sources of Vitamin A respectively in the study area (at critical index = 0.65). This table further shows that 30.19% and 69.81% of the respondents are uninformed and informed with respect to knowledge of selected sources of Vitamin A respectively in the study area (at critical index = 0.44). Comparatively, the higher the critical index the less the proportion of the households found to be informed with respect to knowledge of selected sources of Vitamin A. This disparity is plausible because the mean basically, compared to two thirds of the mean is a higher threshold for categorizing respondents as uninformed and uninformed. It is therefore reasonable that a much earlier study Bendech *et al*. (2007), in tandem with the figures obtained when using two-thirds of the mean as critical index, found that 28% of his respondents did not know the sources of Vitamin A. In further consonance, Njue *et al*. (2010) reported that 94% of their respondents had heard about Vitamin A. This is probable because mothers of children under five, as a result of knowledge gleaned during ante natal care; and women generally have been reported to have average to high knowledge of sources of vitamin A.

Disaggregated Mean Prevalence: Similarly, where the mean *ksva* (= 0.65) is adopted as the threshold score, assuming that households are divided into two classes – uninformed and informed, Table 5 shows that the mean *ksva* for these two classes are 0.45 and 0.93 respectively. These figures imply that household preparers who are informed and uninformed, respectively, know about two and all of the selected sources of Vitamin A presented to them. This same set of figures highlight the difference between the two named categories to be 0.48, suggesting a gap of three sources between the

uninformed and the informed. Using 2/3 mean *ksva* (= 0.44) as critical score, and assuming that households are dichotomized into uninformed and informed, the respective mean *ksva* are 0.31 and 0.80 as seen in Table 5. These figures mean that, using this critical score, the un-informed and informed in this context were aware of one and four of the selected sources of Vitamin A, respectively. These figures further showed that the difference between the un-informed and the informed was 0.49, i.e. three sources of vitamin A. Pooling the figures for the percentage prevalence and disaggregated mean prevalence, both seen in Table 5 and taking the mean as critical index, 56.89% and 43.11% of household food preparers were, respectively, informed about two and all of the selected sources of Vitamin A presented to them. Similarly, from this table, given two thirds of the mean as critical index, 30.19% and 69.81% of household food preparers were informed about one and four selected sources of Vitamin A, respectively. These results imply that, given both indices, the uninformed and informed knew about not more than two and at least four sources of vitamin A, respectively. This outcome is at variance with Adamu and Muhammad (2016), in a study in Sokoto, who found that majority of the mothers (85%) could not name any natural source of Vitamin A found in their environment, while only 15% of them were able to name one or more sources of Vitamin A. The contrasting outcome may be explained by the differences in culture and level of education generally attendant in the North and South-East of Nigeria.

Mean Margin of knowledge of sources of vitamin A

Outcome for the mean margin of knowledge of sources of vitamin A; based on the uninformed (n) and all the households (N) is presented in Table 6. With respect to the threshold scores; 0.65, 0.44, the figures, 0.20 and 0.12 as seen in Table 5, depict the mean deviation from the critical scores strictly of uninformed households in the study area. These values are the minimum value by which an intervention/policy set should seek to raise the *ksva* (overall knowledge of selected sources of vitamin A) provided that the measures are targeted only uninformed households (i.e. households with *ksva* below the respective critical scores being considered). This would simply translate to aiming to make their knowledge inclusive of at least one more selected source of Vitamin A. Similarly, with respect to the same threshold scores, also from Table 5; 0.65, 0.44, the figures, 0.12 and 0.04 are the minimum values by which an intervention or programme should aim to increase the knowledge of household food preparers' with respect to selected sources of vitamin A as measured by *ksva*, where the intervention is non-discriminatory (i.e. applicable to all households).

Intensity of knowledge of sources of vitamin A

Results for the intensity of the mean margin of knowledge of sources of vitamin A are presented in Table 7. The figures 0.17, 0.17 and 0.09, 0.05, reported in Table 7, show that the intensity of the deviation (of households that are uninformed) from the threshold scores 0.65, 0.44 (respectively) when the mean margin is obtained based on the number of un-informed households (n) and all(N) the households respectively. This implies that using both the mean and two thirds of the mean as critical indices, the intensity of the gap between the uninformed and informed is equally critical.

Knowledge of deficiency diseases of vitamin A: Prevalence, mean margin and intensity

Prevalence of Knowledge of Vitamin A Deficiency Diseases

Results of the percentage prevalence and disaggregated mean prevalence of knowledge of deficiency diseases are presented Table 8.

Percentage Prevalence: Irrespective of the varied threshold scores (0.54 and 0.36), results of the study, in Table 8, revealed that 54.27% and 45.73% of the households in the study area were un-informed (and informed), respectively.

Disaggregated Mean Prevalence: Given the critical scores: 0.54 and 0.36, assuming also that households are split into un-informed (and informed) with regard to their knowledge of deficiency diseases of vitamin A, the mean *kdva* for these respective categories of households are 0.28 and 0.85, as seen in Table 8. These values suggest that uninformed and informed household food preparers know about one and all three deficiency diseases of Vitamin A respectively. It further indicates that the gap between the uninformed and the informed is two deficiency diseases. Pooling the figures for the percentage prevalence and disaggregated mean prevalence, both seen in Table 8 and taking the mean and two-thirds of the mean as critical index, 54.27% and 45.73% of household food preparers are, respectively, informed about one and all of the deficiency diseases of Vitamin A presented to them. Contrarily, Baytekus *et al*. (2019), in a study among pregnant and lactating women in Ethiopia, found that 52.3% respectively of women did not know the signs and symptoms of Vitamin A deficiency.

Mean margin of knowledge of deficiency diseases of vitamin A

Results of the mean margin of knowledge of deficiency diseases are given in Table 9. Given the critical score: 0.54, and 0.36, as seen in Table 6, the figures 0.27 and 0.09 depict the mean deviation from critical sources strictly of household uninformed in the study area. These values are the minimum value by which an intervention or policy set should seek to raise the *kdva* general knowledge of several outcomes of Vitamin A) provided that the measures are targeted (directed at only uninformed households i.e households with *kdva* shows below the respective critical scores). These figures imply that, taking the mean as critical index, the knowledge of one more deficiency outcome should be included to ensure that all households are on the informed line, with respect to deficiency diseases of vitamin A.

Intensity of knowledge of deficiency diseases of vitamin A

The results of the intensity of the mean margin of deficiency diseases of vitamin A are reported in Table 10. The figures: 0.30, 0.18 and 0.16, 0.10, seen in Table 8, reveal the intensity of the deviation of households that are uninformed from the thresholds scores: 0.54, 0.36 (respectively) when the mean margin is obtained based on the number of uninformed households and all households respectively. The higher the value of the intensity, as for critical index 0.54, the more severe the lack of information is considered to be.

Conclusion

The study described households' awareness of sources and deficiency diseases of Vitamin A in Akwa Ibom State. Results show that less than half of the population are informed about all sources and all deficiency diseases of Vitamin A presented. The study, additionally, revealed a gap of one source and two deficiency outcomes, respectively, between the uninformed and the informed line. Results of the study further indicated a gap of three and two sources and deficiency outcomes of vitamin A, respectively, between the uninformed and the informed. The study concludes that the gap between the uninformed and informed about knowledge of sources of vitamin A is equally critical irrespective of whether the mean or two thirds of the mean is used as critical index. On the other hand, this gap between the uninformed and informed about knowledge of deficiency diseases of Vitamin A is more severe when the mean is used as threshold score. The gap of three sources about knowledge of sources of vitamin A can be bridged by educating the population about these sources; specifically, the sources which they are least informed about-beef/liver, sweet potatoes and yeast. Similarly, the study recommends that the gap bridge of two deficiency diseases be closed by creating awareness of the risk of measles and diarrhea as deficiency diseases of vitamin A. The awareness campaigns, projects and programmes, aimed at bridging the stated gaps, could be engaged in by government and non-government organisations. The study therefore shows a progressive escalation in the description of the knowledge of sources and deficiency diseases of Vitamin A; from percentage prevalence, to disaggregated mean prevalence, to mean margin, to intensity. This increasing detail provides a more incisive approach to the measurement of knowledge with specific reference to vitamin A and possible replication in related studies.

Table 1: Summary Statistics of Continuous variables

Variables	Mean	Std. Dev.	Min	Max
Age (years)	41	11	18	78
Monthly income (figures in Naira)	94793.03	71297.76	10000	850000
Education (years)	13	4	0	23
Household Size (figures)	5	1	1	9
Children below five (5) years (figures)	1	1	0	6
Adults above 65 years(figures)	1	1	0	5

Source: Field Survey, 2018

Table 2: Descriptive Statistics of Dummy Variables (N= 457)

Variables	Frequencies	Percentages
Marital Status		
Single	40	8.75
Married	417	91.25
Employment Status		
Unemployed	12	2.63
Employed	445	97.37
Gender		
Male	1	0.22
Female	456	99.78

Source: Field Survey, 2018

Table 3: Distribution of knowledge of sources of Vitamin A (N=457)

Sources		Frequency	Percentage
Carrots & Mangoes			
	Aware	348	76.15
	Unaware	109	23.85
Palm oil			
	Aware	340	74.40
	Unaware	117	25.60
Yeast			
	Aware	322	70.45
	Unaware	135	29.54
Beef/liver			
	Aware	239	52.30
	Unaware	218	47.70
Sweet potatoes			
	Aware	266	58.21
	Unaware	191	41.79

Source: Field Survey, 2018

Table 4: Distribution of respondents according to their knowledge of Vitamin A deficiency diseases (N=457)

Deficiency diseases		Frequency	Percentage
Night blindness & Severe vision impairment	Aware	398	87.09
	Unaware	59	12.91
	Total	457	100
Risk of Diarrhea	Aware	173	37.86
	Unaware	284	62.14
	Total	457	100
Risk of Measles	Aware	181	39.61
	Unaware	276	60.39
	Total	457	100

Source: Field Survey, 2018

Table 5: Knowledge of Selected Sources of Vitamin A: Prevalence

	Percentage prevalence		Disaggregated Mean prevalence			
Critical score	Un-informed	Informed	Un-informe	Informed	Un-informed	Informed
0.65	56.89	43.11	0.45	0.93	0.25(38.89)	0.40(61.11)
0.44	30.19	69.81	0.31	0.80	0.09(14.48)	0.56(85.52)

Source: Field Survey, 2018 *uninformed (<critical index), informed (≥ critical index)

Table 6: Knowledge of sources of Vitamin A in the study area: Mean margin

Critical index	Targeted(n)	Untargeted(N)
0.65	0.20	0.12
0.44	0.12	0.04

Source: Field Survey, 2018

Table 7: Knowledge of Sources of Vitamin A: Intensity

Critical Index	Intensity	
	Targeted(n)	Untargeted(N)
0.65	0.17	0.09
0.44	0.17	0.05

Source: Field Survey, 2018

Table 8: Distribution of respondents according to their knowledge of vitamin A deficiency diseases

	Percentage prevalence		Disaggregated Mean prevalence	
Critical score	Uninformed	Informed	Uninformed	Informed
0.54	54.27	45.73	0.28	0.85
0.36	54.27	45.73	0.28	0.85

Source: Field Survey, 2018 *uninformed (<critical index), informed (≥ critical index)

Table 9: Knowledge of deficiency diseases of Vitamin A in the study area: Mean margin

Critical index	Targeted(n)	Untargeted(N)
0.54	0.27	0.14
0.36	0.09	0.05

Source: Field Survey, 2018

Table 10: Knowledge of Deficiency Outcomes of Vitamin A: Intensity

Critical Index	Intensity	
	Targeted(n)	Untargeted(N)
0.54	0.30	0.16
0.36	0.18	0.10

Source: Field Survey, 2018

References

Abolurin, O.O., Adegbola, A.J., Oyelami, O.A., Adegoke, S.A., and Bolaji, O.O. (2018). Vitamin A deficiency among under-five Nigerian children with diarrhoea. *African Health Science*, *18*(3), 737-742. https://dx.doi.org/10.4314/ahs.v18i3.32.

Adamu, M.D., and Muhammad, N. (2016). Assessment of Vitamin A supplementation coverage and associated barriers in Sokoto State, Nigeria. *Annals of Nigerian Medicine 10*(1), 16-23. https://doi.org/10.4103/0331-3131.189803.

Aghaji, A. E., Duke, R., and Aghaji, U.C. (2019). Inequitable coverage of vitamin A supplementation in Nigeria and implications for childhood blindness. *BioMedCentral Public Health*, *19*(1), 282-289. https://dx.doi.org/10.1186/s12889-019-6413-1.

Aguayo, V.M., and Baker, S.K. (2005). Vitamin A deficiency and child survival in sub-Saharan Africa: A reappraisal of challenges and opportunities. *Food and Nutrition Bulletin*, *26*(4), 348–355. https://doi.org/10.1177%2F156482650502600404.

Aina, B., and Ojedokun, O. (2014). Knowledge and use of dietary supplements by students of College of Medicine, University of Lagos, Idi-Araba, Lagos, Nigeria. *Journal of Basic and Clinical Pharmacy, 5*(2), 34-39. http://dx.doi.org/10.4103/0976-0105.134952.

Ajana, A. M. (1996). *Survey of Coastal and Brackish-Water Shell Fish Fishery of Akwa Ibom State*. A Refills Report for National Aquaculture Research Project; Nigerian Institute for Oceanography and Marine Research, Lagos, pp. 6-10.

Allen, L., Benoist, B., Dary, O., and Hurrell, R. (2006). *Guidelines on food fortification with micronutrients.* Geneva, Switzerland; WHO Press, 376p.

Al Tamimi, J.Z. (2019). Awareness of the Consumption of Dietary Supplements among Students in a University in Saudi Arabia. *Journal of Nutrition and Metabolism*, 1-10. https://doi.org/10.1155/2019/4641768.

Aremu, O., Lawoko, S., and Dalal, K. (2010). Childhood Vitamin A Capsule Supplementation Coverage in Nigeria: A Multilevel Analysis of Geographic and Socioeconomic Inequities. *The Scientific World (Child health and human development)*, 10, 1901–1914. https://dx.doi.org/10.1100/tsw.2010.188.

Ayogu, R. N., Nnam, N. M., Ibemesi, O., and Okechukwu, F. (2016). Prevalence and factors associated with anthropometric failure, vitamin A and iron deficiency among adolescents in a Nigerian urban community. *African health sciences*, *16*(2), 389–398. https://doi.org/10.4314/ahs.v16i2.7.

Bailey, R. L., West, K. P., and Black, R. E. (2015). The epidemiology of global micronutrient deficiencies. *Annals of Nutrition metabolism*, *66*(2), 22-33. https://dx.doi/10.1159/000371618.

Bates, C.J. (1995). Vitamin A. *The Lancet*, *345*, 31-5. https://dx.doi.org/10.1016/S0140-6736(95)91157-X

Baytekus, A., Tariku, A. and Debi, A. (2019). Clinical vitamin-A deficiency and associated.

factors among pregnant and lactating women in Northwest Ethiopia: a community-based cross-sectional study. *BMC Pregnancy and Childbirth*, 19, 506-513. https://doi.org/10.1186/s12884-019-2663-2.

Bendech, M.A., Cusack, G., Konaté, F., Touré, A., Ba, M. and Baker, S.K. (2007). National Vitamin A Supplementation Coverage Survey among 6–59 Months Old Children in Guinea (West Africa). *Journal of Tropical Pediatrics*, 53 (3),190-196, https://doi.org/10.1093/tropej/fmm007.

Berti, P.R., Fallu, C., Agudo, Y. (2014). A systematic review of the nutritional adequacy of the diet in the Central Andes. *Rev Panam Salud Publica*, 34(5), 314–323.

Bowman, B.A., and Russell, R.M. (2001). *Present Knowledge in Nutrition (Vol.8*.) Washington DC: International Life Science Institute press. Pp 127-145.

Catharine, A.R., Caballero, B., CouShilssins, R.J., Tucker, K.L., and Ziegler, T.R.M.D. (2006). *Modern Nutrition in Health and Disease* (10th Ed.). Philadelphia, PA: Lippincott Williams and Wilkins.

Coates, P.M., Betz, J.M., Blackman, M.R., Cragg, G.M., Levine, M., Moss, J., and White, J.D. (2010). *In Encyclopedia of Dietary Supplements* (2nd Ed.). https://doi.org/10.1201/b14669 Pp 105-120; 778-791.

Darnton-Hill, I., Webb, P., Harvey P.W., Hunt, J.M, Dalmiya, N., Chopra, M., Ball, M. J., Bloem, M.J.,

and de Benoist, B (2005). Micronutrient deficiencies and gender: social and economic costs. *American Journal of Clinical Nutrition*. *81*(5), 1198S–1205S.

Edem, D.O. (2009). Vitamin A: a review. *Asian Journal of Clinical Nutrition, 1*(1), 65-82. https://dx.doi.org/10.3923/ajcn.2009.65.82

Gilbert, C. (2007). Changing challenges in the control of blindness in children. *Eye, 21*(10), 1338–1343. https://dx.doi/10.1038/sj.eye.6702841.

Gogate, P., Kalua, K., and Courtright, P. (2009). Blindness in childhood in developing countries: Time for a reassessment? *PLoS Mediicne,* 6(12). e1000177-e1000180. https://dx.doi:10.1371/journal.pmed.1000177.

Harika, R., Faber, M., Samuel, F., Kimiywe, J., Mulugeta, A., and Eilander, A. (2017). Micronutrient Status and Dietary Intake of Iron, Vitamin A, Iodine, Folate and Zinc in Women of Reproductive Age and Pregnant Women in Ethiopia, Kenya, Nigeria and South Africa: A Systematic Review of Data from 2005 to 2015. *Nutrients*, *9*(10), 1096-1118; https://dx.doi.org/10.3390/nu9101096

Herrador, Z., Sordo, L., Gadisa, E., Buño, A., Gómez-Rioja, R., Iturzaeta, J.M., de Armas, L.F., Benito, A., Aseffa, A., Moreno, J., Cañavate, C. and Custodio, E. (2014). Micronutrient deficiencies and related factors in school-aged children in Ethiopia: a cross-sectional study in Libo Kemkem and Fogera districts, Amhara Regional State. *PLoS One*, 9(12):e112858. https://dx.doi.org/10.1371/journal.pone.0112858

Janmohamed, A., Klemm, R.D., and Doledec, D. (2017). Determinants of successful vitamin A supplementation coverage among children aged 6–59 months in thirteen sub-Saharan African countries. *Public Health Nutrition*, *20* (11), 2016–2022. http//dx.doi/10.1017/S1368980017000684.

John, D.A and Brundha, M.P. (2016). Awareness of Vitamin A Deficiency among Middle Aged Men-Research. *Vitamins & Minerals*, 5(2), 144-146 https://dx.doi.org/10.4172/23761318.1000144.

Kupka, R., Nielsen, J., Dhillon, C. N., Blankenship, J., Haskell, M. J., Baker, S. K., and Brown, K. H. (2016). Safety and Mortality Benefits of Delivering Vitamin A Supplementation at 6 Months of Age in Sub-Saharan Africa. *Food and Nutrition Bulletin*, (3), 375-386. https://dx.doi.org/10.1177/0379572116646280.

Merson, M.H., Black, R.E. and Mills, A.J. (2012). *Global Health: Diseases, Programs, Systems, and Policies,* ed 3. Burlington, Jones and Bartlett Learning. Pp 271-304Njue, M.W, Makokha A.O. and Mutai J. (2010). Vitamin A supplementation awareness among mothers of children under five years old at Mbagathi district hospital, Nairobi, Kenya. *East African Journal of Public Health* 7(3), 233-241 http://dx.doi.org/10.4314/eajph.v7i3.64734.

Onyeneke, R.U., Nwajiuba, C.A., Igberi, C. O., Amadi, M.U., Anosike,F.C., Oko-Isu, A., Munonye,J., Uwadoka, C., and Adeolu, A.I. (2019). Impacts of Caregivers' Nutrition Knowledge and Food Market Accessibility on Preschool Children's Dietary Diversity in Remote Communities in Southeast Nigeria. *Sustainability, 11*(6), 1688-1704 https://doi.org/10.3390/su11061688.

Rahman, A., and 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. https://dx.doi.org/10.11648/j.sjph.20140204.22.

Stevens, G.A., Bennett, J.E., Hennocq, Q., Lu, Y., De-Regil L.M, Rogers, L., … Ezzati, M. (2015). Trends and mortality effects of vitamin A deficiency in children in 138 low-income and middle-income countries between 1991 and 2013: A pooled analysis of population-based surveys. *Lancet Global Health,* 3(9), e528–e36. https://doi.org/10.1016/S2214-109X(15)00039-X.

Tulchinsky, T. H. (2010). Micronutrient Deficiency Conditions: Global Health Issues. *Public Health Reviews*, *32*(1), 243-255.

Udoh, E. S., and Udoh, E.J. (2020) Dietary Diversity of Households in Akwa Ibom State, Nigeria. *International Journal of Development and Sustainability*, 8(11), 722-736.

Uti and Edet (2005) Nigerian mothers' knowledge of, and attitudes towards, vitamin A-rich foods and vitamin A supplements. *Africa Journal of Nursing and Midwifery, 7* (2), 67-78. https://journals.co.za/doi/abs/10.10520/AJA16825055_9.

Uwatt, U. B. (2000). Impact of New Technology on Agricultural Production; A Case of Small Farmers in Akwa Ibom State of Nigeria. *International Journal of Social Science*, 1, 75 – 76.

Walker, L. F., Rudan, I., Liu, L., Nair, H., Theodoratou, E., Bhutta, Z.A., O'Brien, K.L., Harry, C. and Black, R. E. (2013). Global burden of childhood pneumonia and diarrhea. *The Lancet*, 381, 1405-1416. http://dx.doi.org/10.1016/S0140-6736(13)60222-6.

Wirth, J. P., Petry, N., Tanumihardjo, S. A., Rogers, L.M., McLean, E., Greig, A., Garrett, G. S., … Rohner, F. (2017). Vitamin A Supplementation Programs and Country-Level Evidence of Vitamin A Deficiency. *Nutrients*, *9*(3), 190-197. https://dx.doi.org/10.3390/nu9030190.